Patterns and Practices: A Mixed Methods Investigation into Psychotropic Prescribing Among UK Care Home Residents

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SUMMARY

Background: Many care home residents have dementia, with Alzheimer's disease (AD) being the most common type. These individuals often experience behavioural and psychological symptoms of dementia (BPSD), such as depression and agitation, which frequently lead to care home admission. National Institute for Health and Care Excellence guidelines recommend non-pharmacological approaches for managing BPSD. However, treatment remains challenging, and psychotropic medications such as antidepressants are often prescribed, despite limited effectiveness in people with dementia. Given the high prevalence of dementia and BPSD among care home residents, alongside the widespread use of psychotropic medications, the aim of this thesis is to investigate the prevalence and patterns of prescribing of psychotropic medications (particularly antidepressants, antipsychotics, and anxiolytics) among older adults living in UK care homes, including their use in the management of BPSD.

Methods: A mixed-methods approach was used. A systematic review was conducted initially to understand how depression is treated pharmacologically in people with AD in care homes. Second, secondary pseudonymized electronic Medication Administration Record data were analysed to describe the characteristics of care home residents and their prescribed medications, with a focus on psychotropic medications. Third, psychotropic prescribing was compared between residents prescribed and not prescribed anti-dementia medications. Finally, care home staff were interviewed to understand their perspectives on the management of BPSD and the use of psychotropic medications, in residents with dementia in care homes.

Results: Across 310 UK care homes, 9060 residents were included. 56.5% were prescribed at least one psychotropic medication, with 69% on a single type and 31% on combinations. Antidepressants (57%) were the most commonly prescribed psychotropic medication, followed by antipsychotics (26%) and anxiolytics (17%). A significant association was observed between anti-dementia and psychotropic medication prescribing, with 66% of residents prescribed anti-dementia medications also prescribed psychotropics, compared with 54% of those not prescribed anti-dementia medications. Among all residents, the prescribing of antidepressants alone (30.9% vs. 26.5%), anxiolytics alone (4.9% vs. 3.3%), and combinations of psychotropics (22.2% vs. 16.2%) was significantly higher among residents prescribed anti-dementia medications compared with those not prescribed such medications. Male residents and youngest-old residents (irrespective of gender) were more likely to be prescribed psychotropic medications than female and oldest-old residents, respectively, regardless of anti-dementia medication prescribing status. Interviews with two care home managers highlighted barriers to providing effective treatment for residents with BPSD, leading care home staff to potentially rely more on psychotropic medications.

Conclusions: The demographic data for the care home residents from this study are representative as they align with UK census data. Psychotropic medications were prescribed extensively in these care homes, with a marked increase among residents also prescribed anti-dementia medications, suggesting anti-dementia medications may

be driving psychotropic prescribing, despite efficacy and side effect concerns. Age and gender also appear to influence prescribing patterns. Residents prescribed anti-dementia medications may exhibit more symptoms or lack medication reviews, leading to inappropriate prescribing. Therefore, it is important for prescribers to consider guidelines and other factors that might influence prescribing practices, particularly for those residents prescribed anti-dementia medications and thus likely to have AD.

List of Abbreviations

AD	Alzheimer's disease
AEC	Anticholinergic Effect on Cognition
AOR	Adjusted odds ratio
APOE	Apolipoprotein E
ATC	Anatomical Therapeutic Chemical
BNF	British National Formulary
BPSD	Behavioural and Psychological Symptoms of Dementia
BZD	Benzodiazepines
CBT	Cognitive Behaviour Therapy
CI	Confidence interval
CIW	Care Inspectorate Wales
CQC	Care Quality Commission
CSDD	Cornell Scale for Depression in Dementia
CT	Computed Tomography
ECT	Electroconvulsive therapy
eMAR	electronic Medication Administration Record
GDS	Geriatric Depression Scale
GI	Gastrointestinal
GPs	General Practitioners
IPT	Interpersonal Therapy
JBI	Joanna Briggs Institute
MMSE	Mini-Mental Status Examination
MOCA	Montreal Cognitive Assessment
MRI	Magnetic Resonance Imaging
NICE	National Institute for Health and Care Excellence
ONS	The Office for National Statistics
OR	Odds Ratio
PR	Prevalence Risk
RCT	Randomized controlled Trial
rTMS	Repetitive Transcranial Magnetic Stimulation
SIAD	Syndrome of Inappropriate Antidiuresis
SIDAH	Syndrome of Inappropriate Antidiuretic Hormone secretion
SLUMS	Saint Louis University Mental Status
SPICE	Setting, Population (or Perspective), Intervention, Comparison and Evaluation
SPSS	Statistical Package for the Social Sciences
SQL	Structured Query Language
SSRIs	Selective Serotonin Reuptake Inhibitors
TCAs	Tricyclic Antidepressants
UK	United Kingdom

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Chapter 1: General Introduction

1.1 Dementia

Dementia is a term that refers to a group of cognitive and behavioural symptoms that include memory loss, difficulty with thinking and speech, personality changes, and a decrease in a person's ability to do daily tasks such as bathing and shopping (National Institute for Health and Care Excellence [NICE] 2018). Dementia is a progressive and irreversible disease, which means the symptoms worsen over time. This development will differ from person to person, and each will have a unique experience with dementia (National Institute for Health and Care Excellence [NICE] 2018).

Every year, more than 10 million new cases of dementia are diagnosed around the world, meaning one case every 3.2 seconds (Alzheimer's Disease International 2023). In 2020, there were more than 55 million people living with dementia around the world, and it is anticipated that this figure will nearly double every 20 years, reaching 78 million in 2030 and 139 million in 2050 (Alzheimer's Disease International 2023). People with dementia currently account for 60% of the population in low- and middle-income countries, but, by 2050, that number will have risen to 71% (Alzheimer's Disease International 2023).

Dementia has a substantial economic effect globally: it was estimated to cost US$818 billion in 2015, while in 2020, this figure was above US$1 trillion (Alzheimer's Disease International 2023). Direct medical care costs (the cost of treating dementia in healthcare settings) account for about 20% of this expenditure, while informal care costs (unpaid care provided by family and others) and direct social care costs (provided by community care professionals and in residential home settings) each account for about 40% of global dementia costs (Alzheimer's Disease International 2023).

Dementia is divided into five types: Alzheimer's disease, vascular dementia, fronto-temporal dementia, Lewy body dementia, and mixed dementia (more than one type of dementia) (National Institute for Health and Care Excellence [NICE] 2018; Alzheimer's Society 2023). Alzheimer's disease is the most prevalent type, accounting for 50 - 75%

of all dementia cases, vascular dementia 17 - 30%, Lewy body dementia 10 - 15% while fronto-temporal dementia is rare, 2.5% of all dementia cases (Alzheimer's Disease International 2020b). Dementia not only affects older people, which is called late onset dementia, but also those under the age of 65: this is known as young or early-onset dementia and it is much less common (Alzheimer's Disease International 2020a; Alzheimer's Society 2023). Accordingly, this thesis will focus on AD, the most common type of dementia

1.2 Alzheimer's disease (AD)

AD is an irreversible, progressive brain disease that causes loss of cognitive and physical function, as well as behavioural symptoms (Wells 2017b; National Institute on Aging 2019a). It was first described in 1906 by Alois Alzheimer, who stated that it was characterised by language difficulties, memory loss and odd behaviour (National Institute on Aging 2019a).

From a pathophysiological perspective, β-amyloid accumulation (plaques) extracellularly, particularly in the cortex and medial temporal lobe, hyperphosphorylation of tau (neurofibrillary tangles [NFTs]) intracellularly, cortical atrophy and degeneration of neurons and synapses are all distinctive features of AD (Wells 2017b; Breijyeh and Karaman 2020).

The causes of AD are unknown, but there are risk factors which increase the chance of developing AD (National Institute on Aging 2019b; Alzheimer's Disease International 2020c). These risk factors could be modifiable or non-modifiable. Modifiable risk factors are mainly related to lifestyle, so maintaining physical activity, participating in social activities, and eating well all promote good brain health and may lower the risk of developing dementia (National Institute on Aging 2019b; Alzheimer's Disease International 2020c). Also, maintaining a healthy heart, which includes quitting smoking and abstaining from excessive alcohol intake, may also reduce the risk of dementia and other diseases (National Institute on Aging 2019b; Alzheimer's Disease International 2020c). Thus, 40% of AD cases could potentially be prevented or delayed by modifying these risk factors (Alzheimer's Disease International 2020c).

Non-modifiable risk factors are age, several genes and biological sex (National Institute on Aging 2019b; Alzheimer's Disease International 2020c; Breijyeh and Karaman 2020). Increasing age is the most significant risk factor for AD. Despite the fact that age increases the risk, AD is not a normal part of the aging process (National Institute on Aging 2019b; Alzheimer's Disease International 2020c). AD is rarely found in young people; most cases of AD begin after the age of 65 (Breijyeh and Karaman 2020). More than 50% of AD cases are related to genetic factors (Van Cauwenberghe et al. 2016; Breijyeh and Karaman 2020). For example, the *Apolipoprotein E* (APOE) gene has been identified as increasing the risk of developing AD if a person has the *APOE4* allele (National Institute on Aging 2019b; Alzheimer's Disease International 2020c; Breijyeh and Karaman 2020). It has also been found that women are more susceptible to developing AD than men, which may be due to women's longer life expectancy and/or the loss of female hormones (estrogen and progesterone) during menopause (National Institute on Aging 2019b; Alzheimer's Disease International 2020c; Breijyeh and Karaman 2020; Alzheimer's Association 2023b).

1.2.1 Diagnosis of AD

AD is diagnosed mainly based on signs and difficulties with everyday tasks reported by patients and caregivers during interviews (Wells 2017b). Mental function can be tested using various tests, which consist of groups of questions or simple tasks. The commonly used tests are 1. The Folstein Mini-Mental State Examination (MMSE); 2. The St. Louis University Mental Status Examination (SLUMS); 3. The Montreal Cognitive Assessment (MOCA); and 4. The Mini-Cog Assessment (Brandt and Bradley 2018). Also, biomarkers (tau & β-amyloid) levels in cerebrospinal fluid and brain imaging, such as magnetic resonance imaging (MRI) or computed tomography (CT) scan, can be used to confirm the diagnosis. Biomarker level measurement and brain imaging have to be done in specialist facilities due to expensive devices and required training for physicians to use them, so are not available in every clinical setting (Frisoni 2001; National Institute for Health and Care Excellence [NICE] 2018). Currently, blood biomarkers are being investigated in the UK for potential implementation as a rapid, accessible, and non-

invasive diagnostic method that may help in the early diagnosis of AD (Alzheimer's Society 2025a).

AD is divided into three stages – mild, moderate and severe – based on the MMSE score (Farlow and Cummings 2007; Brandt and Bradley 2018). Patients with mild AD (MMSE score 26 – 18) usually struggle to recall new events, while in moderate AD (MMSE score 17 – 10), patients require help with daily living activities (Farlow and Cummings 2007; Wells 2017b). Patients with severe AD (MMSE score 9-0) usually lose the ability to walk, speak and feed themselves (Farlow and Cummings 2007; Wells 2017b). **Table 1.1** explains the stages of AD.

***Table 1.1**: Stages of AD based on MMSE scores*

Stage	MMSE Score	Key features
Mild	26 – 18	Early memory loss, trouble managing daily tasks (finances, cooking, driving). May get lost while driving and avoid hobbies and deny symptoms.
Moderate	17 – 10	Needs help with daily living. Disorientation for time/date, poor short-term memory, mood changes (suspicion, sadness), loss of driving ability. Delusions, agitation, and paranoia are common.
Severe	9 -0	Loss of mobility, speech, and self-care. Incontinence of urine and faeces. Requires full-time care (24/7).

Adapted from: (Wells 2017b)

1.2.2 Treatment of AD

There is no cure for AD and thus the aims of AD treatment are temporary recovery, stabilisation, or decreased deterioration in cognitive, functional, and behavioural symptoms (Farlow and Cummings 2007; Wells 2017b). By achieving these objectives, caregivers' burden might be minimized and institutionalisation may be postponed (Farlow and Cummings 2007).

NICE guidelines recommend reminiscence therapy for mild to moderate AD as a non-pharmacological intervention, and cognitive rehabilitation and occupational therapy to

help with functional ability (National Institute for Health and Care Excellence [NICE] 2018).

Patients with AD have been found to have a deficiency of neurotransmitters, particularly acetylcholine (Farlow and Cummings 2007). Increasing the amount of acetylcholine in synapses by inhibiting cholinesterase enzyme activity is one of the main symptomatic treatments for AD (Farlow and Cummings 2007). Cholinesterase inhibitors, including donepezil, rivastigmine and galantamine, are recommended for the treatment of mild to moderate AD (Farlow and Cummings 2007; National Institute for Health and Care Excellence [NICE] 2018).

Glutamatergic therapy (with memantine, an N-methyl-D-aspartate receptor antagonist) is also used. Memantine prevents the action of glutamate, an excitatory neurotransmitter in the brain that causes neuronal excitability and overstimulation in AD. So, memantine can also be used to treat AD, as a monotherapy or in combination with cholinesterase inhibitors (Farlow and Cummings 2007; National Institute for Health and Care Excellence [NICE] 2018). It is also recommended for patients who cannot tolerate or are contraindicated for the cholinesterase inhibitors, or who have moderate to severe AD (Farlow and Cummings 2007; National Institute for Health and Care Excellence [NICE] 2018). **Table 1.2** shows the drugs used in AD in the UK

Although cholinesterase inhibitors have benefits, patients taking these medications will experience adverse events. The most common side effects of cholinesterase inhibitors are gastrointestinal problems (e.g. nausea, vomiting and diarrhoea), so patients are advised to take these agents with meals to minimize these problems (Farlow and Cummings 2007; Electronic medicines compendium 2018). The common side effects of memantine are confusion, agitation and urinary incontinence (Farlow and Cummings 2007; electronic medicines compendium 2019).

Recently, in the United States, lecanemab and donanemab, two anti-amyloid monoclonal antibodies, were approved for the treatment of AD (Cummings 2023). These medications are designed to reduce amyloid-beta (Aβ) plaques in the brain,

thereby delaying the progression of AD (Cummings 2023). Both drugs were approved for the treatment of AD in the UK in August and October 2024, respectively (Medicines and Healthcare products Regulatory Agency [MHRA] 2024a,b). However, neither of these drugs are currently available on the NHS due to their cost (Alzheimer's Research UK 2024b).

Before making a definitive decision about the effectiveness of therapy, at least a six-month cycle should pass, during which cognitive and functional status should be tracked (Farlow and Cummings 2007; Brandt and Bradley 2018). Typically, people diagnosed with AD are prescribed anti-dementia medications, which are continued throughout the duration of the disease and are advised not to be stopped solely due to the severity of the condition (National Institute for Health and Care Excellence [NICE] 2018; Alzheimer's society 2021a). In order to monitor cognitive and functional responses, the MMSE and the Instrumental Activity of Daily Living (IADL) should be used, respectively (Lawton and Brody 1969; Folstein et al. 1975; Farlow and Cummings 2007).

***Table 1.2**: Medications with doses used to treat AD in the UK*

Drug	Starting dose	Maintenance dose	Comments
Cholinesterase Inhibitors			
Donepezil	5 mg daily.	5 – 10 mg daily in mild to moderate AD.	No dose adjustment recommended.
Galantamine	4 mg twice daily or 8 mg once daily ER (Extended release).	8 – 12 mg twice a day or 16-24 mg daily ER.	Renal or hepatic impairment: dosing adjustment necessary
Rivastigmine	1.5 mg twice daily 4.5 mg / day (transdermal patch).	3-6 mg twice a day 9.5 – 13.3 mg/day (transdermal patch).	Transdermal patch for people with GI symptoms; however, skin reactions might occur. Renal or hepatic impairment: dosing adjustment necessary.
Glutamatergic Therapy			
Memantine	5 mg/ day.	20 mg daily.	Used for moderate to severe AD; can also be used in combination with acetylcholinesterase inhibitors. Renal or hepatic impairment: dosing adjustment necessary.

Adapted from: (Wells 2017b; National Institute for Health and Care Excellence [NICE] 2022a)

People with dementia often exhibit Behavioural and Psychological Symptoms of Dementia (BPSD), which are non-cognitive symptoms (Almutairi et al. 2021; Alzheimer's Society 2021d). These symptoms include depression, agitation, anxiety and physical aggression (Cankurtaran 2014; Dhuny et al. 2021). Due to the challenges in identifying and treating depression in people with AD (Banerjee et al. 2013; Leong 2014; Dudas et al. 2018; Alzheimer's Association 2023a), the following section will first discuss depression in general and then BSPD.

1.3 Depression

Depression is a common and severe mood disorder, which can affect individuals' thinking, feeling and management of everyday tasks (e.g. eating, sleeping and working), thus causing significant physical and social dysfunction (National Institute of Mental Health 2018).

There are different types of depression, which occur under different circumstances (National Institute of Mental Health 2018). Major depression is defined as low mood or losing interest in normal activities for two weeks which affects patient life severely, while in dysthymia (persistent depressive disorder), patients will have depressive symptoms for about two years, but with lower intensity and fewer symptoms than major depression (National Institute of Mental Health 2018). When depressive symptoms arise in women after childbirth, this is referred to as postpartum depression. In addition, in psychotic depression, the individual will have depressive symptoms associated with psychotic symptoms, such as delusions and hallucinations, while in seasonal affective disorder, sometimes known as "winter depression", depressive symptoms arise due to the lack of natural sunlight and usually resolve during spring and summer (National Institute of Mental Health 2018).

Furthermore, patients with bipolar disorder will have episodes of two contrasting types, namely mania and major depression (National Institute of Mental Health 2018). In addition, children and teenagers can suffer depressive symptoms, known as "disruptive mood dysregulation disorder". Moreover, some women experience a very severe

premenstrual syndrome (PMS) two weeks before their period starts: this is called premenstrual dysphoric disorder (PMDD) (National Institute of Mental Health 2018). Major depression will be the focus in this Introduction as it is the type most likely to occur in AD (Alzheimer's Association 2023a)

In the United States in 2017, around 17.3 million (7.1%) adults had at least one major depressive episode, and prevalence was higher among women (8.7%) compared to men (5.3%) (National Institute of Mental Health 2019). In the United Kingdom in 2014, 19.7% of adults had depressive symptoms, and prevalence was again higher among women (22.5%) than among men (16.8%) (Mental Health Foundation 2021). The incidence of depressive symptoms is higher among people with a lower socioeconomic class as well as in women (Angelini 2018).

From a pathophysiological perspective, there are many hypotheses to explain how depression occurs. The monoamine deficiency hypothesis states that depression occurs due to reductions in the levels of the neurotransmitters norepinephrine, dopamine and serotonin (5-HT) in the brain, or due to postsynaptic changes in receptor sensitivity, with norepinephrine or serotonin receptors being desensitized or downregulated (Brigitta 2002; Wells 2017a; Angelini 2018). Another suggestion is that the homeostatic regulation of neurotransmitters fails (dysregulation hypothesis) (Wells 2017a; Angelini 2018).

The clinical presentation of depressive patients can involve many symptoms including emotional, cognitive, physical and psychomotor disturbances (Wells 2017a; Angelini 2018). Emotional symptoms include apathy (loss of interest in usual activities), hopelessness, guilt, and psychotic characteristics (delusions and auditory hallucinations), while cognitive symptoms involve confusion and reduced ability to focus and recall recent events (Wells 2017a; Angelini 2018). In addition, physical symptoms include fatigue, sleep disturbance, absence of sexual interest, and gastrointestinal and cardiovascular issues. Psychomotor disturbance can manifest either as retardation (slow physical movement and speech) or agitation (e.g. fast talking and restlessness) (Wells 2017a; Angelini 2018).

1.3.1 Diagnosis:

Diagnosis of depression can be made using the International Classification of Disease (ICD-10), which requires the presence of at least four out of ten depressive symptoms, or the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), which requires the presence of at least five out of nine depressive symptoms to be present in order for the patient to be diagnosed with major depressive disorder (National Institute for Health and Care Excellence [NICE] 2009). Also, the extent of functional impairment and the number and severity of depressive symptoms determine the severity of major depressive disorder (National Institute for Health and Care Excellence [NICE] 2009).

According to the DSM-5, to be diagnosed with major depressive disorder, patients should have at least five depressive symptoms lasting for two weeks. One of these symptoms must be either depressed mood or loss of interest or pleasure in usual activities (anhedonia), and symptoms must not result from using a medication or disease (American Psychiatric Association 2013; Angelini 2018).
The depressive symptoms are sleep disturbances (insomnia or hypersomnia), changes in appetite (either decreased or increased) leading to weight loss or weight gain, suicidal thoughts or attempts, fatigue or loss of energy, feelings of guilt or worthlessness, psychomotor retardation or agitation, or decreased concentration. Patients who have at least five of these symptoms almost every day for at least two weeks, including either anhedonia or depressed mood, will be diagnosed with major depressive disorder (American Psychiatric Association 2013; Angelini 2018).

In order to detect underlying causes of major depression disorder, physical examination and laboratory tests (thyroid disorders, vitamin deficiency, electrolyte determination), a mental status examination and a medication review are all required for diagnosis (Wells 2017a). Depressive symptoms may sometimes be induced or exacerbated by medications (e.g., benzodiazepines or corticosteroids) or by diseases (e.g., stroke, endocrine disorders, or dementia). In such cases, the criteria for major depressive disorder are not met. Once the inducing factor is managed, depressive symptoms often

resolve without psychiatric intervention (Angelini 2018). For example, hypothyroidism frequently induces depressive symptoms, which typically improve once thyroid function is increased by treatment (American Psychiatric Association 2013; Wells 2017a; Angelini 2018).

1.3.2 Assessment:

Depression is classified into four types, depending on its severity. Subthreshold depressive symptoms are defined as the presence of fewer than five depressive symptoms, while mild depression is defined by the presence of few symptoms in excess of the five required to make a diagnosis, leading to mild functional impairment (National Institute for Health and Care Excellence [NICE] 2009; American Psychiatric Association 2013). If symptoms of functional impairment are between mild and severe, this will be defined as moderate depression; however, in severe depression, the majority of symptoms are present and significantly impair functioning (National Institute for Health and Care Excellence [NICE] 2009; American Psychiatric Association 2013).

There are numerous rating scales for assessing the severity of depression. These scales are not only useful for assessing the severity of mental disorders, but also for evaluating treatment effectiveness and quantifying changes in target symptoms. However, they are not used for diagnostic purposes (Angelini 2018). The most common scales are the Hamilton Rating Scale for Depression (HAM-D), the Cornell Scale for Depression in Dementia (CSDD), the Montgomery-Asberg Depression rating scales (MADRS), and the Alzheimer's Disease Cooperative Study-Clinical Global Impression of Change (ADCS-CGIC) (Leong 2014; Angelini 2018) These scales differ in content, format and length, and they can be completed by patients, doctors, family members, or researchers (Angelini 2018). For example, the CSDD consists of 19 questions with total scores ranging from 0-38 on a three-point scale (0-3). Scores ranging from 0 to 8 indicate no or minor depressive symptoms, while scores of 9 to 13 denote mild symptoms, 14 to 18 moderate symptoms, and 19 to 38 severe depressive symptoms (Alexopoulos et al. 1988)

1.3.3 Treatment of Depression

Therapeutic goals for patients with depressive symptoms are that current symptoms should be resolved and relapse or recurrence of depression episodes should be prevented (Wells 2017a). There are two types of treatment: the non-pharmacological approach, which involves psychotherapy and somatic intervention, and the pharmacological approach, which mainly involves using antidepressants (Wells 2017a).

1.3.3.1 Non-pharmacological treatment:

Psychotherapy is one of the non-pharmacological approaches used to treat depression. It takes a long time, around 3 months, to observe its effectiveness, but its effects last longer than medication-related benefits (National Institute for Health and Care Excellence [NICE] 2009; Angelini 2018). The most commonly used types of psychotherapy are cognitive behaviour therapy (CBT) and interpersonal therapy (IPT) (Wells 2017a). CBT focuses on understanding the patient's thoughts and behaviour and how they affect patients, while IPT focuses on the patient's relationships and their issues, such as communication problems (The National Health Services (NHS) 2019).

Physical activity and low intensity psychotherapy are recommended for mild to moderate depression or persistent subthreshold depressive symptoms (National Institute for Health and Care Excellence [NICE] 2009). However, for moderate or severe depression, it is recommended to use a combination of a high intensity psychological intervention, such as CBT or IPT, and antidepressants (National Institute for Health and Care Excellence [NICE] 2009). There is also evidence that psychotherapy might prevent relapse in patients who have already been given antidepressants (National Institute for Health and Care Excellence [NICE] 2009; Angelini 2018)

Somatic intervention is another type of non-pharmacological treatment for depression. Electroconvulsive therapy (ECT) is an invasive somatic approach, which is effective and safe, with a rapid response (National Institute for Health and Care Excellence [NICE] 2009; Wells 2017a; Angelini 2018). It is indicated for refractory depression, psychotic depression, and depression in pregnancy, and is considered as a first-line treatment if symptoms are life-threatening (National Institute for Health and Care Excellence [NICE]

2009; Angelini 2018). Temporary memory loss, headache and muscle pain are the more common side effects of ECT (Angelini 2018). As ECT induces generalized seizures, some medications that increase the seizure threshold or enhance cognitive impairment, such as lithium, should be withdrawn before starting treatment (Angelini 2018).

Another somatic intervention is repetitive transcranial magnetic stimulation (rTMS), which is a non-invasive process in which an electrical magnetic stimulus is applied to the scalp, resulting in an electrical field in the cerebral cortex (Wells 2017a; Angelini 2018). Vagus nerve stimulation, which involves implanting an electrical device under the clavicle though surgery, is another somatic intervention for treating resistant depression (Wells 2017a; Angelini 2018).

1.3.3.2 Pharmacotherapy approach:

In 1950, antidepressants were first introduced by Roland Kuhn. From a pharmacological perspective, antidepressants are the main medications used in treating depression. They are divided into different groups (Cologne 2006), selective serotonin reuptake inhibitors (SSRIs), serotonin norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs) and miscellaneous antidepressants (Cologne 2006; National Institute for Health and Care Excellence [NICE] 2021a). The earliest examples included phenalizine (an MAOI) and imipramine (a TCA) (Brigitta 2002; Francisco and Cecilio 2009). They were used extensively but, due to their serious side effects and low tolerance, their use is now restricted (Brigitta 2002; Francisco and Cecilio 2009). In 1980, fluoxetine, a selective serotonin reuptake inhibitor (SSRI) and reboxetine, a selective norepinephrine reuptake inhibitor (NRI), were discovered (Francisco and Cecilio 2009). **Table 1.3** shows the various antidepressant types and their mechanisms of action, doses, and most common side effects.

Mechanisms of action differ between the various groups of antidepressants. In general, it has been suggested that SSRIs, SNRIs and TCAs treat depression by increasing the concentration of neurotransmitters (serotonin alone or serotonin and norepinephrine) in the synaptic cleft though blocking their reuptake from the synapse to the neurons (Cologne 2006; Angelini 2018). TCAs also block muscarinic, histamine, and alpha-

cholinergic receptors, so they also have anticholinergic and antihistamine effects. MAOIs also increase concentrations of neurotransmitters (serotonin, norepinephrine, dopamine and tyramine), via inhibiting the monoamine oxidase enzyme, which is responsible for the breakdown of neurotransmitters (Cologne 2006; Angelini 2018). Antidepressants should be chosen based on the drug's side effect profile (National Institute for Health and Care Excellence [NICE] 2009). Mirtazapine, for example, has sedative features, which might be helpful to manage depressive symptoms for patients with insomnia (Leong 2014; National Institute for Health and Care Excellence [NICE] 2018).

Table 1.3: *Antidepressant classes, agents, doses and common side effects*

Mechanism of action	Agents	Initial - max doses (mg/day)	Common side effects
Selective Serotonin Reuptake Inhibitors (SSRIs)			
Inhibit the reuptake of serotonin (5-HT) selectively.	Fluoxetine	20 - 60 mg daily	1. Insomnia 2. Gastrointestinal (GI) complaints 3. Sexual dysfunction 4. Serotonin syndrome 5. Bleeding 6. Fractures 7. QT interval prolongation (electrocardiogram change) 8. Hyponatremia due to Syndrome of Inappropriate Antidiuresis (SIDAH).
	Sertraline	50 - 200 mg daily	
	Paroxetine	20- 50 mg daily	
	Citalopram	20 – 40 mg daily	
	Escitalopram	10 – 20 mg daily	
	Fluvoxamine	50 – 300 mg daily	
Serotonin Norepinephrine Reuptake Inhibitors (SNRIs)			
Inhibit the re-uptake of serotonin and noradrenaline (NE)	Duloxetine	60 – 90 mg daily	1. Hypertension 2. Anxiety 3. Nausea
	Venlafaxine	75 – 375 mg daily	
Tricyclic antidepressants (TCAs)			
Inhibit the reuptake of 5-HT and NE. Also block histamine, muscarinic and alpha-adrenergic receptors	Amitriptyline	50 -150mg daily	1. Highly associated with suicidal thoughts/self-harm 2. Anticholinergic effects 3. QT interval prolongation
	Doxepin	75 -300 mg daily	
	Imipramine	75–200 mg daily	
	Nortriptyline	75 – 150 mg daily	
	Clomipramine	10 – 250 daily	
	Dosulepin	75–225 mg daily	
	Lofepramine	140 - 210 mg daily	
	Trimipramine	75 – 300 mg daily	
Monoamine oxidase inhibitors			
Monoamine oxidase enzyme is inhibited by this group, leading to neurotransmitter accumulation	Phenelzine	75 – 90 mg daily	1. Arrhythmia 2. Postural hypotension (orthostatic hypotension) 3. Hypertensive crisis due to food-drug interactions (e.g., tyramine-rich foods such as salami, or matured cheese) 4. Numerous drug–drug interactions
	Isocarboxazid	30 – 60 mg daily	
	Tranylcypromine	20 – 30 mg daily	
	Moclobemide	300 – 600 mg daily	

	Agents	Initial - Max doses (mg/day)	Common side effects
Miscellaneous antidepressants			
Serotonin uptake inhibitors - mixed serotonergic effects	Trazodone	150 – 600 mg daily	1. Priapism 2. Aggression 3. Sedation
Tetracyclic antidepressants- Serotonin and alpha2 adrenergic receptor antagonists	Mirtazapine	15 – 45 mg daily	1. Increased appetite 2. Weight gain 3. Sedation
	Mianserin	30 – 90 mg daily	
Re-establish the inhibitory action of serotonin on amygdaloid nuclei	Tryptophan	1-6 g daily	1. Oedema 2. Drowsiness
5-HT_3 receptor antagonist, 5-HT_{1A} receptor agonist, and inhibits re-uptake of serotonin	Vortioxetine	5 – 20 mg daily	1. Nausea and vomiting 2. Diarrhoea 3. Abnormal dreams
Melatonin receptor agonist and selective serotonin receptor antagonist.	Agomelatine	25 – 50 mg daily	1. Sleep problems 2. Abnormal pain 3. Fatigue
Noradrenaline reuptake inhibitors (NRIs)	Reboxetine	8 – 12 mg daily	1. Decreased appetite 2. Akathisia 3. Accommodation disorder 4. Hyperhidrosis

Adapted from: (Wells 2017a; National Institute for Health and Care Excellence [NICE] 2021a)

1.3.3.2.1 Common side effects of antidepressants and responses to drugs

Antidepressants are frequently associated with adverse events, which are different from one group to another (see **Table 1.3**). The most common side effects of antidepressants are hyponatremia and serotonin syndrome (Wells 2017a; National Institute for Health and Care Excellence [NICE] 2021a). Most antidepressants are associated with hyponatremia, which is common in the older adults and might be due to syndrome of inappropriate antidiuretic hormone secretion (SIADH). If a patient develops confusion or drowsiness while taking antidepressants, it might be due to hyponatremia (National Institute for Health and Care Excellence [NICE] 2021a).

Another side effect is serotonin syndrome, which is a group of motor, autonomic and mental status changes, such as tachycardia and muscle rigidity (Wells 2017a; Cleveland Clinic 2022). It results from either increasing the dose too high or combining more than one antidepressant, which leads to the accumulation of high levels of serotonin (Wells 2017a; Cleveland Clinic 2022). Also, suicidal thoughts are usually associated with treatment in children, young adults (under 25), or patients with a history of suicidal behaviour, so it is vital to assess and monitor patients for suicidal thoughts (Wells 2017a; National Institute for Health and Care Excellence [NICE] 2021a).

Withdrawal symptoms from antidepressants usually result from stopping the drugs suddenly, particularly after they have been given regularly for six weeks or more (Cleare et al. 2015). These symptoms are mild, including GI complaints, anxiety, and sweating (National Institute for Health and Care Excellence [NICE] 2009; Cleare et al. 2015). They are usually associated with drugs which have a short half-life, such as paroxetine (half-life is 24 hours), and fluvoxamine (half-life is 15 hours) (Cleare et al. 2015). Such withdrawal symptoms can be prevented by gradual dose reduction over four weeks (National Institute for Health and Care Excellence [NICE] 2009).

Regarding the response to antidepressants, only 60% to 70% of patients respond (Cologne 2006; Al-Harbi 2012; Cleare et al. 2015). A response is defined as a reduction of depressive symptoms by at least 50% on the rating scales within six to eight weeks,

and remission is defined as returning to a normal status or having minimal symptoms within around 12 weeks (Cologne 2006; Al-Harbi 2012; Cleare et al. 2015). Around 30% of patients do not respond to antidepressants, requiring depression resistance therapy (Al-Harbi 2012).

The response to antidepressants is not immediate but takes time (two to four weeks) and in older adults can be around six weeks (Erb et al. 2016; National Institute for Health and Care Excellence [NICE] 2021a). This might be because neurotransmitters need to accumulate over several weeks in order for the drugs to work (Erb et al. 2016). Thus, in cases of severe depression when this delay in response is undesirable due to the serious symptoms and risk of self-harm, ECT might be used (National Institute for Health and Care Excellence [NICE] 2021a).

Efficacy among antidepressant agents is equal with regards to alleviating depressive symptoms, so the choice of antidepressant will depend on the patient's situation (National Institute for Health and Care Excellence [NICE] 2009; Wells 2017a; Angelini 2018). The history of the patient or a family member in responding, the patient's medical condition, drug-drug interactions, adverse events and safety, patient preference and cost are all factors that should be taken into consideration before selecting an antidepressant (National Institute for Health and Care Excellence [NICE] 2009; Wells 2017a; Angelini 2018).

1.3.3.2.2 Duration of therapy

Antidepressant therapy for the management of depression can be divided into three phases (Gautam et al. 2017; Wells 2017a; Angelini 2018). The first is the acute phase, which might take around 12 weeks. The goal in this stage is to treat current symptoms and encourage remission (Cleare et al. 2015; Gautam et al. 2017; Wells 2017a; Angelini 2018). The effects of antidepressants are usually seen within 4 weeks, so a review should be conducted after this period (National Institute for Health and Care Excellence [NICE] 2022c).

The next phase is continuation treatment, which is usually lasts from four to nine months. The aim in this stage is to keep acute symptoms in remission or prevent relapse. It is recommended that all patients with depression complete these two stages, so the minimum duration of treatment would be seven months (Cleare et al. 2015; Gautam et al. 2017; Wells 2017a; Angelini 2018)

The third phase is the maintenance phase, or prophylaxis, which is not recommended for all patients. A number of factors determine continuation to this stage (Wells 2017a; Angelini 2018). These are the number of prior episodes, patient age, intensity of current symptoms, family history of depression, response to the treatment, and continuation of environmental stressors (Angelini 2018). This phase can last 12-36 months or more, depending on the individual situation (Wells 2017a).

1.3.3.2.3 Switching and Augmentation

Switching between antidepressant agents might be beneficial for some depressive patients. If there are intolerable or severe adverse events, an inadequate or failed response after four weeks, or if the patient prefers to take another antidepressant, switching should be considered (National Institute for Health and Care Excellence [NICE] 2009). However, there is weak evidence for the advantages of switching to another antidepressant – either a different agent in the same class or another class (National Institute for Health and Care Excellence [NICE] 2021b).

Before making a switch, several significant aspects should be taken into consideration. These aspects are the pharmacodynamic and pharmacokinetic properties of antidepressants, the risk of serotonin syndrome, which can result not only from antidepressants but also from other drugs (e.g. opioids have serotoninergic activity), potential drug–drug interactions between the patient's other medications and antidepressants, and the risk that the patient might get confused if two antidepressant agents are prescribed, particularly if one agent needs to be reduced gradually and the other one started at the same time, which could lead to adverse outcomes (Specialist Pharmacy Service 2019).

There are three methods for switching. The **first** is the direct approach, which involves stopping the old antidepressant suddenly, and then immediately starting the new antidepressant the next day (Psychiatric Times 2017; Specialist Pharmacy Service 2019). The **second** approach is the cross-taper approach, in which the old antidepressant is gradually decreased, and at the same time the new antidepressant is started at a low dose and titrated to reach a therapeutic dose (Psychiatric Times 2017; Specialist Pharmacy Service 2019). The **third** approach is gradual withdrawal and then switching over a couple of weeks, gradually reducing the old agent and then starting the new one either immediately after stopping or after a washout period, which depends on the half-life of the old agent (Psychiatric Times 2017; Specialist Pharmacy Service 2019). Usually, the drug is eliminated from the body within five half-lives (Specialist Pharmacy Service 2019). The risk of drug-drug interactions is high in the first two approaches, while it is low in the third strategy due to the washout period (Specialist Pharmacy Service 2019).

If the patient does not respond well to antidepressant monotherapy after six to eight weeks, or in some cases after twelve weeks, with a full therapeutic dose and good adherence from patients, even after switching antidepressants, combination and augmentation should be considered, or somatic treatment, especially ECT (Psychiatric Times 2013; Cleare et al. 2015; Angelini 2018). Combination treatment involves using two antidepressants together, either from the same or different classes, while augmentation involves using an antidepressant agent with a non-antidepressant agent (National Institute for Health and Care Excellence [NICE] 2009). Common drugs used for combination therapy are mirtazapine or mianserin with another antidepressant (National Institute for Health and Care Excellence [NICE] 2009; Cleare et al. 2015). However, in augmentation, common drugs used are atypical antipsychotics (olanzapine, aripiprazole, risperidone, and quetiapine) or lithium (National Institute for Health and Care Excellence [NICE] 2009; Psychiatric Times 2013).

There are some drugs that should not be used routinely in an augmentation strategy. These are benzodiazepines, due to the risk of dependence, and buspirone,

carbamazepine, lamotrigine, and thyroid hormones, due to insufficient and inconsistent evidence for their use (National Institute for Health and Care Excellence [NICE] 2009).

On the other hand, it has been found that achieving remission rate by combination or augmentation was not more than 30 % and response was less than or equal 50% (Sinyor et al. 2010). Thus, the benefits remain unclear. Moreover, this approach increases the risk of polypharmacy (using 5 or more medications at the same time) including a higher chance of side effect burden and drug-drug interactions (National Institute for Health and Care Excellence [NICE] 2009; Psychiatric Times 2013).

1.3.4 Geriatric depression and optimisation of medication

There is no significant difference in depressive symptoms between adult and older adult patients, so depression is not specific to aging (National Institute for Health and Care Excellence [NICE] 2009). However, older adults tend to present more symptoms of psychomotor retardation but are less likely to share suicidal ideation (Angelini 2018). Compared to younger patients, the response to treatment might take longer (six weeks) in older adults; moreover, antidepressant doses should be lower in this population due to age-associated changes in drug pharmacokinetics and pharmacodynamics, and titration to reach a therapeutic dose should be slower (Cleare et al. 2015; Angelini 2018).

The greater sensitivity of adverse events, current medication, and co-morbidities associated with older adults will have an effect on antidepressant selection (Agency for Healthcare Research and Quality 2019). For example, SSRIs are recommended as first-line treatments due to their tolerability and safety of overdose, while TCAs are not recommended in this population due to their anticholinergic effects and increased risk of falls (Agency for Heathcare Research and Quality 2018).

1.4 Behavioural and Psychological Symptoms of Dementia (BPSD)

People with dementia often exhibit BPSD, also referred to as neuropsychiatric symptoms (NPSs), which are non-cognitive symptoms (Cerejeira et al. 2012; Almutairi et al. 2021; Alzheimer's Society 2021d). Behavioural symptoms include agitation, physical aggression, wandering, and restlessness, while psychological symptoms include depression, anxiety, hallucinations, and delusions (Cankurtaran 2014; Dhuny et al. 2021). BPSD have a substantial impact on the quality of life for individuals with dementia and their carers, leading to increased healthcare costs and potential misuse of medications (Cerejeira et al. 2012).

According to NICE guidelines in the UK, the management of BPSD, such as depression, should begin with non-pharmacological interventions, including psychological treatments (talking therapies) for people with mild to moderate dementia who present with mild to moderate depression (National Institute for Health and Care Excellence [NICE] 2018; National Health Service [NHS] 2022a). However, psychotropic medications are still frequently prescribed (Moth et al. 2021; Alzheimer's Association 2024). Many are prescribed off-label to treat BPSD (Ruths et al. 2013; Alzheimer's Association 2024). Off-label use refers to prescribing an approved drug in a manner not specified in its official Summary of Product Characteristics (SmPC) (Aronson and Ferner 2017).

Psychotropic drugs are medications that affect behaviour, perception, and mood, they are used to treat a range of mental disorders such as depression, anxiety, bipolar disorder, and schizophrenia (Resnick et al. 2023; Texas Health and Human Services 2024; World Health Organization 2024b). Psychotropic medications commonly used for BPSD include antidepressants, antipsychotics, and anxiolytics (Alzheimer's Association 2024), and these will be the focus of this thesis.

Depression in AD is difficult to diagnose, due to overlapping symptoms, such as apathy and impaired cognition, and difficulty of communication with dementia patients (Leong 2014; Alzheimer's Association 2023a). As a result, determining the true prevalence and

incidence of depression in people with dementia is likely to be difficult (Leong 2014; Almeida 2019). However, it is estimated that depression affects up to 40% of people with AD (Alzheimer's Association 2023a).

Depression in AD has negative outcomes not only for patients, but also for caregivers. These include reduction of quality of life, increased impairment of cognitive and functional processes, and more stress and depression in health caregivers (An et al. 2017; Zuidersma et al. 2019). Thus, it is important to treat and manage BPSD, particularly depression in patients with AD (An et al. 2017; Zuidersma et al. 2019).

In older adults without AD, antidepressants have been shown to be effective in treating depression after four to six weeks of treatment. However, in older adults with AD and depression, their effectiveness and safety remain controversial (Leong 2014; Dudas et al. 2018; Almeida 2019; Zuidersma et al. 2019). Old guidelines and small trials showed positive outcomes and supported the use of antidepressants in this population (Dudas et al. 2018). For example, the Depression in Alzheimer's Disease study (DIADS) showed significant benefits of sertraline (SSRI) over placebo (Lyketsos et al. 2003; Mayer et al. 2006). However, negative outcomes have been found in more recent and larger trials. For example, the DIDS-2 and Health Technology Assessment Study of the Use of Antidepressants for Depression in Dementia (HTA-SADD) trials showed no significant difference between antidepressants and placebo (Drye et al. 2011; Banerjee et al. 2013; An et al. 2017; Dudas et al. 2018; Zuidersma et al. 2019). It has been suggested that this might be due to the heterogeneity of symptoms of depression in dementia, and the antidepressant response may vary depending on the patient's depressive symptom profile (Zuidersma et al. 2019). Also, antidepressants might not be effective in treating depression in people with dementia, which may result from damage and neuronal death, unlike depression in people without dementia (Wilkins and Forester 2016; Lozupone et al. 2018).

NICE guidelines advise that antidepressants should not be routinely prescribed as first-line therapy for managing mild to moderate depression in AD (National Institute for Health and Care Excellence [NICE] 2018; Zuidersma et al. 2019). Similarly, the US Food

and Drug Administration (FDA) has not approved any antidepressants for the treatment of depression in AD (Cassano et al. 2019). Despite this, antidepressants are the most commonly prescribed psychotropic medications in people with AD, with SSRIs remaining the most frequently used (Helvik et al. 2017; Smeets et al. 2018; Zuidersma et al. 2019; La Frenais et al. 2021; Hughes et al. 2024)

Despite limited evidence and concern about the effectiveness of antidepressants in people with AD, the antidepressant prescription rate is higher among patients with AD compared to non-AD patients (Orgeta et al. 2017; Brimelow et al. 2019). One study found that in care homes, the prescribing rate of psychotropic medications, such as antidepressants and antipsychotics, is between 50% and 80% for managing BPSD (Brimelow et al. 2019). Around half of these prescriptions were inappropriate according to Beers Criteria (Brimelow et al. 2019). The Beers Criteria is a list of potentially inappropriate medications that should be avoided in elderly people (65 years and older), as the harmful side effects often outweigh the benefits, and it is used to promote safer prescribing in this population (American Geriatrics Society Beers Criteria Update Expert 2023; Cleveland Clinic 2023). For example, antipsychotics increase the risk of stroke and mortality, and antidepressants with strong anticholinergic properties, such as amitriptyline, are also included in this list (American Geriatrics Society Beers Criteria Update Expert 2023).

In addition to the higher prescription rate, residents of care home are usually older adults with numerous comorbidities and medications (polypharmacy) (Gordon et al. 2013). Prescribing antidepressants, which may be ineffective, to care home residents with AD can increase the risk of drug–drug interactions and adverse events in these frail, older adults. Hyponatremia, cardiotoxicity and anticholinergic effects are significant adverse effects of antidepressants, particularly in older populations (Leong 2014; Kitching 2015; Cassano et al. 2019; Zuidersma et al. 2019). Moreover, SSRIs can interact with anticoagulants, which are frequently prescribed in older adults, thereby increasing the risk of bleeding (Medicines Complete 2012; National Institute for Health and Care Excellence [NICE] 2021a; Rahman et al. 2024). These adverse effects and drug

interactions highlight the need for caution and careful monitoring when prescribing in older adults.

Antipsychotics, primarily used for schizophrenia and bipolar disorder, are sometimes prescribed for BPSD. However, their benefits in this context are modest, and they should only be considered when individuals with dementia are at risk of harming themselves or others, or are experiencing severe distress due to agitation or hallucinations, and treatment should be at the lowest effective dose and for the shortest possible duration, due to limited efficacy and potential adverse effects (National Institute for Health and Care Excellence [NICE] 2018). In the UK, risperidone and haloperidol are the only licensed drugs for treating non-cognitive symptoms of dementia (National Institute for Health and Care Excellence [NICE] 2018).

The use of anxiolytics to treat BPSD is generally discouraged, although they are sometimes prescribed off-label (Alzheimer's Society 2021d; La Frenais et al. 2021). For example, anxiolytics are frequently prescribed to residents with dementia for agitation and aggression (Rijksen et al. 2021). However, in older adults, they should be avoided due to risks of confusion and ataxia, which increase the likelihood of falls and fractures, and should not be used for more than four weeks to prevent dependence and withdrawal symptoms (Bourgeois et al. 2012a; Rijksen et al. 2021; National Institute for Health and Care Excellence [NICE] 2024b). Furthermore, anxiolytic use may negatively affect dementia progression and accelerate cognitive decline (Rosenberg et al. 2012; Brimelow et al. 2019; He et al. 2019).

In the UK, the majority of care home residents are aged 65 years and over (Barrett 2023b; Storey 2023b). Additionally, 70% of care home residents have dementia (Alzheimer's Society 2025b). Therefore, the following section will provide background information on care homes and their residents.

1.5 Care homes

A care home is a facility that provides personal care, support, and accommodation to individuals who require assistance with daily activities or are unable to live independently due to physical or cognitive impairments (Age UK 2024; Albert 2024; Social Care Institute for Excellence [SCIE] 2024)

Care homes frequently include communal areas, such as lobbies and dining rooms, as well as gardens or outdoor spaces. Social activities are usually organised for residents (Albert 2024; Social Care Institute for Excellence [SCIE] 2024). These homes provide 24-hour care, and visits from GPs, dentists, physiotherapists, and other healthcare providers can be arranged (Albert 2024; Social Care Institute for Excellence [SCIE] 2024).

Care homes can be operated by local authorities, private companies or charitable organisations (Age UK 2024). They are regulated by specific regulatory bodies according to the four constituent parts of the UK (Albert 2024; Social Care Institute for Excellence [SCIE] 2024). For instance, care homes in England are regulated by the Care Quality Commission (CQC), while in Wales, they are overseen by the Care Inspectorate Wales (CIW) (Social Care Institute for Excellence [SCIE] 2024).

There are two primary categories of care homes: residential care homes and nursing homes. In the UK, there are approximately 16,700 care homes, with 70% being residential homes and 30% nursing homes (Berg 2025). The first category is residential care homes, which are designed to accommodate individuals who are unable to independently care for their own needs or live independently, but do not require 24-hour nursing care (Age UK 2024; Albert 2024). Healthcare assistants, or "carers," are the primary staff in residential care facilities, where they provide assistance to residents with their daily activities (Age UK 2024; Albert 2024). The second category is nursing homes, which are intended for individuals who require 24-hour nursing care and experience significant difficulty with daily tasks (Age UK 2024; Albert 2024)(Age UK 2020). The nursing home staff typically consist of qualified nurses who offer continuous

support (Age UK 2024; Albert 2024). People in nursing homes require more intensive care than people in residential care (Albert 2024). Some care homes are more specialized, offering additional services for individuals with greater needs, such as dementia care homes, where staff are qualified nurses with dementia training (Age UK 2024; Albert 2024).

1.6 Care home residents

Recent data indicates that around half a million people (441,479) are living in care homes in the UK (Berg 2025). This number is expected to increase, due to the older population in the UK increasing. In 2011, there were over 9.2 million (16.4%) people aged 65 years and older in the UK, which increased to 11 million (18.6%) in 2022 (Storey 2023a).

According to the 2021 UK Census, the majority of care home residents are aged 65 years and over, making up 82.1% of the population (Barrett 2023b; Storey 2023b). Among these, 56.4% are aged 85 years and older (Storey 2023b). The number of female residents is substantially higher than that of males in care homes for those aged 65 years and over, with a ratio of approximately 23 to 10 (Storey 2023b). Male residents are more likely to be under 85 years (59%), whereas female residents are more likely to be 85 years and older (63%), suggesting male residents tend to be younger than female residents (Storey 2023b). In 2021, the median age of male care home residents aged 65 and over was approximately 82 years, while for females it was 87 years (Storey 2023b).

This may reflect the longer life expectancy of females compared with males. At age 65 in the UK, projected life expectancy is 20.8 years for females, compared with 18.3 years for males (Buxton 2024). Also, in care homes the life expectancy for females aged 65 years and over is significantly higher than for males of the same age group (Barrett 2023b). For female residents, life expectancy ranges from 7 years for those aged 65-69 years to 2.9 years for those aged 90 years and over (Barrett 2023b). For male residents, life expectancy ranges from 6.3 years for those aged 65-69 years to 2.2 years for those aged 90 years and over (Barrett 2023b). The typical resident of a care home is a female

over the age of 85 with six or more clinical diagnoses, taking seven or more medications, and experiencing major physical disabilities, mental health issues, and cognitive impairments (Gordon et al. 2013; Gladman et al. 2015; British Geriatrics Society 2020)

Older adults are susceptible to geriatric syndromes, which incorporate a variety of conditions such as dementia, frailty, osteoporosis, urinary incontinence, sleep disturbances, and delirium, all of which can have a substantial effect on their quality of life (Won et al. 2013). In care homes, approximately 70% of residents have dementia, more than half experience mobility problems, and up to one-third suffer from incontinence (British Geriatrics Society 2020; Alzheimer's Society 2025b). Dementia is considered one of the most common risk factors for care home admission (Luppa et al. 2009; Toot et al. 2017).

1.7 Rationale and scope of the thesis

In the UK, it is estimated that one in three people born today will develop dementia during their lifetime. Currently, around one million people are living with dementia, and this number is expected to increase to 1.4 million by 2040 (Alzheimer's Society 2025b). Notably, approximately 70% of care home residents are estimated to have dementia, which has been identified as the leading cause of death in care homes (Eley 2023; Alzheimer's Society 2025b). AD, the most common type of dementia, accounts for 70% of dementia cases (National Institute for Health and Care Excellence [NICE] 2018).

Up to 90% of people with dementia exhibit BPSD (Almutairi et al. 2021; Alzheimer's Society 2021d). BPSD are difficult to manage at home, often resulting in admission to care homes (Toot et al. 2017; Dhuny et al. 2021). Although guidelines such as NICE recommend that BPSD should be initially treated with non-medication approaches, psychotropic medications are often prescribed off-label (National Institute for Health and Care Excellence [NICE] 2018; Moth et al. 2021; Alzheimer's Association 2024).

BPSD also show variation between gender and age. Males are more likely to exhibit physical aggression and indifference, whereas females are more prone to experiencing depression and anxiety (Lovheim et al. 2009; Zuidema et al. 2009). Also, BPSD are more prevalent among younger residents (Selbaek et al. 2007a). These differences may contribute to distinct prescribing patterns of psychotropic medications.

International evidence shows widespread prescribing of psychotropic medications in care homes. For example, in Australian care homes more than half of residents were prescribed at least one psychotropic medication (McMaster et al. 2017; Brimelow et al. 2019), and similar findings were reported in Norwegian nursing homes (Ruths et al. 2013; Gulla et al. 2016). Antidepressants are the most commonly prescribed psychotropics and are more frequently associated with female residents (Ruths et al. 2013; Almutairi et al. 2021). Age may also influence prescribing: in Australian care homes, those with higher rates of psychotropic prescribing had older residents (mean age 87) compared with homes with lower prescribing rates (mean age 83; $p < 0.001$) (Brimelow et al. 2019). Despite only modest efficacy in this population, these drugs are associated with serious adverse events; for instance, antipsychotic use in people with dementia is associated with increased risk of stroke and mortality (Ballard et al. 2008; Richter et al. 2012; Ruths et al. 2013).

These findings highlight a growing reliance on psychotropic medications in care homes despite their limited benefits and associated risks, particularly for people with AD. Contributing factors may include difficulties in implementing non-pharmacological approaches, limited awareness of adverse effects, understaffing, and the perception of medication as a simpler solution for managing BPSD (Sawan et al. 2017; Almutairi et al. 2018b; Maust et al. 2018b; Yoon et al. 2022). Given the high prevalence of dementia among care home residents, particularly those with BPSD, and the widespread use of psychotropic medications in this setting, there are ongoing concerns about their effectiveness and appropriateness.

1.7.1 Research gap, research question and aim

International studies demonstrated inappropriate prescribing of psychotropics to care home residents including those with dementia. However, there is limited evidence from the UK on the prevalence and prescribing patterns of psychotropic medications (particularly antidepressants, antipsychotics, and anxiolytics) commonly used for managing BPSD in care homes. In addition, little is known about how prescribing patterns are influenced by age, gender, and anti-dementia medication prescribing status.

Given the international evidence around inappropriate prescribing of psychotropics, the overarching research question for this thesis is as follows: How are psychotropic medications prescribed in residential care homes in the UK?

Thus, to address this question, the aim of this thesis is to investigate the prevalence and patterns of prescribing psychotropic medications (particularly antidepressants, antipsychotics, and anxiolytics) among older adults living in UK care homes, including their use in the management of BPSD. In order to achieve this aim, the thesis is structured into chapters, each with specific objectives, that collectively contribute to a more comprehensive understanding of the topic.

1.7.2 Scope of the Thesis:

The scope of this thesis concerns psychotropic medications (particularly antidepressants, antipsychotics, and anxiolytics) which are used for several conditions including the management of BPSD. Non-pharmacological interventions are beyond the scope of the thesis.

Chapter 2: This chapter explains the general methodology used to achieve the thesis's aim through a mixed-methods approach.

Chapter 3: To set the scene and understand the existing literature, a systematic review was conducted on how depression is treated pharmacologically in older adults with dementia in care homes, as so many people with dementia live in such settings.

Chapter 4: Given the focus on the care home population, a care home database was utilized to understand more about the medications prescribed to the residents. The chapter aimed to explore the demographic characteristics of care home residents and their medications, with a particular focus on psychotropic medications. The objectives of this chapter were to:

- Explore the demographic characteristics of residents in care homes using electronic medication administration record (eMAR) software.
- Identify the residents being prescribed psychotropic medications.
- Investigate the association of gender and age group with psychotropic medication prescriptions.

Chapter 5: Building on the previous chapter, this chapter divides residents into two groups based on their anti-dementia medication prescribing status and investigates:

- The association between the prescribing of anti-dementia and psychotropic medications.
- The comparison of psychotropic medication prescribing between residents prescribed and not prescribed anti-dementia medications.

- The identification of different types of psychotropic medications and the most commonly prescribed agents in both groups (prescribed and not prescribed anti-dementia medications).
- The effects of age and gender on the prescribing of psychotropic medications in both groups.

Chapter 6: Based on the results from the previous chapters, this chapter aimed to understand how care homes manage BPSD, particularly depression, including the use of psychotropic medications. To achieve this, a feasibility study was carried out with interviews conducted with staff to:

- Explore their views on the management of BPSD (particularly depression) in residents with AD in care homes.
- Identify barriers to the effective treatment of BPSD in these residents.
- Assess the practical challenges and feasibility of recruiting and conducting interviews with care home staff.

Chapter 7: The thesis ends by discussing the main findings across the chapters, putting them in context with the wider literature and identifying the key learnings from the thesis. It also addresses the strengths and limitations of the thesis, provides suggestions for future work, and presents a final conclusion.

Chapter 2: General Methodology

2.1 Introduction

The methodology, or research approach, is essentially the plan or framework that guides the choice and application of specific research methods, the aim being to align these methods with the anticipated results of the research (Crotty 1998; Creswell and Creswell 2022). The choice of an appropriate methodology is influenced by the nature of the research question under investigation and the philosophical stance, or philosophical worldviews, of the researcher (Holden and Lynch 2004). It interconnects worldviews, research design, and specific methods (**Figure 2.1**) (Creswell and Creswell 2022).

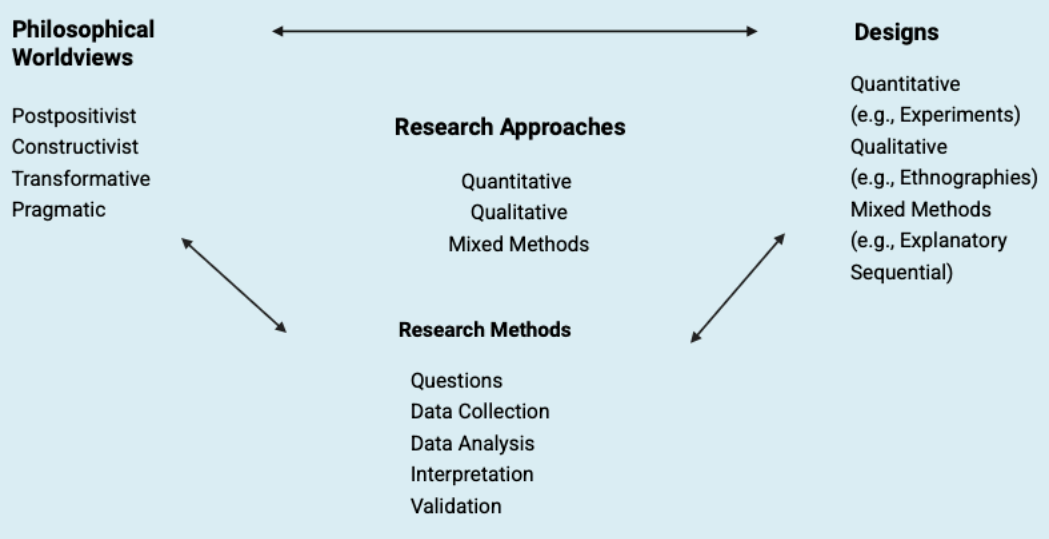


Figure 2.1: This diagram illustrates the links between philosophical worldviews, research designs, and research methods (Adapted from Creswell (2022).

There are three primary research approaches: quantitative, qualitative, and mixed methods (Creswell and Creswell 2022). Quantitative research seeks to test objective hypotheses by analysing variables through statistical methods and is known for its deductive nature, aiming for generalizable and replicable results (Bowling 2014; Creswell and Creswell 2022). Qualitative research, in contrast, is concerned with understanding the subjective meanings people attribute to social issues and uses inductive reasoning, beginning with data collection and observation from which broader patterns and hypotheses are derived (Bowling 2014; Creswell and Creswell 2022). The

mixed-methods approach combines both quantitative and qualitative techniques to provide a fuller picture of the research problem (Creswell and Creswell 2022).

The methodology should not be confused with the actual methods used in the research. While methodology refers to the overall strategy or approach, methods are the specific techniques utilised to collect and analyse data (Crotty 1998; Austin 2019; Creswell and Creswell 2022). This chapter aims to discuss the philosophical worldviews, literature review approaches, research designs, quantitative and qualitative research methods, and other methodological considerations used to address the overall research question in the thesis.

2.2 Philosophical Worldview

Worldviews are defined as "a basic set of beliefs that guide action" (Guba et al. 1990). Some researchers consider the term to be interchangeable with paradigms or epistemology and ontologies (Creswell and Creswell 2022). Also, worldviews or paradigms refer to the researcher's philosophical orientation regarding the world and the nature of the topic being investigated, typically shaped by the orientation of their discipline and previous research experience (Creswell and Creswell 2022). There are four main types of worldviews (Creswell and Creswell 2022), as discussed below.

2.2.1 The postpositivist worldview:

The postpositivist worldview has been predominantly linked more with quantitative research than qualitative research; it is sometimes referred to as the scientific method (Austin 2019; Creswell and Creswell 2022). Although absolute truth is difficult to attain, knowledge can be developed by means of methodical observation and measurement (Phillips and Burbules 2000).

In an effort to better comprehend the world, postpositivist emphasises objectivity, the development of measurable observations, and the testing of hypotheses in support of a deterministic nature of the world in which cause and effect are probably linked (Phillips

and Burbules 2000; Creswell and Creswell 2022). **Chapters 4** and **5** are examples of this worldview.

According to Phillips and Burbules (2000), the key points of a postpositivist worldview are the conjectural nature of knowledge, the iterative process of making and refining claims, the role of data and rationality in shaping knowledge, the aim to explain or describe causal relationships, and the importance of objectivity and methodological rigour in the research, e.g., validity and reliability.

2.2.2 The constructivist / interpretivist worldview:

The constructivist worldview, commonly used in qualitative research methods, such as interviews, is based on the idea that people create their own understanding of the world through their unique experiences (Austin 2019; Creswell and Creswell 2022). Constructivist research emphasises the importance of participants' perspectives, asking broad, open-ended questions that allow participants to express the meaning they find in their experiences (subjective meaning); often developed through social interaction and influenced by cultural and historical contexts (Crotty 1998; Creswell and Creswell 2022). It aims to interpret the world from the participants' point of view. **Chapter 6** is an example of this worldview.

2.2.3 The transformative worldview:

The transformative research perspective goes beyond mere observation as seen in constructivism, by proactively aiding marginalised groups (Creswell and Creswell 2022). This worldview emphasises the significance of investigating the experiences of marginalised groups, addressing inequalities that stem from various forms of social stratification, and linking research to political and social change efforts against these inequalities (Mertens 2010; Creswell and Creswell 2022). This worldview has not been utilised in this thesis.

2.2.4 The pragmatic worldview:

The pragmatic worldview is commonly used in a mixed-methods approach (Creswell and Creswell 2022). This worldview is flexible, as it is not tied to any one philosophy; it emphasises the research problem over the method used, employing a pluralistic approach to gain insights into a problem (Morgan 2007; Creswell and Creswell 2022). Consequently, mixed-methods researchers use both quantitative and qualitative data to obtain a comprehensive understanding of a research issue (Morgan 2007; Creswell and Creswell 2022).

Pragmatists focus on the practical outcomes of research, particularly the 'what' and 'how' that lead to the desired consequences. With the pragmatic worldview, mixed-methods researchers are provided with a spectrum of methods, viewpoints, assumptions, and techniques for data collection and analysis (Morgan 2007; Creswell and Creswell 2022).

In order to answer the research question in this thesis, the pragmatic worldview is used because it focuses on the research problem and does not emphasise one approach, and so it offers a clearer picture of the research problem.

2.3 Literature reviews

Before undertaking empirical research projects, it is important to conduct a literature review in order to summarize existing studies on a specific subject (University Health Network: Library and Information Services 2025). Different types of reviews address research questions with varying levels of completeness and comprehensiveness. The selection of the review type depends on the research question and the overall purpose of the review (Grant and Booth 2009; University Health Network: Library and Information Services 2025). Common types include the narrative review, scoping review, and systematic review.

A narrative review provides a broad overview of a research topic without following a clear methodological approach. The information is collected and interpreted in an

unsystematic manner, based on the author's selection of literature. This approach often relies on subjective summaries of findings, which can introduce bias (Grant and Booth 2009; Boland 2017b; University Health Network: Library and Information Services 2025). A scoping review is a form of evidence synthesis designed to map and outline the breadth of existing research on a topic. Scoping reviews are broader in focus, follow an iterative approach, and generally do not include a detailed quality assessment of studies (Grant and Booth 2009; Boland 2017b; University Health Network: Library and Information Services 2025). A systematic review seeks to identify, evaluate, and synthesize all empirical studies that meet predefined eligibility criteria in order to address a specific and focused research question. It uses a structured, transparent, and reproducible process to minimize bias and produce reliable results (Grant and Booth 2009; Boland 2017b; University Health Network: Library and Information Services 2025).

In **Chapter 3**, a systematic review was conducted to examine how depression is treated pharmacologically in patients with AD, with a special focus on care homes. As the research question was narrowly focused, framed using the SPICE acronym (Setting, Perspective or Population, Intervention, Comparison, and Exploration or Evaluation), and required a detailed approach to minimize bias, a systematic review was considered the most appropriate method. In this review, all relevant studies were captured by searching multiple databases and applying a structured search strategy, ensuring the process was both comprehensive and reproducible. In addition, the PRISMA guidelines were followed to ensure that study identification, screening, and reporting were transparent and consistent.

A narrative review was not selected because it depends on the author's choice of articles and does not follow a clear methodology, making it more prone to subjective bias. Similarly, while a scoping review could have mapped out a wide range of possible interventions for depression in AD (including pharmacological and non-pharmacological approaches), the research question was specifically concerned with pharmacological treatments and their evidence base. Due to this focus, a systematic

review was the most appropriate method, as it allowed for a comprehensive gathering and critical appraisal of the included studies.

2.4 Research design

Research designs represent various forms of investigation within the qualitative, quantitative, and mixed-methods approaches that offer detailed guidance for the processes undertaken in a research project (Creswell and Creswell 2022). The choice of study design to address a specific research question depends on the nature of the question and the available sources (Ranganathan and Aggarwal 2018).

As mentioned earlier, there are several types of research design, which include quantitative, qualitative, and mixed-methods designs (Creswell and Creswell 2022). Quantitative designs, include, for example, experimental, longitudinal, and cross-sectional designs. On the other hand, qualitative designs include grounded theory, narrative research, phenomenological research, and case studies. Regarding mixed-methods designs, there are three main types. The first is the convergent design, where researchers conduct quantitative and qualitative studies simultaneously and then integrate their findings during the discussion phase. The other two designs are sequential. The explanatory sequential design involves first conducting a quantitative study and then following it up with a qualitative study to further explore and explain the quantitative findings. Conversely, the exploratory sequential design begins with qualitative research and uses its findings to inform and shape a subsequent quantitative study (Tariq and Woodman 2013; Creswell and Creswell 2022).

Other sources classify research designs into two main types of study designs: descriptive and analytical studies (Ranganathan and Aggarwal 2018; Abbas 2021). In descriptive studies, researchers focus on describing data without necessarily providing answers to specific questions or establishing relationships between variables (Ranganathan and Aggarwal 2018; Abbas 2021). Examples of descriptive studies include case reports and case series. On the other hand, analytical studies aim to evaluate the effects of exposure on an outcome, to test hypotheses, and to identify

relationships between variables (Ranganathan and Aggarwal 2018; Abbas 2021). Analytical studies can be further divided into observational studies, in which the researcher does not actively intervene but only observes and collects data, for example, cross-sectional studies and cohort studies. They also include experimental studies, in which the researcher actively and intentionally introduces interventions, e.g., field trials (Ranganathan and Aggarwal 2018; Abbas 2021).

To address the research question in this thesis (see **Chapter 1,** section 1.7), a mixed-methods design was utilised. Specifically, this was framed around the explanatory sequential method rooted in a pragmatic worldview. This approach was chosen because it would allow for a deeper exploration of quantitative data (from prescribing datasets) through interviews with selected participants. The interview questions were formulated based on the results of the quantitative data studies, which were readily accessible. In this thesis, the investigation commenced with an analysis of a secondary database of care homes (a quantitative design – **Chapters 4** and **5**). Subsequent to this, interviews were conducted (a qualitative design – **Chapter 6**), informed by the quantitative findings.

2.5 Primary versus Secondary data

Data collection is categorized into two types: primary and secondary data (Ajayi 2017). Primary data refers to information that researchers collect first-hand, also known as raw data (Ajayi 2017; Surbhi 2020). This type of data is original, gathered in real-time, and directly targets the specific problem being investigated (Ajayi 2017; Surbhi 2020; Streefkerk 2022). Although collecting primary data is often a detailed and time-consuming process, it typically provides a higher level of accuracy. Common methods for collecting primary data include surveys, experiments, and interviews (Ajayi 2017; Surbhi 2020; Streefkerk 2022). In **Chapter 6**, data were collected by conducting interviews, which is an example of primary data.

In contrast, secondary data, often referred to as 'second hand' data, comprises information previously collected by others, which is then repurposed for a different

study (Ajayi 2017; Surbhi 2020). Such data is usually retrospective, derived from the analysis and interpretation of primary data, and is utilized for a variety of aims that extend beyond the original research question (Ajayi 2017; Surbhi 2020; Streefkerk 2022). While secondary data can be obtained quickly and is readily available, it may offer less accuracy (Surbhi 2020; Streefkerk 2022). Examples of secondary data include government publications, websites, books, and journals (Ajayi 2017; Surbhi 2020; Streefkerk 2022). The care home medicines database used in **Chapters 4** and **5** is an example of secondary data.

2.6 The difference between quantitative and qualitative research

Quantitative research is underpinned by the positivist worldview, which assumes an objective reality that can be understood through factual data (Castellan 2010; Austin and Sutton 2018). This type of research typically involves hypothesis testing or determining causality through deductive reasoning (Castellan 2010; House 2018). Data in quantitative research are analysed numerically using statistical tests, which can lead to generalizable results or explanations (Lakshman et al. 2000; Castellan 2010). The sample size for such studies is usually large and is often randomly selected (Hinkle et al. 1998; Castellan 2010)

In contrast, qualitative research is supported by the constructivist worldview, acknowledging a subjective reality that emphasizes understanding individual's experiences surrounding specific phenomena (Castellan 2010; Austin 2019). This type of research often involves generating hypotheses through an inductive process, where data analysis results in the identification of themes (Castellan 2010; House 2018). The goal is to gain understanding and insights rather than to generalise. Qualitative studies typically have smaller, purposefully chosen sample sizes (Castellan 2010; House 2018), and the concept of trustworthiness is crucial in ensuring the credibility of the findings (Sullivan and Sargeant 2011; Austin 2019).

2.7 Quantitative research

2.7.1 Cross sectional:

Typically, cross-sectional studies are conducted at a single point in time, with the outcome and exposure measured at the same time (Levin 2006; Setia 2016b; Babbie 2020). Instead of following individuals or subjects over time as in a cohort study (either prospective or retrospective), cross-sectional studies collect data from a group of participants at a single point in time to provide a "snapshot" of a particular outcome and its associated characteristics at that specific time (Levin 2006; Setia 2016b,a). Cross-sectional studies are used when the purpose of the study is descriptive and exploratory, with the aim being to determine prevalence, identify associations, and generate hypotheses (Levin 2006).

Cross-sectional studies have a number of distinct advantages, including their relatively low cost, efficient time frame, lack of loss to follow-up, ability to evaluate multiple outcomes and risk factors, and understanding of disease aetiology (Levin 2006). However, the disadvantages of this type of study include a difficulty in inferring cause-effect relationships, and results might change at different times due to the nature of the study (Levin 2006). Also, the potential presence of Neyman bias (or prevalence-incidence bias), in which extremely healthy or ill individuals are excluded, results in a biased result (Levin 2006; Zach 2020).

Chapters 4 and 5 of the thesis focus primarily on describing, exploring, and identifying associations between variables; thus, the cross-sectional design was the most suitable for this purpose. Also, a long-time frame was used to enhance power by increasing the sample size.

2.7.2 Sampling and bias:

Given the challenge of including the entire population in the study, sample selection becomes necessary to draw inferences about the population (Jones et al. 2003; Taherdoost 2016). There are two primary classifications for sampling techniques: probability (random) sampling and non-probability (non-random) sampling (Etikan

2016; Taherdoost 2016; McCombes 2019). In the first category, probability (random) sampling ensures that each member of the population has an equal chance of being randomly selected for the sample (Taherdoost 2016; McCombes 2019). Despite being time-consuming, this method introduces less bias and permits the generalisation of results (Taherdoost 2016; McCombes 2019). Simple random sampling, systematic sampling, and stratified random sampling are examples of this method (Taherdoost 2016).

Secondly, non-probability (non-random) sampling is used when not all individuals can be selected, and it is not founded on randomisation (Taherdoost 2016; McCombes 2019). This method is economical and time-efficient, but it does not facilitate the generalisation of results (Taherdoost 2016). This category includes methods such as convenience, purposive, and snowball sampling (Taherdoost 2016; McCombes 2019).

In this thesis, convenience and purposive sampling techniques were employed. Convenience sampling involves selecting participants based on their availability, accessibility, and convenience, although there is a risk of selection bias (Etikan 2016; Taherdoost 2016). For example, the number of care homes included in **Chapters 4** and **5** was a convenience sample. Purposive sampling, on the other hand, involves the deliberate selection of participants with specific characteristics in order to acquire insights that may not be available from other participants (Etikan 2016; Taherdoost 2016). For example, residents with psychotropic medications or anti-dementia medications in **Chapters 4** and **5**, and participants in **Chapter 6** are examples of purposive sampling

2.7.3 Statistical analysis

2.7.3.1 Tests (parametric vs non-parametric)

Parametric and non-parametric statistics are two broad categories of statistical methods, each with its own set of assumptions about the data they are used to analyse (Bowling 2014). Parametric statistical methods are based mainly on assumptions about the underlying population distribution, typically requiring that data follow a normal distribution (Bowling 2014; Tajul Islam et al. 2021). When the actual data distribution

deviates from this, such as being skewed, non-parametric methods are more appropriate because they do not assume a specific distribution (Bowling 2014; Tajul Islam et al. 2021).

In this thesis, data analysis was conducted using IBM SPSS 29 software and Prism 10. Selecting appropriate statistical tests depended on the type of study design, research questions, type of data (e.g., continuous or categorical), distribution of data, and number of groups (Parab and Bhalerao 2010; Nayak and Hazra 2011).

Descriptive analysis was used to explore the data, and a chi-square test was used to test any associations. A chi-square test is a test between categorical variables through testing the differences between observed frequencies in the cells in a table, and determining whether the expected frequencies are likely to be due to random chance or if there is a real association (Laerd Statistics 2016b; Giganc 2019; Tajul Islam et al. 2021). Large differences between these frequencies indicate a higher chance of real association and the null hypothesis is rejected (Giganc 2019).

In the case of more than 2*2 tables which occurred in both **Chapters 4 and 5**, a post-hoc chi-square test (or follow-up analysis) was required to determine the precise significant differences. This was achieved by using adjusted standardised residuals (i.e. Z-scores). An adjusted standardised residual greater than 1.96 refers to a significant difference between the observed and the expected frequency, because a Z-score of 1.96 is associated with an alpha value of 0.05 and a confidence interval of 95% (Hazra 2017; Giganc 2019). In addition, Bonferroni corrections needed to be conducted for multiple comparisons and to protect the analysis from familywise error, which is when one or more Type I errors (defined in section 2.7.3.2 below) are committed on the same sample (Armstrong 2014; Giganc 2019).

The Odds Ratio (OR) is used to examine the strength of the association between two variables, typically in cross-sectional and case-control studies. It is useful when looking at data retrospectively (Laerd Statistics 2016a). It compares the odds of an event occurring in one group with the odds in a second group (Ranganathan et al. 2015a;

Laerd Statistics 2016a). Relative Risk (RR), on the other hand, is a measure often employed in cohort studies where participants are observed over a period of time (Ranganathan et al. 2015a). Thus, OR was used because this study was cross-sectional and retrospective.

When interpreting these measures, an OR or RR of 1 indicates no difference in odds or risk between the two groups (no association). If the OR or RR is greater than 1, it suggests a higher likelihood of the event occurring in the first group (positive association). Conversely, if it is less than 1, it indicates a lower likelihood in the first group compared to the second (negative associations) (Ranganathan et al. 2015a; Laerd Statistics 2016a). OR can be affected by other variables so, to get a true association, an Adjusted Odds Ratio (AOR) was calculated using logistic regression, which controls for the effect of other variables (e.g. age and gender in this thesis) (Statistics 2017; Zach 2021).

In addition, the Mann-Whitney U test was used as a rank-based non-parametric test. It is used for comparing two independent groups when the dependent variable is either continuous or ordinal (Laerd Statistics 2016c; Tajul Islam et al. 2021). It is an appropriate alternative to the independent samples t-test especially when the data do not follow a normal distribution (Laerd Statistics 2016c).

2.7.3.2 Sample size

To draw inferences about the whole population, a representative sample is needed; therefore, a calculation of the sample size is required (Jones et al. 2003; Taherdoost 2016). A bigger sample size means a more accurate inference can be obtained; however, recruiting additional participants is both time-consuming and expensive (Kadam and Bhalerao 2010; Creswell and Creswell 2022).

Calculations of sample size are required to prevent Type II errors, which involve accepting a negative result in a study when it is actually positive (also known as a false negative) (Jones et al. 2003; Creswell and Creswell 2018). Type II errors, referred to as the beta value, are widely accepted to have a value of 0.2 (Creswell and Creswell 2018).

In the context of a study, power also refers to its ability to detect true effects and reduce the likelihood of Type II errors (Jones et al. 2003; Levin 2005; Austin 2019). Typically, the estimated power of a study is expressed as (1 - beta) and is frequently set at 0.80 (Jones et al. 2003; Creswell and Creswell 2018). Factors affecting the power of a study include sample size, effect size (magnitude of the difference between groups or association between variables), and level of significance (Jones et al. 2003; Austin 2019).

In contrast, Type I errors (alpha value) occur when a study provides a positive result when, in actuality, none exists (also known as a false positive) (Jones et al. 2003). Thus, the probability of making a type I error with an alpha value of 0.05 (5% level of significance) is widely used (Jones et al. 2003; Creswell and Creswell 2018). In addition, the Z-score corresponds to the combination of the level of confidence needed in a study and the alpha value (Taherdoost 2016). Thus, a 95% confidence interval (95% CI) and 5% alpha value, which are commonly used, correspond to a Z-value of 1.96 (Taherdoost 2016; Hazra 2017).

Due to this study's cross-sectional design and the utilisation of secondary data, all data were accessible. In addition, a larger sample size provides more accurate results and decreases the confidence interval (Jones et al. 2003). According to the inclusion and exclusion criteria described in **Chapters 4 and 5**, all residents in the care homes were included. This resulted in a large sample size, which in turn increased statistical power. Therefore, it was not considered necessary to calculate the sample size *a priori*, as the study relied on the complete population of residents meeting the inclusion criteria rather than a predetermined sample.

After the project was completed, however, a sample size calculation was performed for one test to assess whether the achieved sample was adequate. G*Power software was used to conduct a chi-square test to determine the relationship between gender and psychotropic medications. The alpha level was set to 0.05 and the power to 0.80. Based on the test result with degrees of freedom (df) equal to 6 and an effect size (Cramer’s V) of 0.11, the total sample size required was 1,126, but a sample size of 5,123 was used so the study had sufficient power. Also, further classifications were performed which

led to a reduction in the sample size. For example, when classifying psychotropic medications into different classes, the sample size for anxiolytics was 1330. Alpha was 0.05, and the power was 0.80. The degree of freedom (df) was 2, and Cramer's V was 0.12, so the required sample was 670 to have sufficient power. Therefore, the achieved sample size exceeded the required thresholds, and the study was sufficiently powered.

2.7.3.3 Statistical significance

Statistical significance is a measure that indicates the likelihood of whether the results observed in a study are due to chance (Ranganathan et al. 2015b; Austin 2019). It is commonly represented by the p-value, with a p-value below 0.05 typically considered significant (Ranganathan et al. 2015b; Austin 2019). The determination of statistical significance depends on both the magnitude of the observed effect and the size of the sample; larger samples have more power to detect smaller effects (Ranganathan et al. 2015b; Austin 2019). For instance, a large study may identify a statistically significant but minor difference, while a smaller study might miss it. Thus, in this thesis, statistical significance was calculated to determine whether the results were unlikely to be due to chance.

2.8 Qualitative research

Qualitative research is a social science approach that focuses specifically on gathering non-numerical data (Bowling 2014). It usually uses diverse data sources, including interviews, observations, and audiovisual materials (Bowling 2014; Creswell and Creswell 2022). Analysing data involves two methods of reasoning, the inductive and deductive approaches. Inductive reasoning involves a 'bottom-up' approach, where concepts and themes are constructed without predefined notions (Braun and Clarke 2006; Bowling 2014; Creswell and Creswell 2022). In contrast, deductive reasoning follows a 'top-down' approach, where themes and concepts are predefined, and data is used to support these preexisting themes (Braun and Clarke 2006; Bowling 2014; Creswell and Creswell 2022). These reasoning methods were applied in **Chapter 3**.

Qualitative research is designed to immerse the researcher in the subjects' natural environment to understand their experiences and perspectives (Bowling 2014; Creswell and Creswell 2022). The emphasis is on capturing rich, interpretive data that represents the participants' viewpoint without the researcher's bias (Bowling 2014; Creswell and Creswell 2022). **Chapter 6** of this thesis is an example of a qualitative project that focused on participants' viewpoints.

In qualitative research, the concept of reliability, which is defined as giving the same results at different times and typically assessed through statistical measures in quantitative studies, is replaced by the principle of trustworthiness (Austin 2019). This principle concerns the credibility of the researcher's interpretation (Darawsheh 2014; Hadi and Jose Closs 2016; Austin 2019). Trustworthiness can be enhanced by verifying participants' statements during interviews and seeking clarifications (Hadi and Jose Closs 2016; Austin 2019). Additionally, involving multiple researchers to independently code the data, followed by a comparison and discussion of the coding process, helps refine the categories and ensures a consistent interpretation of the data (Hadi and Jose Closs 2016; Austin 2019). To minimize bias and enhance the trustworthiness, credibility, and quality of qualitative research, reflexivity should be employed (Berger 2013; Darawsheh 2014). More details about qualitative design are discussed in **Chapter 6**.

2.8.1 Reflexivity:

Reflexivity in qualitative research is the process by which researchers examine their own impact on the study by reflecting on their personal histories, cultural backgrounds, and experiences - much like turning the lens upon themselves (Berger 2013; Austin 2019; Creswell and Creswell 2022). This self-examination is crucial for understanding how these factors may shape data interpretation and research direction (Berger 2013; Austin 2019; Creswell and Creswell 2022).

The practice of reflexivity in research addresses two critical aspects: firstly, the researcher's previous experiences related to the research problem or the participants, and secondly, the influence of these experiences on the researcher's interpretations

(Creswell and Creswell 2022). Researchers need to be transparent about potential biases due to their experiences. These biases could have an impact on the evidence they collect, the themes they investigate, or the conclusions they reach regarding the subjects of the research (Berger 2013; Creswell and Creswell 2022).

2.8.1.1 The researcher's personal background

The researcher who authored this thesis is male and comes from an Arabic culture, specifically, Saudi Arabia. He earned a Bachelor's degree in Pharmaceutical Sciences from a Pharmacy school in Saudi Arabia and subsequently obtained a Master of Pharmacy Practice from the UK. His work experience includes working as a pharmacist at the Saudi Food and Drug Authority (SFDA) for a year and then working as a teaching assistant at the College of Pharmacy, Hail University, where he remains employed.

Although the researcher has not been directly involved with care homes or residents with dementia, he completed a one-week rotation at a psychiatric hospital as part of a training course during his bachelor's degree in Saudi Arabia. During his PhD, the researcher undertook several projects focusing on the management of depression in people with AD and prescription of psychotropic medications in UK care homes. These projects included conducting a systematic review, working with a care home medication management database and developing an interview protocol for care home managers. The results of his projects were regularly discussed with his supervisors to ensure quality assurance. Furthermore, the researcher has expanded his knowledge and background by reading books and articles, as well as taking courses on quantitative and qualitative research methods.

2.9 Summary

In this thesis, a mixed-methods approach, particularly the explanatory sequential mixed methods design, was utilized. This approach stems from pragmatic worldviews. The choice was influenced by the readily accessible quantitative data, which necessitated further explanation through qualitative means, such as interviews. The formulation of interview questions was based on the quantitative data results. The

secondary database from care homes was first investigated, after which interviews were conducted with participants to gain further insights. Moreover, the qualitative project required time for preliminary steps, such as obtaining ethical approval. Hence, employing this method facilitated a comprehensive understanding of the overall research aim, which examined the prevalence and patterns of prescribing psychotropic medication for managing conditions including BPSD in UK care homes.

Chapter 3: Pharmacological Management of Depression in Older Adults with Dementia in Care Homes: A Systematic Literature Review

3.1 Introduction

Care home residents are often older, and the majority are affected by multiple long-term diseases, significant disability, and frailty, all of which impact their physical and mental health (British Geriatrics Society (BGS) 2016). In the UK, most (70%) care home residents have dementia, primarily AD (Alzheimer's Society 2025b).

As mentioned in Section 1.4, AD is associated with neuropsychiatric symptoms, also known as BPSD (Banerjee et al. 2013). BPSD are a broad category of symptoms that affect up to 90% of dementia patients and include depression, agitation, anxiety, delusions, and hallucinations (Alzheimer's Society 2021d). Understanding the link between depression and dementia is challenging because of the complexity of both disorders (Dudas et al. 2018; Almeida 2019; Paris et al. 2025). In older adults, depressive disease may present as 'pseudodementia,' making it difficult to distinguish it from true dementia (Dudas et al. 2018). Also, depression is frequently associated with a decline in cognitive functioning that is sometimes not entirely reversible with treatment (Leong 2014; Dudas et al. 2018; Almeida 2019). Additionally, a history of depression in later life may be associated with an increased risk of developing dementia in older adults (Dudas et al. 2018; Paris et al. 2025).

Due to this complexity, diagnosing depression in dementia patients can be challenging (Almeida 2019). The manifestation of depression may change as the dementia progresses. Additionally, autonomic symptoms such as inability to concentrate and anhedonia are associated with both depression and dementia (Dudas et al. 2018; Almeida 2019). As a result, there is no consensus regarding the optimal method for diagnosing depression in people with dementia (Dudas et al. 2018; Almeida 2019). The Cornell Scale for Depression in Dementia (CSDD), is the only tool specifically developed for use in a dementia population (Dudas et al. 2018) (see Section 1.3.2 for more details). Thus, due to this complexity, determining the accurate prevalence and incidence of depression in individuals with dementia is anticipated to be challenging

(Leong 2014; Almeida 2019). Nevertheless, it is estimated that depression impacts up to 40% of individuals with AD (Alzheimer's Association 2023a).

Treating and managing depression in AD is very important. Non-pharmacological approaches, including psychosocial interventions, such as interpersonal management, cognitive behaviour therapy (CBT), and physical activity, are recommended to be tried first and should be designed to be within the person's ability (National Institute for Health and Care Excellence [NICE] 2018). However, in situations where non-pharmacological approaches have not been successful or in cases of severe depression, the pharmacological approach, i.e. antidepressants, could be used (Leong 2014; National Institute for Health and Care Excellence [NICE] 2018).

The most frequently recommended medications are selective serotonin reuptake inhibitors (SSRIs), which are better tolerated than tricyclic antidepressants (TCAs) due to the side effects of the latter (Leong 2014; Cassano et al. 2019; Zuidersma et al. 2019). However, there is concern that antidepressants may be ineffective in dementia patients, with no significant difference seen between antidepressants and placebo, highlighted in the Depression in Alzheimer's Disease study (DIADS-2) and the Health Technology Assessment–Study of the use of Antidepressants for Depression in Dementia (HTA-SADD) trials (Banerjee et al. 2013; An et al. 2017; Dudas et al. 2018; Zuidersma et al. 2019; Costello et al. 2023).

When the adverse effects of a medication outweigh the benefits, it is defined as a potentially inappropriate medication (PIM), which is common in older adults (Zhang et al. 2017; Tian et al. 2023). Several tools are used to assess PIMs; for example, the Beers Criteria provides a list of medications that should be avoided in older adults due to their side effects and aims to improve safe prescribing (American Geriatrics Society Beers Criteria Update Expert 2023; Cleveland Clinic 2023). For example, amitriptyline (tricyclic antidepressant) is considered inappropriate due to its strong anticholinergic properties and its tendency to cause orthostatic hypotension (American Geriatrics Society Beers Criteria Update Expert 2023). These effects can result in confusion,

dizziness, and an increased risk of falls and fractures, making them particularly harmful for older adults (Cassano et al. 2019; van Poelgeest et al. 2021)

Antidepressant use in care homes rose from 46% in 2006 to 58.5% in 2019 (Hughes et al. 2024). Interestingly, it has been found that people with AD receive more antidepressant prescriptions than those without AD in care homes (Brimelow et al. 2019). Similarly, in community settings, antidepressant use was reported to be three times higher in people with AD compared to those without AD (Laitinen et al. 2015), despite ongoing concerns regarding their efficacy. As a result, the risks of adverse events and drug interactions are likely to be higher in this population. The adverse effects of antidepressants may include anticholinergic effects, hyponatremia, cardiotoxicity, and serotonin syndrome (Leong 2014; Cassano et al. 2019; Zuidersma et al. 2019).

Due to concerns about the efficacy and adverse effects of antidepressants in people with AD, it is important to explore how people with AD and depression are being treated. This will be addressed by reviewing the existing literature through a systematic review.

3.1.1 Aim

Due to the evidence that antidepressants may be ineffective, a high prevalence of antidepressant prescribing, and the possibility of increasing adverse events in patients with AD, the purpose of this review is to address how depression is treated pharmacologically in patients with AD in care homes as so many people with AD live in care homes.

3.2 Methods

3.2.1 Search Strategy

This review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (see Appendix 1) (Moher et al. 2009), and it has been registered in Prospero (an international database of prospectively registered systematic reviews): registration number – CRD42021251061) (https://www.crd.york.ac.uk/prospero/). The SPICE acronym was used to develop the

research question (Boland 2017a). S means setting, P indicates perspective or population, I indicates the intervention or phenomenon, C indicates comparison, E means Exploration or Evaluation. In this review, S refers to care homes, P indicates older people with AD, I refers to depression, C indicates comparison between dementia versus non-dementia, but no comparison between settings, and E indicates pharmacological management of depression in this population. Thus, the following research question was developed: how is depression managed pharmacologically in residents with AD resident in care homes? Initially, a pilot study was conducted only on Medline (R) ALL (1946 to February 2021) in order to discover and resolve any issues and to ensure all keywords had been identified before conducting the full search.

Regarding keywords, four concepts were identified: depression, Alzheimer's disease, management, and care homes. These concepts were then combined between synonyms by using OR and between different concepts by using AND (**Table 3.1**). These keywords were identified by reviewing relevant literature and discussing them with a librarian and my supervisors. Furthermore, MeSH terms (Medical Subject Headings), a controlled vocabulary used to index articles in databases, were used. Combining keywords and MeSH terms helps to retrieve relevant articles more effectively (DeMars and Perruso 2022).

The next stage was to conduct a comprehensive search strategy using Medline (R) ALL (1946 to February 2021), Ovid MEDLINE (R) ALL (1946 to March 05, 2021), EMBASE (1947 – 22/2/2021), PsycINFO (1806 – March Week 1 2021), and Ovid Emcare (1995 to 2021 Week 06). These databases were used because they are the most relevant to the field and I believed that most of the articles published would be found in these databases, as discussed with my supervisors and the librarian. Scopus (searched on 02/02/2021), and Web of Science (searched on 03/03/2021) were also included to find more relevant articles, and a detailed search strategy is provided in Appendix 1. Grey literature, e.g., government documents or conference papers, was not included in this review due to the lack of rigorous peer review, not containing enough information and difficulty in access (Adams et al. 2017).

The British National Formulary (BNF) was used to determine the generic names of individual antidepressant drugs and their therapeutic class (Joint Formulary Committee 2022) (**Table 3.2**). The generic names were used because articles often only use scientific names, and trade names differ between countries. The entire search strategy for each database is shown in Appendix 1.

After the search had been run in the different databases, the results were exported into EndNote X9 and the 'find duplicates' feature was used. After removing duplicates, the remaining references were exported to Rayyan (Ouzzani et al. 2016), a tool that helps researchers screen, organize, and manage articles, allowing them to either include, exclude, or mark articles as unsure to be decided later. It also allows collaboration among multiple researchers working on the same project. Also, 10% of the articles for full-text screening (8 out of 77) were reviewed by my supervisor (E.K.) at the full-text stage. If any disagreements had arisen, my second supervisor (M.S.) would have been involved to resolve them. However, no disagreements occurred. Having a second reviewer in a systematic review helps to reduce bias and increase rigor (Stoll et al. 2019).

Table 3.1: *Different concepts and keywords used to address the research question*

	Disease (1)	Disease (2)	Intervention	Setting
Concepts	Alzheimer's disease	Depression	Management	Care home
		AND		
Keyword or synonyms	-Alzheimer* -Alzheimer disease -Dementia	-Depress* -Low mood -Depressive symptom* -Depressive disorder -Resistant depress* -Major depress*	Listing the names of all drugs and their therapeutic class (see Table 3.2) -Therapy -Treat* -Manag* -Antidepress*	-Nursing home* -Care home* -Residential home* -Long-term care facilit* -Home for the aged -Residential facilit* -Long-term care centre -Geriatric nursing
	OR			
MeSH term	-Alzheimer Disease -Dementia	-Depression -Depressive Disorder -Depressive Disorder, Major -Depressive Disorder, Treatment-Resistant	-Antidepressive agents -Antidepressive agents, second generation -Antidepressive agents, tricyclic -Serotonin uptake inhibitors -Serotonin and noradrenaline reuptake inhibitors -Monoamine oxidase inhibitors -Therapeutics	-Residential facilities -Homes for the aged -Nursing homes -Geriatric nursing

Table 3.2: *Drug names and their therapeutic class according to the BNF (Joint Formulary Committee 2022)*

Drug class	Individual drugs (generic name)
Selective Serotonin Reuptake Inhibitors	Citalopram Escitalopram Fluoxetine Fluvoxamine Paroxetine Sertraline
Serotonin and Noradrenaline Reuptake Inhibitors	Duloxetine Venlafaxine
Tricyclic Antidepressants	Amitriptyline Doxepin Imipramine Nortriptyline Clomipramine Dosulepin Lofepramine Trimipramine
Tetracyclic Antidepressants	Mianserin Mirtazapine
Serotonin Uptake Inhibitors	Trazodone
Monoamine Oxidase Inhibitors	Phenelzine Isocarboxazid Tranylcypromine Moclobemide
Melatonin receptor agonists	Agomelatine
Noradrenaline Reuptake Inhibitors	Reboxetine
Other antidepressants	Vortioxetine Tryptophan

3.2.2 Inclusion and Exclusion Criteria

The search was carried out to look for all articles published in English, either qualitative or quantitative studies, which included care home residents who had AD and depression at any stage of severity. If articles did not specify the type of dementia, they were included, because AD is the most prevalent of all dementia types and thus highly likely to be present in those care homes (Alzheimer's Disease International 2023). Articles only discussing other specific types of dementia were not included as those patients may be treated different to people with AD. This information was screened at the full text stage to determine eligibility. Also, only studies involving elderly people, aged 65 or older, who had any stage of depression, were included. This is because 65 years old is generally considered the definition of an older adult, and dementia more commonly affects people aged 65 and older (Office for National Statistics (ONS) 2019; Alzheimer's Society 2021b; World Health Organization 2023). Review articles were excluded, but they were used to check for any articles that were not included as additional resources.

In addition, the search was focused on articles on pharmacological interventions published from 2000 onward, due to interest in the most recent pharmacological treatments, allowing enough time for new drugs to be on the market and to enable a reasonable number of articles to be retrieved. The inclusion and exclusion criteria are summarised in **Table 3.3**.

Table 3.3 *Inclusion and exclusion criteria used in this study*

	Inclusion	Exclusion
Setting	Care homes, including the following synonyms: • Long-term care • Residential facilities • Dementia specialist nursing home • Long-term care facility • Home for the aged	• Hospital • Patient's home • General practitioner (GP) clinics • Home care (providing multiple services at the patient's home)
Population	Older people (65 or older) who have any stage of AD and depression (regardless of severity).	• Young people (below 65 years of age). • Other types of dementia (vascular dementia, frontal temporal dementia, Lewy body dementia).
Intervention	All antidepressant drugs included in the BNF (see Table 3.2).	
Types of study included	Focused on pharmacological intervention articles published from 2000 onward. All types of study (qualitative or quantitative).	Non-pharmacological intervention articles. Abstracts and conference papers, reviews, commentary articles, and protocols.
Language	Only English language, full text	Non–English language studies

3.2.3 Data Extraction and Quality Assessment Checklist

Once eligible studies had been identified, the author, date of publication, country, study design, setting, number of participants and main findings were extracted from each study into an Excel spreadsheet for further analysis. Since the aim of the review is descriptive and comprehensive in nature, both deductive and inductive approaches were used. The deductive approach (confirmatory) involves predefined themes or concepts, such as pharmacological treatment. Conversely, the inductive approach (interpretative) does not require preconceived themes; instead, themes arise from the data itself and are not fixed in advance, which allows for more exploration (Braun and Clarke 2006; Boland 2017a).

Moreover, thematic analysis was applied because it is beneficial for summarising significant characteristics of data, conducting comparisons across data sets and identifying similarities and differences (Braun and Clarke 2006; Boland 2017a). The steps of thematic analysis include familiarization with the data through multiple readings, coding the data, and combining relevant codes to generate themes. Finally, the themes are reviewed, and then the report is written (Braun and Clarke 2006; Boland 2017a). Here, the papers were read multiple times to identify and code relevant data. These codes were then combined into broader themes or categories. For example, the prevalence of depression was a recurring finding in most studies. It was also noted that many studies mentioned other symptoms in addition to depression, and these were combined under the broader theme or category of (Prevalence of BPSD). In another example, some studies reported that age and gender affected prescribing practices, and these findings were grouped under (Resident Characteristics). From there, broader themes were identified, such as (Factors affecting treatment).

All included studies were critically appraised. Due to the comprehensive nature of the aim of this review, all study designs were included: hence, a hierarchy of clinical evidence was used to evaluate the validity of the various study designs, as set out in **Figure 3.1** (Desai et al. 2019). A variety of checklists can be used for evaluation, but in order to promote objectivity and minimise subjectivity, open-ended checklist items

were avoided. The Joanna Briggs Institute (JBI) Critical Appraisal Tools were used because they exist in different forms according to the type of study design (The University of Adelaide 2020). The JBI checklists for prevalence studies, cohort studies, and randomised controlled trials were used to address all included studies (Appendix 1).

To answer the questions within these checklists, "yes" with a single point was assigned if the study met the criterion; "no," "unclear," or "not applicable" were assigned with a zero if the criterion was not met. After responding to all questions, all scores were summed together, and a total score was assigned for each study. Based on the JBI checklists, for prevalence studies, scores of 1–3 were considered to indicate weak evidence, scores of 4–6 indicated moderate evidence, and scores of 7 or higher indicated good evidence. For cohort and RCT studies, scores of 1–4 indicated weak evidence, scores of 5–8 indicated moderate evidence, and scores of 9 or higher indicated good evidence.

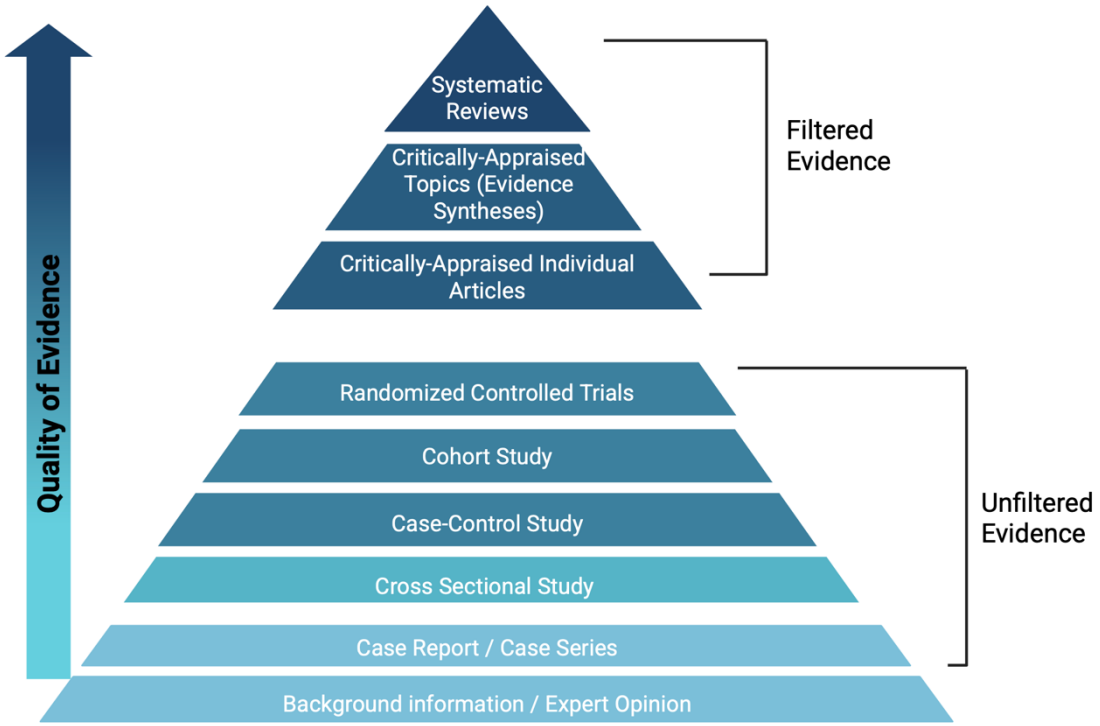


Figure 3.1: *The Hierarchy of Clinical Evidence, adapted from (Desai et al. 2019). This figure shows that the highest quality is filtered information, which is evaluated by others, and the lowest quality is unfiltered information, which comprises original studies that are not evaluated by others.*

3.3 Results

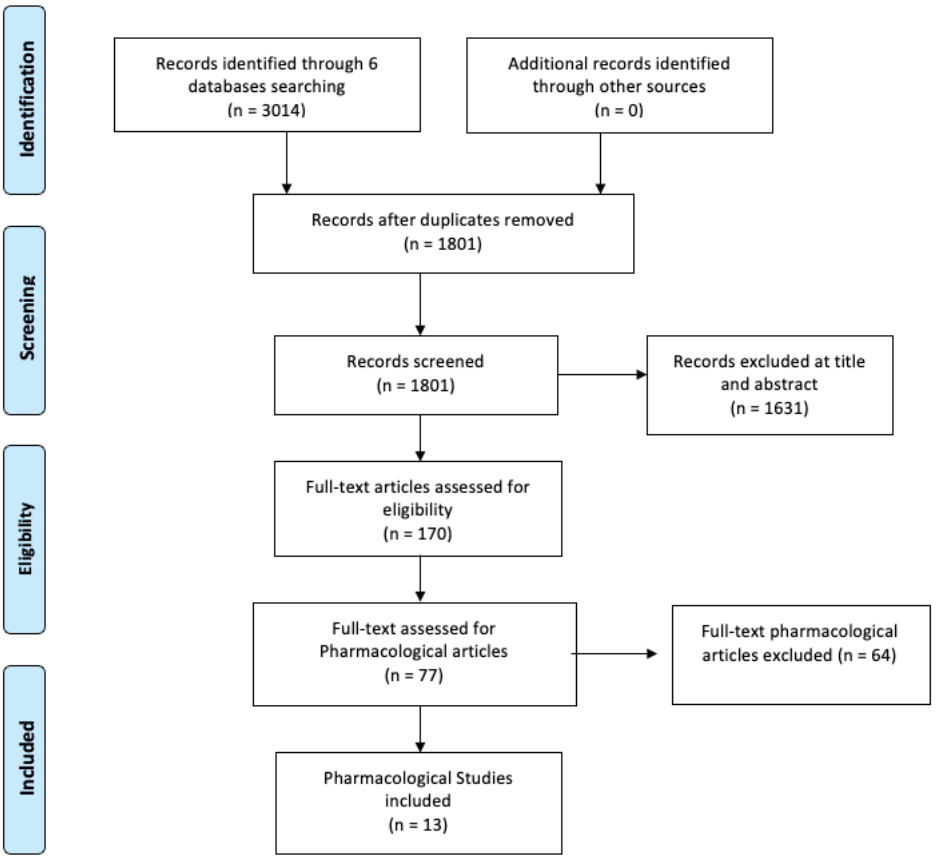
3.3.1 Search results

The search across six different databases resulted in the retrieval of 3014 articles (**Table 3.4, Figure 3.2**). After the removal of duplicates, 1801 studies remained for title and abstract screening (**Table 3.4, Figure 3.2**). Of these, 1631 were excluded based on the criteria, leaving 170 articles for full-text screening (**Figures 3.2 and 3.3**). These 170 articles included 77 pharmacological studies and 93 non-pharmacological studies (**Figures 3.2 and 3.3**). As this review was specifically focused on pharmacological interventions alone, only the 77 pharmacological studies were taken forward for detailed full-text screening. During this stage, 64 of these 77 articles were excluded because they did not meet all the inclusion criteria (not in dementia populations, not addressing depression management, not conducted in care homes, or being commentary or review articles), resulting in 13 articles that were included in the final

analysis **(Figures 3.2 and 3.4**). Among the 64 excluded articles, six review articles were identified, but, after checking each review, no new studies were found (Snowden et al. 2003; Herrmann and Lanctot 2007; Jean-Francois et al. 2008; Boyce et al. 2012; Dudas et al. 2018; Yoon et al. 2018).

Table 3.4 *Number of articles retrieved from each database*

Database	Search strategy	Results
Ovid MEDLINE (R) ALL 1946 to Feb 25, 2021	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. See Appendix 1.	180
EMBASE 1947 to 27 February 2021	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. See Appendix 1.	413
APA PsycInfo 1806 to March Week 1 2021	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. See Appendix 1.	195
Ovid Emcare 1995 to 2021 Week 06	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. Appendix 1.	214
Scopus on 02/03/2021	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. See Appendix 1.	1,030
Web of Science on 03/03/2021	Combining 4 concepts together. Using OR between synonyms. Using AND between different concepts. See Appendix 1.	982
Total		**3,014**
Total after removing duplicates		**1,801**



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

Figure 3.2: *PRISMA flow diagram, which illustrates the number of articles identified, screened, excluded and included at each stage of the review.*

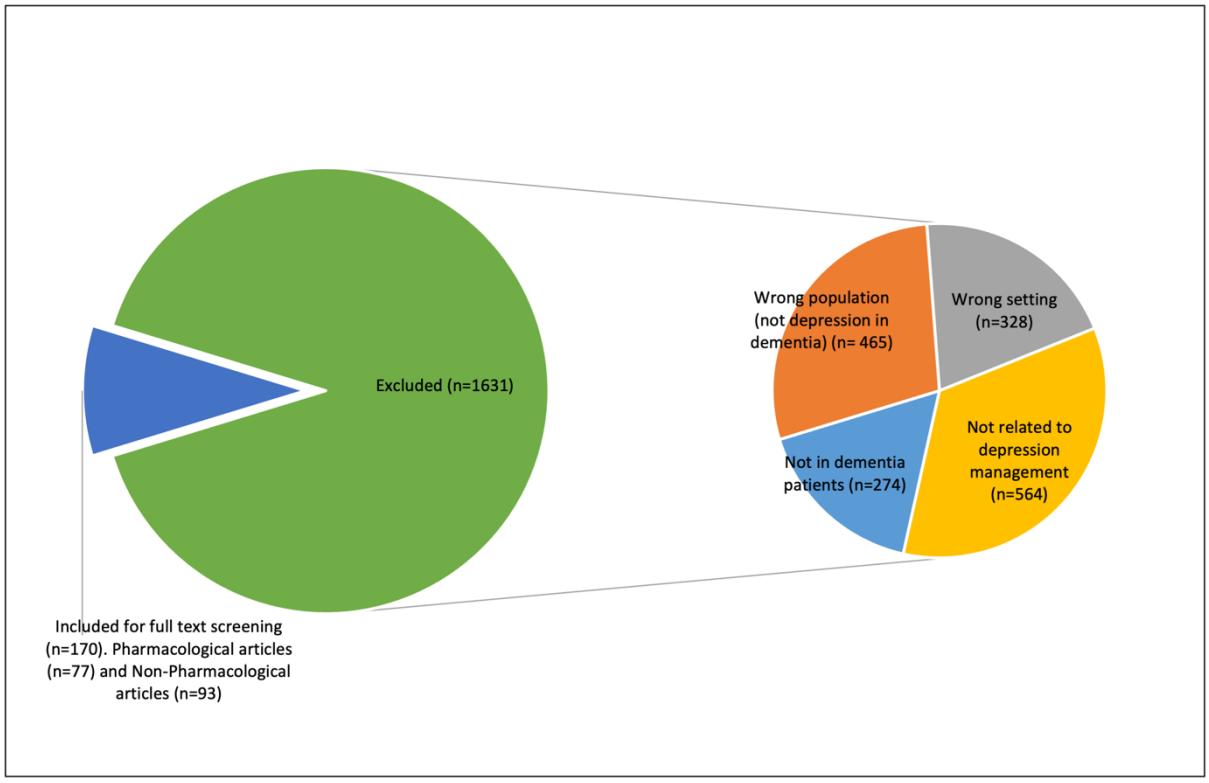


Figure 3.3: *Number of articles included and excluded during title and abstract screening, with reasons for exclusion. In total, 170 articles were eligible for full-text screening: 77 pharmacological intervention studies and 93 non-pharmacological intervention studies were identified.*

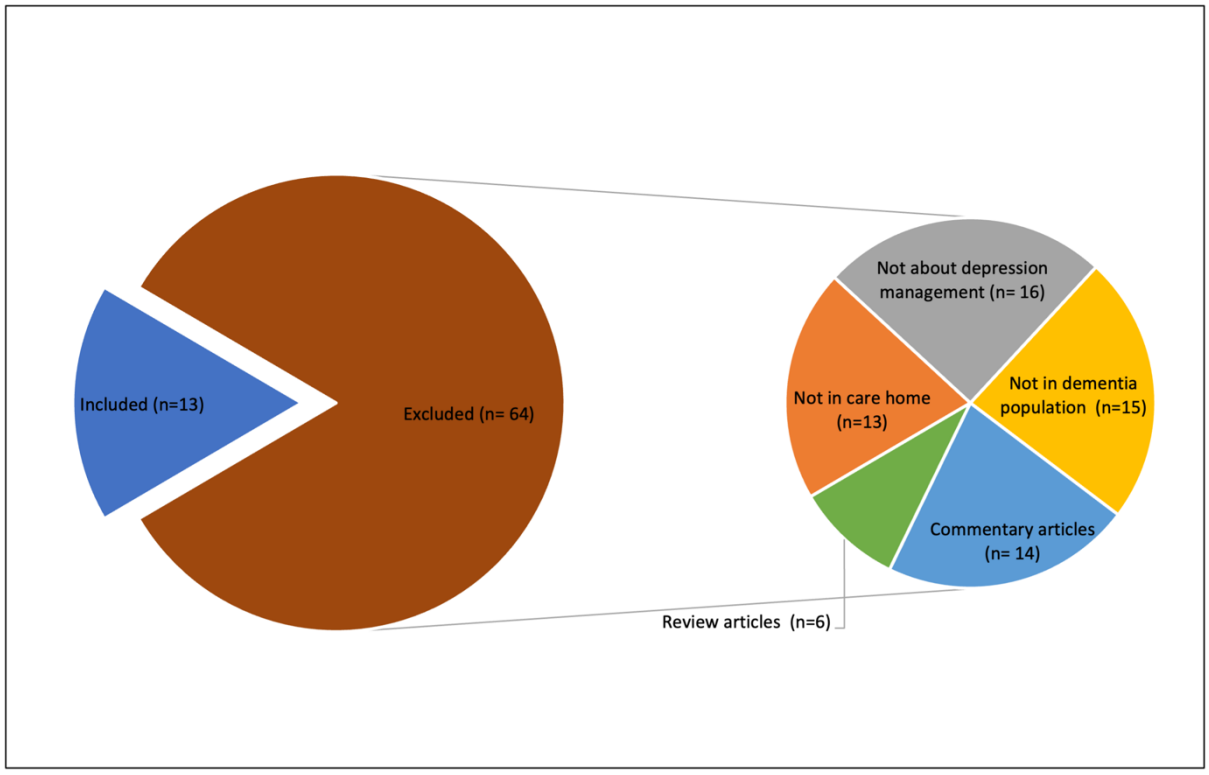


Figure 3.4: *Number of pharmacological intervention articles included and excluded after full-text screening with reasons for exclusion. 13 articles were included and 64 were excluded.*

3.3.2 Study characteristics

The thirteen articles were published within the date range from 2000 to 2019. The studies were conducted in various countries: five studies were carried out in Europe, five in the United States, and three in Australia. Eleven articles were cross-sectional in design, one was a longitudinal cohort study, and one was a randomised controlled trial (RCT). Regarding settings, the focus of this review is on care homes or nursing homes; however, two articles conducted parts of their studies in a community or hospital setting for comparison purposes (Pitkala et al. 2004; Giebel et al. 2015), so it was not possible to exclude these articles. Most of the residents had a mean age $\geq$ 80 years, and there were more female than male residents. Only three articles were limited to patients with severe dementia (Magai et al. 2000; Kverno et al. 2008; Giebel et al. 2015) and different scales were used to measure depressive symptoms (**Table 3.5**).

Table 3.5 *Study Characteristics*

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
Study 1: Prescribing of psychotropic drugs and indicators for use in residential aged care and residents with dementia **Brimelow et al. (2019)**	Australia In 12 Residential Aged Care (RAC) homes.	Cross-sectional. Aimed to evaluate psychotropic prescribing rates in RAC homes and identify common symptoms prompting prescriptions in residents with and without dementia.	Overall 779 residents: 57% dementia 43% without dementia 604 (78%) of all patients completed the CSDD.	Overall 86 ± 8.9 years Gender: Females 74% Males 26%	Cornell Scale for Depression in Dementia (CSDD). Total score range from 0-38: 0-8 indicates no depression 9-13 mild depression 14-18 moderate depression 19-38 major depression
Study 2: Depressive symptomatology in severe dementia in a European sample: prevalence, associated factors and prescription rate of antidepressants **Giebel et al. (2015)**	Eight European countries: England Finland France Germany Netherlands Spain Sweden In community care and nursing homes	Cross-sectional. Aimed to investigate the prevalence of depressive symptoms and factors associated with antidepressant use in severe dementia across eight European countries.	414 participants with severe dementia: 48% in care homes 52% in community care	In both sites, the average age was 82 ± 6.8 years. In care homes: 84.1 ± 6.3 years. Gender in both sites: Females 66% Males 34% Gender in care homes: Females 69% Males 31%.	1. CSDD for assessing depressive symptoms (using a cut-off of 10 or above for depression). 2. Neuropsychiatric Inventory Questionnaire (NPI-Q) for assessing neuropsychiatric symptoms, including depression. 3. Limited to severe dementia.
Study 3: Characteristics Associated with Depression in Long-	USA In 10 nursing homes and 35	Cross-sectional. Aim to examine depression prevalence in long-term care	347 participants with dementia: 69% in residential care.	Overall: 84.5 ± 7.1 years. Gender:	Used a CSDD cut-off of 7 to indicate depression.

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
Term Care Residents with Dementia **Gruber-Baldini et al. (2005)**	residential care/assisted living settings.	residents with dementia and identify staff, facility, and resident factors associated with it.	31% in nursing homes.	Females 81%. Males 19%.	
Study 4: Factors associated with antidepressant use in residents with and without dementia in Australian aged care facilities **Hiltunen et al. (2016)**	Australia In six residential aged care facilities (RACFs)	Cross-sectional. Aimed to identify factors associated with antidepressant use in residents with and without dementia.	Overall, 383 residents: 44% with dementia 56% without dementia	Overall age, 87.53 ± 6.18 years With dementia: 87.39 ± 6.1 years Without dementia: 87.62 ± 6.27 years Overall gender: Females 78% Males 22% With dementia: Females 78% Males 22% Without dementia: Females 77% Males 23%	Nothing was mentioned about the scale used to assess depression in dementia, but diagnoses were extracted from medical records.
Study 5: Prevalence and Treatment of Neuropsychiatric Symptoms (NPS) in	USA In three nursing homes	Cross-sectional. Aimed to assess the prevalence and treatment of NPS in advanced dementia.	123 residents with advanced dementia.	Overall 81.5 ± 7.1 years Gender: Females 55%	1. From medical records. 2. Also, neuropsychiatric symptoms (NPS) (including depression) were identified using the Neuropsychiatric

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
Hospice-Eligible Nursing Home Residents with Advanced Dementia **Kverno et al. (2008)**				Males 45%	Inventory (NPI). Limited only to residents with advanced dementia.
Study 6: A cross-sectional examination of the prevalence of psychotropic medications for people living with dementia in Australian long-term care facilities: issues of concern **McMaster et al. (2017)**	Australia In 53 long-term care facilities (LTC)	Cross-sectional. Aimed to examine the prevalence of psychotropic drug prescriptions.	446 residents with dementia	Overall: 86 ± 6.8 years Gender: Females 81% Males 19%.	Geriatric Depression Scale (GDS) for depression (GDS score of 4 or above indicated depression).
Study 7: Depression and use of antidepressants in Swedish nursing homes: a 12-month follow-up study **Midlöv et al. (2014)**	Sweden In 11 nursing homes.	Longitudinal cohort study. Aimed to examine whether symptoms of depression among residents in nursing homes were treated adequately, and whether antidepressants were used in an appropriate manner.	429 residents Only 401 residents completed the CSDD. 41% with dementia 59% without dementia	Overall: 85 ± 6.6 years. With dementia: 84 ± 6.4 years Without dementia: 86 ± 7.2 years Gender with dementia:	CSDD (using a cut-off of 8 or above to indicate depression) and medical records.

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
				Females 71.2% Males 28.8%. Gender without dementia: Females 71% Males 29%	
Study 8: Prevalence and correlates of psychotropic drug use in Dutch nursing-home patients with dementia. **Nijk et al. (2009)**	Netherlands In 25 nursing homes.	Cross-sectional. Aimed to investigate psychotropic drugs use in Dutch nursing home patients with dementia and association of age, gender, severity of dementia, and types of neuropsychiatric symptoms.	1322 residents with dementia.	Overall: 83 ± 8.1 years Gender: Females 80%, Males 20%.	Neuropsychiatric Inventory - nursing home version (NPI-NH) to assess neuropsychiatric symptoms.
Study 9: The diagnosis of depression and use of antidepressants in nursing home residents with and without dementia. **van Asch et al. (2013)**	Netherlands In seven nursing homes.	Cross-sectional. Aimed to compare the prevalence of depressive disorders, depressive symptoms, and antidepressant use between nursing home residents with and without dementia.	1885 residents: 44% with dementia. 56% without dementia.	With dementia: 84 ± 6.9 years Without dementia: 81.9 ±7.8 years Gender: with dementia: Females 72%, Males 28% Without dementia: Females 71%, Males 29%.	Depressive symptoms measured using the Depression Rating Scale (DRS). Medical records were also consulted.

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
Study 10: Agitation and Depression in Frail Nursing Home Elderly Patients With Dementia. **Bartels et al. (2003)**	USA In 109 long-term care facilities.	Cross-sectional. Aimed to explore characteristics, treatment, and acute service use associated with agitation and depression in dementia.	2,487 residents: 74% with dementia 26% without dementia	All residents: 80 ± 14.1 years Gender overall: Females 70% Males 30%	- Depression in dementia was identified using chart diagnosis or clear documentation. - Nothing was stated about how depression was measured, and no scale was mentioned.
Study 11: A Controlled Clinical Trial of Sertraline in the Treatment of Depression in Nursing Home Patients with Late-Stage Alzheimer's Disease **Magai et al. (2000)**	USA In five nursing homes.	Double-blind, placebo-controlled design. Clinical trial. Study length 8 weeks Aimed to evaluate the efficacy of the antidepressant medication sertraline in the treatment of depressive symptoms and signs in late-stage dementia patients.	101 residents with dementia. Only 31 of 101 residents entered into the clinical trial. 17 received sertraline, 14 received placebo.	Only those entered in the clinical trial (n=31) overall: 89.2 ± 6.3 years Gender: All participants were female with dementia	- Different scales were used to assess depression in dementia: 1. CSDD (cut-off >= 3) 2. Gestalt scale (GS) (cut-off >=1). - If either of the two was above or equal to the cut-off, patients were considered as depressed. - Limited to female participants and late-stage dementia.
Study 12: Behavioral symptoms and the administration of psychotropic drugs to aged patients with dementia in nursing homes and	Finland In two geriatric hospitals In seven nursing homes.	Cross-sectional. Aimed to describe the prevalence of psychiatric and behavioural symptoms in dementia patients in nursing homes and geriatric wards and to examine their	255 with dementia in both sites. 81% with dementia in nursing homes	Only included residents aged 70 and over. Mean age in both sites: 86.1 years (no SD mentioned).	Depression and other symptoms were collected from medical records and interviews (no specific scale was mentioned).

Title, Author, Date of publication	Country and setting	Study design / Aim	Number of participants	Mean age ± SD Gender (M/F)	Scales used for Depression in Dementia and Notes
in acute geriatric wards **Pitkala et al. (2004)**		psychotropic medication use.		Gender in both sites: Females 85.5%. Males 14.5%. (the authors did not differentiate age and genders between the two settings).	
Study 13: Antidepressant prescribing in nursing homes: is there a place for tricyclics? **Borson et al. (2002)**	USA In 137 skilled nursing facilities.	Cross-sectional. Aimed to develop a model explaining physicians' antidepressant choices for elderly nursing home patients.	3440 residents taking antidepressants: 46% with dementia 54% without dementia.	All residents: 83.1± 7.8 years Gender overall: Females 74% Males 26%	Based on medical records, with no scale used.

3.3.3 Thematic analysis and interpretation of data

Three main themes were identified: the first theme was the prevalence and prescribing patterns in the dementia group, and the sub-themes were BPSD (mainly depression), psychotropic medication (mainly antidepressants), potentially inappropriate drugs, and number of psychotropic medications. The second theme was the comparison of dementia patients to the non-dementia group, and the sub-themes were depression and antidepressants. The third theme was factors influencing treatment, and the sub-themes were resident characteristics (age and gender), antidepressants not only for depression, the identification and severity of depression and dementia and location and staff (**Figure 3.5**). These themes and sub-themes are presented in **Tables 3.6–3.8** and are described narratively in the text following the tables.

Some articles did not differentiate depression between dementia and non-dementia groups, although there was differentiation between the two groups in terms of antidepressants. Thus, if the authors did not make a clear differentiation, their data were included with the dementia group (Borson et al. 2002; Brimelow et al. 2019).

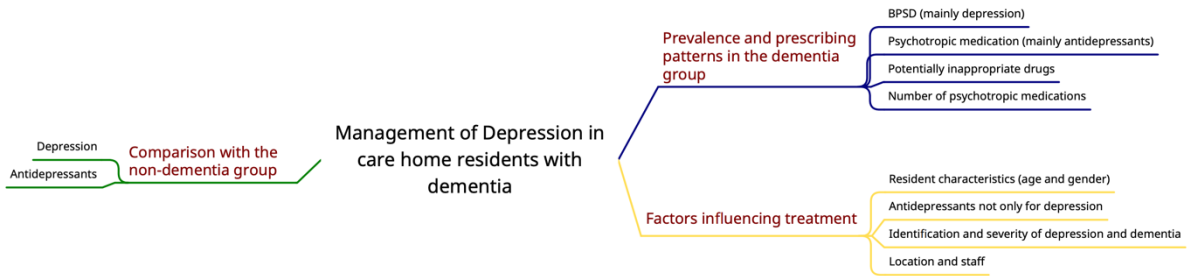


Figure 3.5 *Mind Map showing a schematic presentation of the themes and sub-themes illustrating the management of depression in care home residents with dementia.*

Table 3.6 *Themes and Sub-themes: Theme 1 - prevalence and prescribing patterns in the dementia group.*

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
Study 1: **Brimelow et al. (2019)**	Overall: Depression 61% Anxiety 27% Agitation 14% Psychosis 11%	In the Dementia group: - Any psychotropic: 50% - Antidepressants: 35% (most commonly mirtazapine and citalopram) - Benzodiazepines (BZD): 17% - Anti-psychotics: 18%	- One psychotropic drug: 58.3% - Two psychotropic drugs: 31.6% - Three psychotropic drugs: 8.6%	53-55% of psychotropic prescriptions were inappropriate according to Beers Criteria.	- The study did not differentiate between depression diagnosis in dementia vs non-dementia. However, prescribing data were presented separately for residents with and without dementia.
Study 2: **Giebel et al. (2015)**	Depression: 30.4%. The highest prevalence of depression was in Germany (47%), while the lowest was in Finland (15%).	-Antidepressants: 21% -Only 26% of patients with depression were receiving antidepressants. - The most commonly prescribed antidepressants among eight European countries were citalopram and mirtazapine. -The highest rate of antidepressants was in Spain (46%), while the lowest rate was in Estonia (3%).			- Authors did not clearly differentiate between settings (community care and nursing homes) in the prevalence of depression and antidepressants. - Only differentiated between countries. - Study limited to severe dementia. - Prevalence of depression (30%) higher than prevalence of antidepressants (21%).

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
Study 3: **Gruber-Baldini et al. (2005)**	Depression 25%.	- Overall antidepressants: 39% - Antidepressant use in dementia residents: A) with depression 54% vs B) without depression 33% There was a significant difference between the two groups.		33% of residents with dementia were receiving antidepressants, but without a depression diagnosis.	- Antidepressants were used in 54% of residents with dementia and depression, whereas only 25% had a depression diagnosis, so there was a higher percentage of antidepressant use than depression diagnoses in residents with dementia and depression.
Study 4: Hiltunen et al. (2016)	-In dementia group: depression 66%	-In dementia group with depression: A) Antidepressant users 47% vs B) Non-antidepressant users 19%. -SSRIs more prevalent			- Depression 66% in dementia group, higher than antidepressants, which had a 47% prevalence.
Study 5: **Kverno et al. (2008)**	- Overall, 85.4% of residents had at least one neuropsychiatric symptom (NPS): - Agitation: 50% - Depression 45.5% - Withdrawal/lethargy 43%	- Overall, at least 78% of residents were taking psychotropic medications. - Medication aimed at reducing mood symptoms (41%) (including antidepressants & mood stabilizers).			- Authors categorized treatment by target symptoms (e.g. medication aimed at reducing mood-related symptoms, including depression, anxiety, and apathy). Thus, it is difficult to know how depression was treated specifically.

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
	Thus, the most common symptom was agitation, followed by depression, and then withdrawal/lethargy.	- Medication to reduce problematic behaviour (38%). - Medication to reduce psychotic symptoms (23%)			- Antidepressants were not only used for depression, but also for other NPS, anxiety, behaviour, and sleep problems. - The study was limited to severe dementia only.
Study 6: **McMaster et al. (2017)**	Depression (70%) and agitation (67%) were the most common BPSDs.	-Antipsychotics 36%: the most common was atypical (risperidone: 41%). -Benzodiazepines 31%: the most common was temazepam (27%). -Antidepressants 26%: The most common were SSRIs (15%) This means that there was a higher prevalence of antipsychotics and benzodiazepines but a lower prevalence of antidepressants.	Overall, 58% of residents took at least one psychotropic medication: - 32% were prescribed one psychotropic medication. - 13% were prescribed two psychotropic medications. - 13% were prescribed three or more psychotropic medications. - 42% were prescribed no psychotropic medications.	31% were prescribed BZD. 9% were prescribed TCA.	- The prevalence of depression (70%) was higher than the prevalence of antidepressant prescriptions (26%).
Study 7: **Midlöv et al.**	- Dementia group: diagnosed with depression according	- Dementia group: SSRIs 34% Other antidepressants 20%	- Dementia group: 15% were taking three or more psychotropic drugs.	33% of residents were prescribed one or more	In the dementia group: depression 7% and antidepressants 50%

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
(2014)	to medical records in 7% vs CSDD in 7% - After 12 months: 56% of residents still had depression, according to either medical records or CSDD.	One or more antidepressants 50% - After 12 months: 90% of residents were still on antidepressants.	- After 12 months, 76% of residents still had psychotropic polypharmacy.	antidepressants without depression. After 12 months, 90% of those treated with antidepressants were still on the antidepressants without a clear indication.	Persistent rate of antidepressant use after 12 months
Study 8: **Nijk et al. (2009)**	Not clear	- In general, at least 63% residents were prescribed one psychotropic medication: Antipsychotics (37%) Antidepressants (27%) Anxiolytics (16%) -The most common combination was antidepressants and antipsychotics. - Depressive symptoms were associated with psychotropic drugs in general and antidepressants specifically.	- 36% were prescribed one psychotropic medication. - 20% were prescribed two psychotropic medications. - 6% were prescribed three or more psychotropic medications. - Around 27 % were taking a combination of medications. - The most common combination was antidepressants and antipsychotics (taken by 12.3% of patients).		- It is not clear how many residents with depression there were.

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
Study 9: **van Asch et al. (2013)**	- Dementia group: Depression 9.6%	- Dementia group: Antidepressants 59%			- Nearly 60% of the residents with depression (either with or without dementia) were using antidepressants. - The study did not mention how the remaining 40% were being treated. - The scale used was not specific for measuring depression in dementia patients.
Study 10: **Bartels et al. (2003)**	Depression 22.4% Agitation 43.5% Dementia with both depression and agitation 34.1%	- Dementia with depression only: Antipsychotics 18% Antidepressants 59% Anxiolytics 17% - Dementia with mixed depression and agitation: Antipsychotics 32% Antidepressants 60% Anxiolytics 37% -Dementia alone (uncomplicated): Antipsychotics 9% Antidepressants 12% Anxiolytics 15%	- Dementia with depression only: More than one psychotropic drug was prescribed for 29% of patients. - Dementia with mixed depression and agitation: More than one psychotropic drug was prescribed for 47% of patients. -Dementia alone (Uncomplicated):	- Dementia and depression only: No clear indication for prescribing antipsychotic (18%) and anxiolytic (17%) medications. - Dementia only (No depression, no agitation): No clear indication for prescribing psychotropic medications. Antipsychotics 9%	- Antidepressants, antipsychotic and anxiolytic medications were prescribed for all three groups but in different percentages, even without a clear indication. - Antidepressants were the highest in both groups (dementia with depression and dementia with mixed depression and agitation).

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
		Antidepressants were the highest in both the dementia with depression group and the dementia with mixed depression and agitation group.	More than one psychotropic drug was prescribed for 10% of patients. -The percentage combination of psychotropic drugs in dementia with mixed depression and agitation (47%) was higher than in dementia with depression only (29%).	Antidepressants 12% Anxiolytics 15%	
Study 11: **Magai et al. (2000)**	- Probable minor or greater depression 84% (within this, 16% probable major depression, 10% definite major depression).	Sertraline prescribed: Week 1-2 >> 25 mg Week 3-4 >> 50 mg Week 5-8 >> 100 mg Over eight weeks, depression in the treatment group and the placebo group both improved, and there was no significant difference between groups.			- No difference between treatment and placebo groups: both improved. - All participants were female and in the late stage of dementia.

Sub-themes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Number of psychotropic medications	Potentially inappropriate medications	Notes
Study 12: **Pitkala et al. (2004)**	-In nursing homes (NH): Psychotic Symptoms 56% Depressive symptoms 51% Anxiety 51% Agitation 27% -Psychotic symptoms, depressive symptoms, and anxiety were more common among patients with dementia in NH (significant difference), compared to geriatric hospital (GH).	-In nursing homes: Typical antipsychotic 41% Atypical antipsychotic 13% Antidepressants 47% Anxiolytics 38% Anticholinergic drugs 19%. -Use of antidepressants and anxiolytics was higher in NH and was significant compared to GH. -The most common antidepressants prescribed were SSRIs (particularly citalopram and mirtazapine).	For both sites (authors did not differentiate between sites): - One psychotropic drug 87% - Two psychotropic drugs 66% - Three psychotropic drugs 36% - Four psychotropic drugs 11%	In nursing homes: Anticholinergics (e.g. TCA): 19%. Anxiolytics (e.g. BZD): 38%. The authors did not mention how long these medications had been prescribed for.	-This study included NH and Geriatric hospital, this review only focused on NH -It is not clear which scale was used to measure depression in dementia. - In nursing homes, the prevalence of depression (51%) was higher than antidepressant use (47%).
Study 13: **Borson et al. (2002)**	Depression 85%	-With dementia: SSRIs 54% TCAs 20%		20% TCA in dementia	- The authors did not differentiate age, gender, or depression between dementia and non-dementia groups.

Table 3.7 *Themes and sub-themes: Theme 2 - comparison of patients with dementia to those without dementia*

Subthemes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Notes
Study 1: **Brimelow et al. (2019)**		With dementia group: - Any psychotropic: 50% - Antidepressants: 35% (most commonly mirtazapine and citalopram) - BZD: 17% - Anti-psychotics: 18% Without dementia group: -Any psychotropic 46% -Antidepressants: 27% -BZD: 24% -Anti-psychotics: 11% There was no significant difference between the two groups in overall psychotropic medications. However, there was a significant difference for each medication class between the groups, with the use of antidepressants and antipsychotics being significantly higher in dementia than in non-dementia patients.	- Antidepressant prescriptions were significantly higher in dementia versus non-dementia patients (p-value <0.05).

Subthemes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Notes
Study 4: **Hiltunen et al. (2016)**	Overall, depression and dementia 29% versus depression and non-dementia 31%: -In dementia group: depression 65.7% -In non-dementia group: depression 55.6%.	Overall, antidepressants 48%: - In dementia group with depression: Antidepressant users 47% vs Non-antidepressant users 19%. - In non-dementia group with depression: A) Antidepressant users 38% vs B) Non-antidepressant users 17%.	- The prevalence of antidepressant use was similar among residents with or without dementia.
Study 7: **Midlöv et al. (2014)**	- Dementia group: diagnosed depression 7% vs CSDD 7% - Non-dementia group: diagnosed depression 11% vs CSDD 7% There was no significant difference in depression between the dementia and non-dementia groups, as measured either with medical records or CSDD.	- Dementia group: SSRIs 34% Other antidepressants 20% One or more antidepressants 50% - Non-dementia group: SSRIs 35% Other antidepressants 15% One or more antidepressants 44% There was no significant difference in antidepressant use between dementia and non-dementia groups. However, antidepressant use was higher in the dementia group than in the non-dementia group.	

Subthemes Studies	BPSD (mainly depression)	Psychotropic medications (mainly antidepressants)	Notes
Study 9: **van Asch et al. (2013)**	- Dementia group: Depression 9.6% - Non-dementia group: Depression 9.8% There was no significant difference between the two groups.	- Dementia group: Antidepressants 59% - Non-dementia group: antidepressants 57% A slightly higher percentage of patients in the dementia group were taking antidepressants, but this difference was not significant.	- The prevalence of antidepressant use was higher than the prevalence of depression in both groups.
Study 13: **Borson et al. (2002)**		- Overall antidepressant use: SSRI 59% and TCA 23% -With dementia: SSRI 54% and TCA 20% -Without dementia: SSRI 62% and TCA 26% -For TCA users: Residents with dementia and non-psychiatric symptoms: Nortriptyline 9%, Amitriptyline 3%. This indicates that SSRIs are more likely to be prescribed than TCAs for treating depression either with or without dementia.	- The study did not differentiate depression between dementia and non-dementia groups.

Table 3.8 *Themes and sub-themes: Theme 3 - factors influencing the management of depression in people with dementia*

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
Study 1: **Brimelow et al. (2019)**	Care homes with higher prescribing rates had older residents (mean age 87) compared to those with the lowest prescribing rates (mean age 83) (the older the resident, the more psychotropics are prescribed, although the authors did not mention specific drug classes).	Antidepressants might be used for BPSD, e.g. anxiety.	- Residents with severe depression were more likely to be prescribed treatment. - Care homes, which used more screening and identified more depression, used more psychotropic medications, particularly antidepressants. - CSDD classification: 0-8 indicates no depression		

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
			9-13 mild depression 14-18 moderate depression 19-38 major depression		
Study 2: **Giebel et al. (2015)**			- Cut-off CSDD 10 or above, indicates probable major depression.	- The highest prevalence of depression was in Germany (47%) while the lowest was in Finland (15%). - The highest rate of antidepressant use was in Spain (46%), while the lowest was in Estonia (3%). - Estonia and Germany reported the	- Different sample sizes between countries. - Study compared eight European countries and participants were limited to patients with severe dementia.

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
				biggest difference between depression and antidepressants, with both countries prescribing fewer antidepressants than there were cases of depression. - In England, France, Spain, and Sweden, the rate of prescription was slightly higher than the prevalence of depression.	

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
				-The Netherlands and Finland reported similar levels of antidepressants and depression.	
Study 3: **Gruber-Baldini et al. (2005)**			-CSDD cut-off point >= 7 for depression	In residential care (N = 238): - Residents with depression: 24% - Treatment by a mental health professional: 15.2% - Antidepressants used: 36.4% - Non-pharmacological treatment: 33.0%	- Study compared residential care versus nursing homes. - It was not clear how it was decided to use non-pharmacological treatment. - In nursing homes, treatment with antidepressants (42%) was lower than non-

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
				In nursing homes (N = 109): - Residents with depression: 27% - Treatment by a mental health professional: 26.5% - Antidepressant use: 42.1% - Non-pharmacological treatment: 45.1% There were no significant differences between the two settings except for treatment by mental health professionals.	pharmacological approaches (45%). However, in residential care homes, treatment using antidepressants (36%) was higher than the use of non-pharmacological treatments (33%). - According to the literature, mental health professionals could include psychiatrists, psychologists, mental health social workers,

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
					physicians, or anyone defined as a professional mental health provider by the supervisor.
Study 4: **Hiltunen et al. (2016)**	- Among residents with dementia, no significant difference in antidepressant use between females and males (OR = 0.39, 95% CI = 0.13 – 1.17).	Antidepressants have other indications including insomnia, neuropathic pain, anxiety and neuropsychiatric symptoms.			
Study 5: **Kverno et al. (2008)**		Antidepressants can be used for other neuropsychiatric symptoms, e.g. anxiety or sleep disturbances	Neuropsychiatric Inventory (NPI) was used to assess neuropsychiatric symptoms (including depression).		-Limited to severe dementia

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
Study 6: **McMaster et al. (2017)**	- Older people (>80) less likely to have antidepressant prescriptions. - No significant difference in antidepressant use between females and males.	- Antidepressants also used for other BPSDs (e.g. agitation).	- Geriatric Depression Scale (GDS) was used to identify depression (GDS >=4, indicated depression). -More antidepressants were prescribed for mild than for severe depression.		
Study 7: **Midlöv et al. (2014)**	- Females have higher percentage of depression, dementia and antidepressants than males (but this difference was not significant). - The prevalence of one or more antidepressants		- CSDD cut off = 8 for depression		- No associations between dementia and antidepressants or psychotropic polypharmacy (3 or more psychotropics), but there was an

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
	in patients aged 80+ was 43% in female and 36% in males.				association between depression and psychotropic polypharmacy. - No participant was treated with CBT, so there may be an issue of feasibility.
Study 8: **Nijk et al. (2009)**	- Age was significantly associated with psychotropic drugs (particularly antipsychotics and anxiolytics). Younger patients (65-74) had significantly higher odds of being prescribed these medications compared to those over 85. However, age was	Antidepressants used for other BPSD, e.g. anxiety	Neuropsychiatric Inventory – nursing home version (NPI-NH) was used for assessing neuropsychiatric symptoms (including depression).		- Modest effect of psychotropic medications.

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
	not significantly associated with antidepressant prescribing. –Females were prescribed significantly more antidepressants than males.		- Patients with severe dementia were prescribed more antipsychotics and antidepressants.		
Study 9: **van Asch et al. (2013)**		SSRIs might also be prescribed for agitation, aggression, and anxiety disorders. Tricyclic antidepressants might be prescribed for neuropathic pain.	- Depression Rating Scale (DRS) was used.	- Training might be affected by staff workload or insufficient training courses.	- No significance difference in antidepressant use was found between depression with or without dementia.
Study 10: **Bartels et al. (2003)**	- Prevalence of dementia and depression in females (74.6%) higher than in males (25.4%).	- Residents with dementia who had both agitation and depression were more likely to be prescribed antipsychotics (32%), antidepressants (60%), and anxiolytics (37%) than residents with dementia and depression alone.			- Mixed BPSD (depression and agitation together) with dementia affects treatment.

Sub-themes Studies	Resident characteristics (Age and Gender)	Antidepressants not only for depression	Identification and severity of depression and dementia	Location and staff	Notes
		Therefore, having more than one BPSD might increase psychotropic prescriptions.			
Study 12: **Pitkala et al. (2004)**				- More psychotic symptoms, depressive symptoms and anxiety were found in nursing homes than in geriatric hospitals. - In nursing homes, there were higher prescriptions of antidepressants, anxiolytics and antipsychotics.	- BPSD usually the reason for admission to nursing homes. - Patients in nursing homes may exhibit more severe symptoms than those in geriatric hospitals, which could explain the higher percentage of symptoms in nursing homes (with mild stages being found in patients in geriatric hospitals).

3.3.3.1 Behavioural and Psychological Symptoms of Dementia (BPSD) (mainly depression)

From the studies reviewed, there are conflicting findings regarding the prevalence of depression in people with dementia. Several studies reported that depression affected more than 60% of participants with dementia, making it the most commonly observed BPSD (Borson et al. 2002; Hiltunen et al. 2016; McMaster et al. 2017; Brimelow et al. 2019). For example, McMaster et al. (2017) found that depression (70%) and agitation (67%) were the most frequent symptoms, although the assessment scale they used was not specific for depression in dementia. However, other studies reported a lower prevalence for depression, with figures under 50% (Bartels et al., 2003; Gruber-Baldini et al., 2005; Kverno et al., 2008). Kverno et al. (2008) observed that 45.5% of residents had depression and 50% agitation, but again, the scale applied was not specific for depression in dementia. Some studies also found that agitation was more prevalent than depression, although the statistical significance of this difference was unclear (Bartels et al. 2003; Kverno et al. 2008).

The variance in scales used makes comparisons complex but, in studies using the same scale, for example the Cornell Scale for Depression in Dementia (CSDD), which is a specific scale for depression in dementia, there is still significant variation reported in the prevalence. For instance, Brimelow et al. (2019) reported the prevalence of depression in people with dementia was 61%, whereas Gruber-Baldini et al. (2005) found only 25%. Furthermore, a longitudinal cohort study following residents with dementia receiving antidepressants over a 12-month period reported that 56% still had depression at follow-up (Midlöv et al. 2014).

With regards to comparisons between residents with and without dementia, Hiltunen et al. (2016) reported that the prevalence of depression was higher in the dementia group (65.7%) compared to the non-dementia group (55.6%). In contrast, Van Asch et al. (2013), found no significant difference in prevalence (9.6% vs. 9.8%). Similarly, Midlöv et al. (2014) reported comparable rates between groups (7% vs. 11%), with no statistically

significant difference. It should be noted the prevalences in the Hiltunen study were much higher than the other studies.

3.3.3.2 Psychotropic Medication (mainly antidepressants)

Antidepressants were among the most commonly prescribed psychotropic medications for residents with dementia. Several studies have reported high rates of antidepressant prescribing in this population (Bartels et al. 2003; Pitkala et al. 2004; Gruber-Baldini et al. 2005; Van Asch et al. 2013; Brimelow et al. 2019). For example, Bartels et al. (2003) reported that the prevalence of antidepressants (59%) exceeded the prevalence of both antipsychotics (18%) and anxiolytics (17%) in residents with dementia and depression. Also, in residents with dementia who had mixed depression and agitation, the prevalence of antidepressants (60%) was also higher than that of antipsychotics (32%) and anxiolytics (37%) (Bartels et al. 2003). A longitudinal cohort study of Swedish nursing home residents assessed antidepressant prescribing at baseline and again after 12 months, reporting that 90% continued antidepressant treatment at follow-up (Midlöv et al. 2014). In contrast, only two studies found that the prevalence of antidepressant prescriptions in residents with dementia was the lowest (less than 30%) among other psychotropic medications, and the prescription of antipsychotics was the highest (Nijk et al. 2009; McMaster et al. 2017)

When comparing residents with dementia to those without dementia, several studies reported the prevalence of antidepressants was higher among residents with dementia (Van Asch et al. 2013; Midlöv et al. 2014; Hiltunen et al. 2016; Brimelow et al. 2019). Brimelow et al. (2019) found this difference to be statistically significant, with 35% of residents with dementia being prescribed antidepressants compared to 27% of residents without dementia (p-value <0.05), whereas other studies did not report whether the differences observed were statistically significant. However, only one study reported that the prevalence of antidepressants in residents without dementia (SSRI 62%, TCA 26%) was higher than in residents with dementia (SSRI 54%, TCA 20%), but statistical significance was not mentioned (Borson et al. 2002). Also, it was noted from the included studies that the prevalence of antidepressant prescribing had fallen in

recent years in both the dementia and the non-dementia groups (Borson et al. 2002; Van Asch et al. 2013; Midlöv et al. 2014; Hiltunen et al. 2016; Brimelow et al. 2019) (**Figure 3.6**).

The most frequently prescribed types of antidepressants were SSRIs, particularly citalopram and sertraline, as well as tetracyclic antidepressants, particularly mirtazapine, for residents with dementia and depression (Magai et al. 2000; Borson et al. 2002; Pitkala et al. 2004; Midlöv et al. 2014; Giebel et al. 2015; Hiltunen et al. 2016; McMaster et al. 2017; Brimelow et al. 2019). An RCT also examined the effectiveness of sertraline in dementia patients with depression over eight weeks and reported that the treatment and placebo group both improved, with no significant difference between groups (Magai et al. 2000).

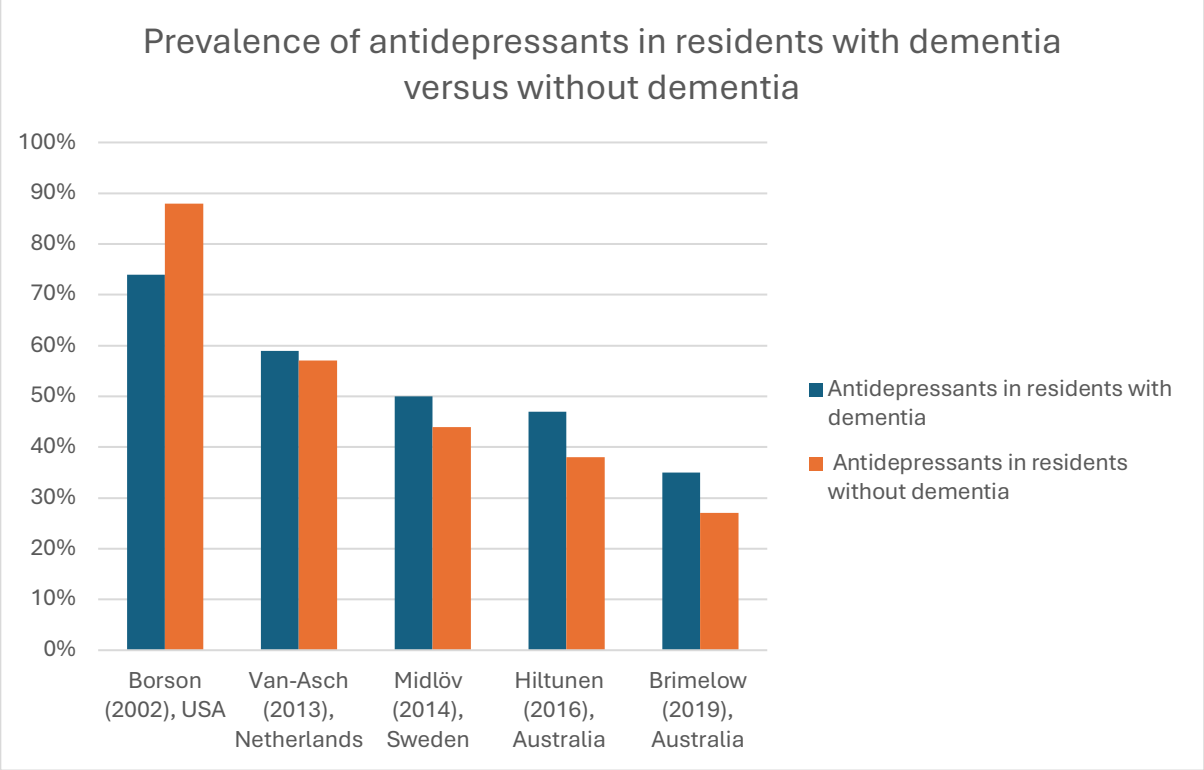


***Figure 3.6**:Prevalence of antidepressant use in residents with dementia versus without dementia from 2002 to 2019. The percentage data were taken from Borson et al. (2002), Van Asch et al. (2013), Midlöv et al. (2014), Hiltunen et al. (2016) and Brimelow et al. (2019) and show that antidepressant use decreased in both groups with time.*

3.3.3.3 BPSD and Psychotropic Medication Use (mainly depression and antidepressants)

Regarding the prevalence of depression compared to the prevalence of antidepressant use, some studies found that the prevalence of depression was higher than that of antidepressants, while others found the opposite. As shown in **Figure 3.7**, there were three patterns, as follows.

- In the first pattern, the prevalence of depression was higher than that for antidepressant use (Borson et al. 2002; Giebel et al. 2015; Hiltunen et al. 2016; McMaster et al. 2017; Brimelow et al. 2019). For example, McMaster et al. (2017) found that the prevalence of depression in residents with dementia (70%) was higher than the prevalence of antidepressant use (26%).

- In the second pattern, the prevalence of antidepressant use exceeded the prevalence of depression (Bartels et al. 2003; Gruber-Baldini et al. 2005; Van Asch et al. 2013; Midlöv et al. 2014). For instance, Van Asch et al. (2013) reported that 59% of residents were prescribed antidepressants, while only 9.6% were diagnosed with depression. Similarly, in a longitudinal cohort study, at baseline, 50% of residents were prescribed antidepressants, whereas only 7% were diagnosed with depression (Midlöv et al. 2014).

- In the third pattern, the prevalences of depression and antidepressant use were similar (Pitkala et al. 2004; Kverno et al. 2008).

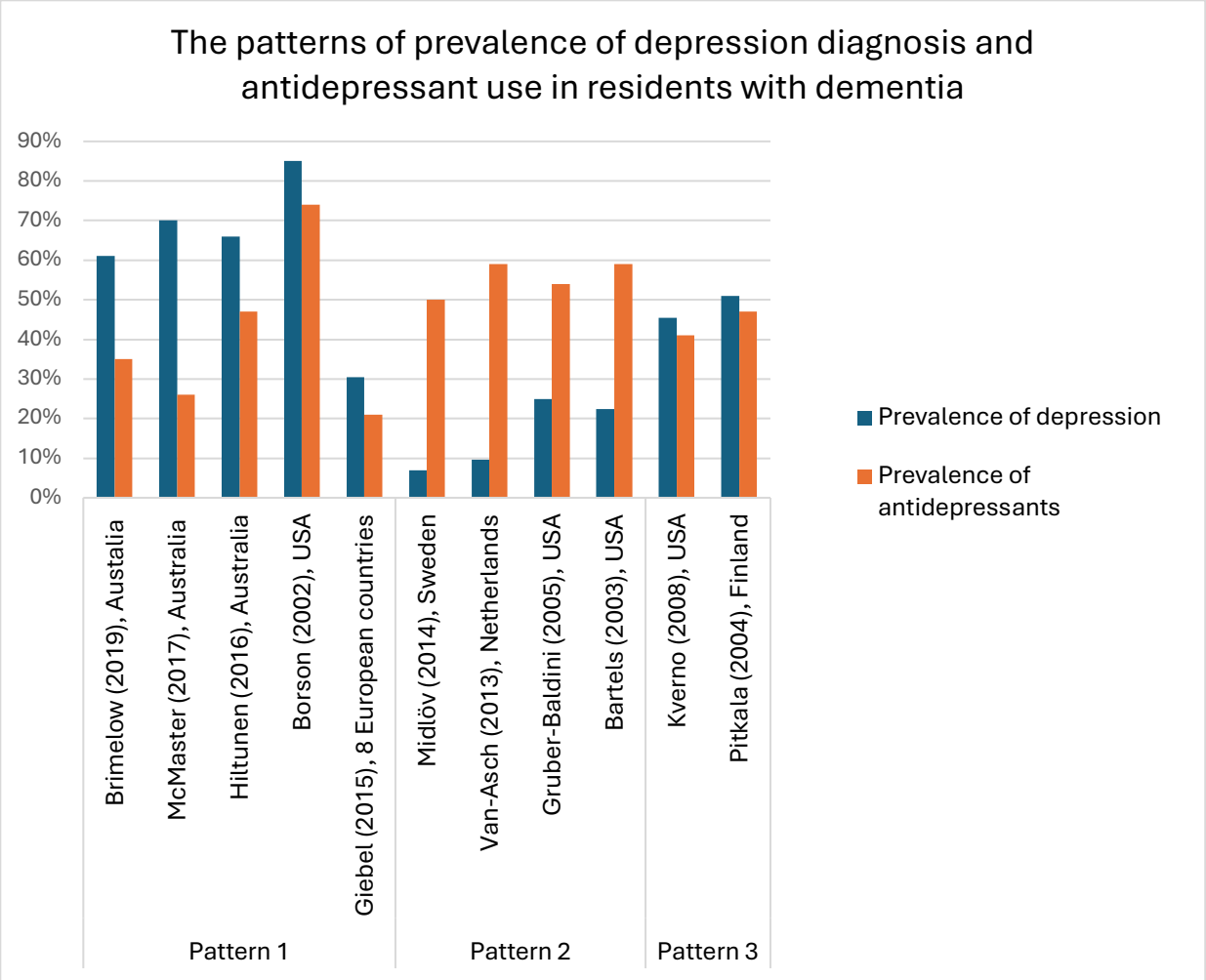


Figure 3.7: *The patterns of prevalence of depression diagnosis and antidepressant use in residents with dementia. The percentage data were taken from Brimelow et al. (2019), McMaster et al. (2017), Hiltunen et al. (2016), Borson et al. (2002), Giebel et al. (2015), Midlöv et al. (2014), Van-Asch et al. (2013), Gruber-Baldini et al. (2005), Bartels et al. (2003), Kverno et al. (2008), Pitkala et al. (2004).Three patterns were seen with diagnosis of depression higher than antidepressant use (Pattern 1), antidepressant use higher than diagnosis of depression (Pattern 2) and similar levels of diagnosis of depression and antidepressant use (Pattern 3).*

With regards to comparing to residents without dementia, Hiltunen et al. (2016) reported that the prevalence of depression (55%) was higher than the prevalence of antidepressant prescribing (38%). However, Van Asch et al. (2013) and Midlöv et al. (2014) found that the prevalence of antidepressant prescribing was higher (more than 40%) than the prevalence of depression (less than 15%).

Regarding the association between BPSD and psychotropic medication prescribing, Nijk et al. (2009) found that antidepressant prescribing was positively associated with depression, while prescribing of antipsychotics and anxiolytics was positively

associated with psychotic symptoms and agitation. Also, residents with dementia were prescribed higher numbers of psychotropic medications for depression, agitation, and psychosis compared to those without dementia, but this difference was statistically significant only for agitation and psychosis (OR =2.01 and OR = 2.11, respectively, $p < 0.05$) (Brimelow et al. 2019).

3.3.3.4 Potentially Inappropriate Medication

Some of the studies reported potentially inappropriate psychotropic medication prescribing in residents with dementia. Approximately 50% of medications were deemed inappropriate according to the Beers Criteria (Brimelow et al. 2019). For example, benzodiazepines and tricyclic antidepressants were prescribed for residents with dementia and depression (Borson et al. 2002; Pitkala et al. 2004; McMaster et al. 2017).

Moreover, antipsychotic and anxiolytic medications were prescribed for residents with dementia and depression without clear indications (Bartels et al. 2003). Also, residents with dementia alone (i.e., without depression or agitation) were still prescribed antidepressants, antipsychotics and anxiolytics without clear indications (Bartels et al. 2003; Gruber-Baldini et al. 2005; Midlöv et al. 2014).

3.3.3.5 Number of Psychotropic Medications

Some studies reported that more than half of care home residents were prescribed at least one psychotropic medication (Nijk et al. 2009; McMaster et al. 2017; Brimelow et al. 2019). McMaster et al. (2017) found that 58% of residents were prescribed at least one psychotropic drug, while 42% were not. The percentage of residents prescribed two psychotropic medications ranged from 13% to 31.6% (Nijk et al. 2009; McMaster et al. 2017; Brimelow et al. 2019). These percentages declined as the number of prescribed psychotropics increased, with only 6–15% of residents receiving three or more psychotropic medications (Nijk et al. 2009; Midlöv et al. 2014; McMaster et al. 2017; Brimelow et al. 2019). Nijk et al. (2009) was the only study that reported on specific combinations, with the most common being antidepressants plus antipsychotics.

Furthermore, the presence of multiple BPSD symptoms appeared to be associated with higher psychotropic medication prescribing. Bartels et al. (2003) reported that 29% of residents with dementia and depression were prescribed combinations of psychotropic drugs, compared to 10% of those with dementia alone, with the highest prevalence (47%) observed in residents with dementia who had both depression and agitation.

3.3.3.6 Influencing factors

Several factors might affect the identification and treatment of depression in residents with dementia.

3.3.3.6.1 Resident characteristics (age and gender)

In all included studies, residents with or without dementia and depression had a mean age equal to or greater than 80 years. In residents with dementia and depression, the mean age range was 80 ± 14.1 years to 89.2 ± 6.3 years, and they were significantly older than residents without dementia (Magai et al. 2000; Bartels et al. 2003; Van Asch et al. 2013)

In contrast, other studies found that in residents without dementia, the mean age range was 81.9 ± 7.8 years to 87.62 ± 6.27 years (Van Asch et al. 2013; Hiltunen et al. 2016). Midlöv et al. (2014), who conducted a longitudinal cohort study, found that residents without dementia were significantly older than residents with dementia; however, Hiltunen et al. (2016) found no significant difference in age between the dementia and no-dementia groups in their study.

Age may also be associated with psychotropic drug prescribing. Two cross-sectional studies (Nijk et al. 2009; McMaster et al. 2017) found that older people (> 80) with dementia were less likely to be prescribed antidepressants, antipsychotics and anxiolytics. On the other hand, Brimelow et al. (2019) divided care homes into quartiles based on psychotropic prescribing rate and found that residents in the highest

psychotropic prescribing home were older (mean age 87.5) than those in the lowest psychotropic prescribing home (mean age 83.7).

Regarding gender, across studies, the percentage of females was higher than the males in care homes. Also, the number of females with dementia and depression was higher than males (Bartels et al. 2003; Midlöv et al. 2014; Hiltunen et al. 2016). For example, around 75% of care home residents diagnosed with both dementia and depression were female (Bartels et al. 2003). Similarly, 77% of care home residents without dementia were female (Hiltunen et al. 2016).

With respect to psychotropic medications, antidepressant prescriptions may be influenced by gender. Nijk et al. (2019) reported that females with dementia were more likely to be prescribed antidepressants than males (OR 1.44, 95% CI 1.03–2.02). In contrast, two other studies found that females with dementia were less likely to be prescribed antidepressants, although these differences were not statistically significant (Hiltunen et al. 2016; McMaster et al. 2017). For example, McMaster et al. (2017) reported an odds ratio of 0.62 ($p = 0.12$). Similarly, a longitudinal cohort study by Midlöv et al. (2014) found no significant differences in antidepressant use between men and women; however, this study combined data from residents with and without dementia, without differentiating gender differences within each group.

3.3.3.6.2 Other factors

In addition to age and gender, antidepressants might be used not only for depression, but also for other purposes in residents with dementia. It was reported that antidepressants were used for other indications, such as agitation, anxiety, insomnia, sleep disturbances and neuropathic pain (Kverno et al. 2008; Nijk et al. 2009; Van Asch et al. 2013; Midlöv et al. 2014; McMaster et al. 2017; Brimelow et al. 2019).

Moreover, the severity of the depression or dementia might be a factor affecting antidepressant prescriptions. Nijk et al. (2009) and Brimelow et al. (2019) found that patients with severe depression or dementia were prescribed more antidepressants,

while in contrast, McMaster et al. (2017) reported that patients with mild depression were more likely to have antidepressant prescriptions than those with severe depression. Also, different scales and cut-off points were used across the various studies, which might affect the identification of depression. The CSDD was used in four studies (Gruber-Baldini et al. 2005; Midlöv et al. 2014; Giebel et al. 2015; Brimelow et al. 2019), albeit with different cut-off points, while the NPI and the GDS were used in three studies (Kverno et al. 2008; Nijk et al. 2009; McMaster et al. 2017).

In addition, the location of residents and staff may influence the identification and treatment of depression in residents with dementia. Giebel et al. (2015) examined the prevalence of depression and antidepressant use across eight European countries, finding that Germany had the highest prevalence of depression, while Finland had the lowest. Spain had the highest rate of antidepressant use, whereas Estonia had the lowest. Both Germany and Estonia prescribed fewer antidepressants than the number of identified depression cases. Similarly, Gruber-Baldini et al. (2005) compared nursing homes with residential care facilities and found that rates of depression, antidepressant use, non-pharmacological approaches and treatment by mental health professionals were all higher in nursing homes. The only statistically significant difference, however, was in treatment by mental health professionals. In nursing homes, non-pharmacological treatment (45.1%) was slightly more common than antidepressant use (42.1%), whereas the opposite pattern was observed in residential care. Depression was also more prevalent in for-profit nursing homes compared to non-profit nursing homes and residential care settings. Training might be affected by high staff workload and training courses might be not sufficient (Van Asch et al. 2013); thus this might lead to underdiagnosis and then affect treatment.

3.3.4 Quality of studies

The JBI Critical Appraisal Tools were used to assess the quality of the studies (The University of Adelaide 2020). Due to the different study designs, the JBI for prevalence studies (**Table 3.9**), the JBI for cohort studies (**Table 3.10**) and the JBI for RCTs were used (**Table 3.11**). For prevalence studies, three articles were given a good quality score of 7

out of 9 (Gruber-Baldini et al. 2005; McMaster et al. 2017; Brimelow et al. 2019), and two articles were given a moderate quality score of 6 out of 9 (Giebel et al. 2015; Hiltunen et al. 2016), while the remaining articles were given moderate quality scores of 5 or less out of 9 (Borson et al. 2002; Bartels et al. 2003; Pitkala et al. 2004; Kverno et al. 2008; Nijk et al. 2009; Van Asch et al. 2013). The cohort study was given a moderate quality score of 5 out of 11(Midlöv et al. 2014). The RCT study was given a good quality score of 10 out of 13 (Magai et al. 2000).

According to the Hierarchy of Clinical Evidence (**Figure 3.1**), randomised controlled trials (RCTs) provide the highest quality evidence, followed by cohort studies, while cross-sectional (prevalence) studies provide the lowest quality evidence.

Table 3.9 *Quality appraisal checklist using the Joanna Briggs Institute (JBI) tool for studies reporting prevalence data (The University of Adelaide 2020)*

Study	Representative sample	Appropriate sampling	Adequate sample size	Reporting study subjects and settings in detail	Data coverage of identified sample is adequate	Valid method used for the identification of the condition	Measure condition in a standard, reliable way for all participants	Appropriate statistical analysis	Response rate adequate, and if not, low response rate managed appropriately	Quality Score (out of 9)	Notes
Brimelow et al. (2019)	Y	Y	Y	N	Y	Y	UC	Y	Y	7 (good)	Only in Australia
Giebel et al. (2015)	Y	UC	Y	N	Y	Y	Y	UC	Y	6 (moderate)	Only in severe dementia and in 8 European countries
Gruber-Baldini et al. (2005)	N	Y	Y	N	Y	Y	Y	Y	Y	7 (good)	Only in USA
Hiltunen et al. (2016)	Y	UC	Y	Y	Y	N	N	Y	Y	6 (moderate)	Only in Australia
Kverno et al. (2008)	UC	Y	Y	N	Y	UC	Y	UC	Y	5 (moderate)	Only in USA
McMaster et al. (2018)	Y	Y	Y	UC	Y	UC	Y	Y	Y	7 (good)	Only in Australia
Nijk et al. (2009)	Y	UC	UC	N	Y	UC	UC	Y	Y	5 (moderate)	Only in Australia
van Asch et al. (2013)	Y	Y	UC	N	Y	UC	UC	Y	Y	5 (moderate)	Only in Netherlands
Bartels et al. (2003)	UC	Y	Y	N	Y	UC	UC	UC	Y	4 (moderate)	Only in USA
Pitkala (2004)	N	Y	Y	N	Y	UC	UC	N	Y	4 (moderate)	Only in Finland. Only reports p-values, and does not mention 95% Confidence Interval
Borson et al. (2002)	Y	N	Y	N	Y	UC	UC	UC	Y	4 (moderate)	Only in USA

Yes (Y), No (N), Unclear (UC) or Not/Applicable (NA)

For scoring, Y = 1, all others (N or UC) = 0

Scores 1 – 3 weak, 4 – 6 moderate, equal or greater than 7 good

Table 3.10 *Quality appraisal checklist using the Joanna Briggs Institute (JBI) for cohort studies (The University of Adelaide 2020)*

Study	Two groups similar and from same population	Exposure measured similarly to assign people to both exposed and unexposed groups	Exposure measured in a valid and reliable way	Strategies to deal with confounding factors	Groups/ participants free of the outcome at the start of the study	Outcomes measured in a valid and reliable way	Follow-up time reported and sufficiently long for outcomes to occur	Was the follow-up complete, and if not, are reasons for loss to follow up described and explored?	Strategies to address incomplete follow up utilized	Appropriate statistical analysis used	Quality Score (out of 11)	Notes
Midlöv et al. (2014)	Y	Y	Y	N	N	Y	UC	Y	N	UC	5 (moderate)	From a large-scale study limited to Sweden

Yes (Y), No (N), Unclear (UC) or Not Applicable (NA)

For scoring, Y = 1, all others (N or UC) = 0

Scores 1 – 4 weak, 5 – 8 moderate, equal or greater than 9 good

Table 3.11 *Quality appraisal checklist using the Joanna Briggs Institute (JBI) for randomized controlled trials (RCT) (The University of Adelaide 2020)*

Study	True randomization	Allocation to treatment groups concealed	Treatment groups similar at baseline	Participant blinding to treatment assignment	Delivering treatment blind to treatment assignment	Outcome assessors blind to treatment assignment	Groups treated identically other than the intervention	Was follow-up complete and if not, were differences between groups in adequately described?	Participants analysed in the groups to which they were randomized	Outcomes measured in the same way for treatment groups	Outcomes measured in a reliable way	Appropriate statistical analysis used	Trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis of the trial	Quality Score (out of 13)	Notes
Magai et al. (2000)	Y	UC	Y	Y	Y	Y	UC	Y	Y	Y	Y	Y	UC	10 (good)	Limited to severe dementia and female patients only. In United States

Yes (Y), No (N), Unclear (UC) or Not/Applicable (NA)

For scoring, Y = 1, all others (N or UC) = 0

Scores 1 – 4 weak, 5 – 8 moderate, equal or greater than 9 good

3.4 Discussion

This systematic review identified three main themes from the thirteen papers. The first theme was the prevalence and prescribing patterns in the dementia group, with sub-themes including BPSD (mainly depression), psychotropic medications (mainly antidepressants), potentially inappropriate drugs, and the number of psychotropic medications. The second theme focused on comparisons between dementia patients and patients without dementia, with sub-themes covering depression and antidepressant use, and is discussed within the first theme to enable direct comparison. The third theme addressed factors influencing treatment, with sub-themes related to resident characteristics (age and gender), the use of antidepressants for conditions other than depression, and the identification and severity of depression and dementia.

3.4.1 Prevalence of depression

This review showed conflicting findings regarding the prevalence of depression among care home residents with dementia. These inconsistencies may be partly explained by the use of different diagnostic scales and varying cut-off points across studies. In Brimelow et al. (2019), the prevalence of depression was reported as 61% using the CSDD with a cut-off score of ≥9 to indicate depression. However, this study did not differentiate between residents with and without dementia when reporting depression prevalence; the differentiation was only made when analyzing psychotropic medication prescribing patterns, which may have influenced the reported prevalence. Another study using the CSDD with a lower cut-off score (≥7) found a prevalence of less than 30% in residential care and nursing homes residents with dementia (Gruber-Baldini et al. 2005).

The CSDD is specifically designed to detect depression in people with dementia (Alexopoulos et al. 1988; Burns et al. 2002; Dudas et al. 2018). In contrast, alternatives such as the GDS and the Hamilton Rating Scale may not be suitable for this population because they rely on self-reported symptoms and intact cognitive functioning, which is likely to be compromised in people with dementia (Burns et al. 2002).

Therefore, when studies combine residents with and without dementia or use different scales and cut-off points, the resulting prevalence estimates may vary widely.

When comparing depression prevalence between residents with and without dementia, Van Asch et al. (2013) and Midlöv et al. (2014) found no significant differences between the groups. Hiltunen et al. (2016) also did not report a statistically significant difference, although the prevalence of depression was higher in the dementia group (65.7%) compared to the non-dementia group (55.6%). These studies were conducted in different countries and provided evidence rated as moderate quality (quality scores 5 and 6). In Dutch care homes, no statistically significant differences in depression prevalence were reported between residents with and without dementia (Baller et al. 2010). However, depression in residents with dementia is more likely to remain underdiagnosed due to overlapping symptoms such as apathy and impaired cognition, as well as difficulties in communication (Kitching 2015; Almeida 2019; Alzheimer's Association 2023a). These factors may therefore partly explain the lower prevalence reported in some studies (Baller et al. 2010; Hiltunen et al. 2016). Nevertheless, depression is estimated to affect up to 40% of individuals with AD (Alzheimer's Association 2023a).

In community settings, depression prevalence was significantly higher in people with dementia (43%) compared to those without dementia (24%) ($p < 0.001$) (Bergdahl et al. 2011). This relationship may reflect neurodegenerative changes associated with dementia, alongside evidence that depression increases the risk of developing dementia (Yu et al. 2020; Alzheimer's Society 2024a; Paris et al. 2025). Nevertheless, not all individuals with depression develop dementia, and not all individuals with dementia experience depression (Alzheimer's Research UK 2024a)

To treat depression in residents with dementia, most guidelines, including NICE, recommend non-pharmacological interventions (psychological interventions) such as interpersonal management, CBT, and physical activity as first-line treatments for both mild and moderate depression and dementia, within the person's ability to engage (Guideline Adaptation Committee 2016; McMaster et al. 2017; National Institute for

Health and Care Excellence [NICE] 2018). Although psychological treatments can reduce depression and improve well-being in people with dementia (Orgeta et al. 2014), access to these interventions in care homes may be limited (Yoon et al. 2018; Brimelow et al. 2019; Baker et al. 2022). Difficulty of diagnosis of depression in dementia, assumptions regarding this population's ability to engage in CBT, increased pressure on staff, and the cost of these interventions may act as barriers to the implementation of non-pharmacological treatments (Gutzmann and Qazi 2015; Baker et al. 2022).

On the other hand, when non-pharmacological approaches have not been successful or when depression is severe, pharmacological treatments, antidepressants, could be used (Leong 2014; National Institute for Health and Care Excellence [NICE] 2018). SSRIs are the most widely studied and prescribed antidepressants due to their favourable safety profile (Herrmann and Lanctot 2007; Phan et al. 2019). Consistent with the findings of this review, and supported by several included studies, SSRIs were the most frequently prescribed antidepressants in care homes (Borson et al. 2002; Pitkala et al. 2004; Midlöv et al. 2014; Giebel et al. 2015; Brimelow et al. 2019).

3.4.2 Prevalence of Psychotropic medications (mainly antidepressants)

In this review, it was found that more than half of care home residents were prescribed at least one psychotropic medication (Nijk et al. 2009; McMaster et al. 2017; Brimelow et al. 2019), despite these drugs having only modest therapeutic effects and being associated with increased risks of mortality, stroke, impaired balance, cognitive decline, and falls (Sink et al. 2005; Galik 2013). In the literature, rates of psychotropic medication use in care homes range from 50% to 80% and the number of residents prescribed psychotropic medications is increasing (Lustenberger et al. 2011; Snowdon et al. 2011).

In a Norwegian study, Gulla et al. (2016) found that 73% of nursing home residents used psychotropic medications. Of these, 32% were taking only one agent, while 41% were on multiple psychotropic drugs (24% took two and 17% took three or more). The study

noted that the clinical indications for many of these medications were not recorded, which was identified as a limitation.

Also, Ruths et al. (2013) observed that the prevalence of psychotropic use in nursing homes has increased over time, rising from 58% in 1997 to 71% in 2009. Antidepressants were the most frequently prescribed medications, followed by antipsychotics (Ruths et al. 2013). Furthermore, the prevalence of use of two or three different psychotropic medications increased from 17% to 22%, and from 5% to 11%, respectively (Gulla et al. 2016). These findings highlight a growing reliance on psychotropic drugs in care homes despite their associated risks, raising concerns about prescribing practices.

3.4.2.1 Antidepressants

In the literature, the prevalence of antidepressant use in care homes has increased over time, while the use of antipsychotics has remained relatively unchanged (Ruths et al., 2013). Three of the reviewed studies reported a high prevalence of antidepressant use in care homes, with rates exceeding 50% (Bartels et al. 2003; Gruber-Baldini et al. 2005; Van Asch et al. 2013). In this review, the most commonly prescribed antidepressants for residents with dementia in care homes were SSRIs, including citalopram and sertraline, as well as the tetracyclic antidepressant mirtazapine (Borson et al. 2002; Pitkala et al. 2004; Midlöv et al. 2014; Giebel et al. 2015; Hiltunen et al. 2016; McMaster et al. 2017; Brimelow et al. 2019)

In England, a study focusing on residents with dementia found that 40.6% of residents were prescribed antidepressants, making them the most commonly used class of psychotropic medications in this population. The most frequently prescribed antidepressants were citalopram, mirtazapine, and sertraline (La Frenais et al. 2021). Similarly, a study conducted in Belgium reported that citalopram and sertraline were predominantly prescribed for depression in care home residents. However, this study did not focus on residents with dementia (Bourgeois et al. 2012b). Therefore, these

studies indicate that generally citalopram, sertraline and mirtazapine are widely used in care homes for managing depression in residents with dementia.

The effectiveness of antidepressants in dementia patients with depression is uncertain (Nelson and Devanand 2011; Leong 2014; Dudas et al. 2018). In this review, Magai et al. (2000) found no difference in effect between the placebo and treatment (using sertraline), but this study was limited only to female participants with late stages of dementia and a small sample (31 female residents). This is in line with other studies which have found that antidepressants are not effective in treating depression in people with dementia, and there is a risk of adverse drug events (Banerjee et al. 2013; An et al. 2017; Dudas et al. 2018; Lozupone et al. 2018; Zuidersma et al. 2019). This could be because the aetiology of depressive symptoms in older people with dementia may be different from the aetiology of such symptoms in individuals without dementia, possibly due to the damage caused by the dementia process and the resulting neuronal death (Lozupone et al. 2018). In addition, it has been found that antidepressants do not improve patients' health-related quality of life over time (Almohammed et al. 2022).

While the prevalence of antidepressant use in care homes rose in the early 2000s, as shown in **Figure 3.6**, the use of antidepressants in residents with or without dementia has fallen in more recent years, possibly due to increasing awareness among prescribers about the uncertain effectiveness of antidepressants in this population. Since the studies were conducted in different countries, other factors may also have influenced the findings (Borson et al. 2002; Van Asch et al. 2013; Midlöv et al. 2014; Hiltunen et al. 2016; Brimelow et al. 2019). However, while antidepressant prescriptions were higher in residents with dementia than those without dementia; only one study (Brimelow et al. 2019), with good evidence (quality score of 7 out of 9), found a significant difference between the groups. In another study, antidepressant use was three times higher in people with dementia than in those without dementia in a community setting (Laitinen et al. 2015). Thus, dementia might be a factor in patients receiving more antidepressant prescriptions, perhaps due to the challenges of managing BPSD in these patients.

In Midlöv et al. (2014), after 12 months of antidepressant treatment, 56% of residents remained depressed, with 90% of those treated with antidepressants still being on these antidepressants without a clear indication. This persistence rate is consistent with another study (Bergdahl et al. 2005) which shows that the persistence rate of antidepressants after a year is over 50%. This may suggest a lack of evaluation for discontinuing antidepressants, which might thus be prescribed for a long time or until the resident dies.

Several factors might contribute to the high prevalence of antidepressant use in residents with dementia in care homes. First, as described below, residents' age and gender might be relevant (section 3.4.4.1). Also, antidepressants are not only used for depression, but also for other purposes. In this review, antidepressants were found to be used for agitation, anxiety, insomnia, sleep disturbances and neuropathic pain (Kverno et al. 2008; Nijk et al. 2009; Van Asch et al. 2013; Midlöv et al. 2014; McMaster et al. 2017; Brimelow et al. 2019). These findings align with a Belgian nursing home study, which reported that among elderly residents, antidepressants were prescribed for depression (66%), insomnia (13%), anxiety (6%), and neuropathic pain (2%) (Bourgeois et al. 2012b). It has also been found that SSRIs may be effective in treating agitation in this population (Wilkins and Forester 2016). Furthermore, residents with dementia who had both depression and agitation were more likely to receive antidepressants than those with depression alone, indicating that mixed BPSD may contribute to higher antidepressant use (Bartels et al. 2003).

Moreover, antidepressants have the highest safety profile compared to other psychotropic medications to treat BPSD, so it has been noted that antidepressant prescriptions have risen significantly across the care home population (Riese 2015; Vasudev et al. 2015). Another factor to consider is that antidepressant prescriptions are not always made on the basis of depression diagnosis, but more frequently on the basis of registered nurses' judgments (Iden et al. 2011; Shah et al. 2012). Doctors stated that they depended on nurses' observations and rarely conducted systematic diagnostic work or follow-up on depressed patients (Iden et al. 2011). Also, antidepressants were frequently the only treatment available for symptoms, and patients were kept on them

even when staff were unsure whether they were effective (Iden et al. 2011). Care home staff also tend to request medication, and physicians are under some pressure to administer antidepressants (Iden et al. 2011). These factors could also contribute to the high percentage of antidepressant prescriptions.

On the other hand, it has been found that some residents were diagnosed with depression but not prescribed antidepressants. In the reviewed studies (Pitkala et al. 2004; Giebel et al. 2015; Hiltunen et al. 2016; McMaster et al. 2017; Brimelow et al. 2019), the prevalence of depression was higher than that of antidepressant use. This could be explained by a number of reasons. First, it is possible that residents were receiving non-pharmacological care (Hiltunen et al. 2016). Second, despite having a depression diagnosis in their medical records, residents might have stopped showing depressive symptoms. Finally, people might have taken antidepressants in the past but found them ineffective or discontinued them due to unpleasant side effects (Hiltunen et al. 2016).

Due to uncertainty about the effects of antidepressants in residents with depression and dementia (Dudas et al. 2018; Zuidersma et al. 2019; Costello et al. 2023), it might seem sensible to discontinue these medications. However, in the 'Discontinuation of antidepressants in people with dementia and neuropsychiatric symptoms' (DESEP study), people with dementia and neuropsychiatric symptoms who discontinued antidepressant medication experienced an increase in depressive symptoms compared to those who maintained treatment (Bergh et al. 2012). This might be because of the modest effect of antidepressant treatment; however, this study excluded residents with depression. Nonetheless, it has been recommended that psychotropic medication should be prescribed in low doses, monitoring the effects and evaluating the appropriateness of discontinuation regularly (Ballard et al. 2008; Phan et al. 2019).

3.4.3 Potentially Inappropriate Medication

According to Beers Criteria, the use of antipsychotics, BZD, and TCA is generally considered potentially inappropriate for older adults (American Geriatrics Society 2019;

Fixen 2019). It has been established that such antipsychotic medications, either atypical or conventional, are associated with an increased risk of stroke and mortality (Jennum et al. 2015). Also, BZD are associated with increased cognitive decline, falls, mortality, drowsiness, sedation, and substance dependence (Defrancesco et al. 2015). Thus, residents with dementia should not be prescribed BZD to treat insomnia, delirium, or agitation (Defrancesco et al. 2015).

The use of antipsychotics for agitation in residents with dementia should be limited, and they should only be used if the condition is severe or if residents are at risk of harming themselves or others (National Institute for Health and Care Excellence [NICE] 2018; American Geriatrics Society 2019). In the present review, Brimelow et al. (2019) reported that 54% of prescribed psychotropic medications were considered potentially inappropriate. Similarly, McMaster et al. (2017) found that 52.9% of those receiving psychotropic medications, and 30.5% of the total sample, were prescribed BZD. These findings raise concerns about the potential inappropriate use of psychotropic medications among residents with dementia in care homes.

The higher prevalence of BZD might be because resident's or family requests for prescriptions are likely to be met with enthusiasm by doctors, who believe that they improve quality of life (Flick et al. 2012; Brimelow et al. 2019). Also, GPs are unable to work with residents to identify and address the psychosocial reasons for sleep issues due to time constraints and dementia because patients with dementia cannot engage with such processes (Chang et al. 2009; Flick et al. 2012). Thus, medication is the easier option for prescribers. When nurses have high workloads, this leads to the avoidance of psychosocial treatments, which require time, and doctors feel more pressure to prescribe medication: this might result in the prescribing of inappropriate medications (van der Spek et al. 2018a).

3.4.4 Factors influencing the management of depression in people with dementia

3.4.4.1 Resident characteristics (age and gender)

Nijk et al. (2009) and McMaster et al. (2017) found that older adults aged over 80 (mean ages of 83 and 86 years, respectively) were less likely to be prescribed antidepressant, antipsychotic and anxiolytic medications compared to those under 80. Both studies were conducted in Australia and provided moderate to good evidence (quality scores of 5 and 7 out of 9, respectively). These findings align with other studies reporting that psychotropic drugs are prescribed more frequently to younger elderly residents (65 – 80 years) (Draper et al. 2001; Lövheim et al. 2006; Ruths et al. 2013; David et al. 2016b). Similarly, Richter et al. (2012) reported a negative association between increasing age and psychotropic prescribing. This pattern may be explained by age-related physiological changes, as elderly individuals respond differently to psychotropic medications and are more sensitive and susceptible to adverse reactions (Lindsey 2009; Yoon et al. 2018). The risk of medication-related adverse effects also increases considerably with age and with the number of medications taken (Lindsey 2009).
In contrast, Brimelow et al. (2019) found that care homes with the highest psychotropic prescribing rates had residents with a higher mean age (87.5 years) compared to homes with the lowest prescribing rates (mean age 83.7 years). However, this study did not directly compare individual residents aged above and below 80. This study was also conducted in Australia suggesting that location cannot explain the different findings. Although it provided good evidence (quality score of 7 out of 9), it had several limitations as it did not differentiate between residents with and without dementia, did not specify the types of psychotropic medications and lacked clarity on how prescribing rates were determined. Thus, there is some evidence that age affects psychotropic medication prescribing.

Regarding gender, the percentage of females in care homes was higher than that of males in this review. This is line with other studies (Lovheim et al. 2011; Ruths et al. 2013; Resnick et al. 2021). Howley (2020) reported that two-thirds of care-home residents were female and one-third were male. This could be attributed to the fact that

women generally live longer than men. In the UK, life expectancy at age 65 is an additional 20.8 years for females, compared to 18.3 years for males (Buxton 2024). Moreover, in care homes, the life expectancy for females aged 65 and over is significantly higher than for males in the same age group (Barrett 2023b). Also, mortality rates are higher for males than for females, which may be due to men being more likely to suffer from fatal diseases (e.g., cancer), whereas women are more often affected by non-fatal conditions (e.g., depression) (Zhao and Crimmins 2022; Patwardhan et al. 2024; Taylor 2024). All these factors might explain the higher percentage of female residents in care homes.

In this review, Nijk et al. (2009) found that females with dementia were significantly more likely to be prescribed antidepressants than males. However, two studies reported no gender difference in antidepressant prescribing (Hiltunen et al. 2016; McMaster et al. 2017). Other studies have also reported that both depression and antidepressant use were higher in females than in males in care homes (David et al. 2016b; Resnick et al. 2021). Finally, regardless of age and setting, females still have higher percentages of depression and antidepressant use than males (Almohammed et al. 2022).

Although the cause for this disparity in prevalence between men and women is not entirely understood, there are some theories that attempt to explain it. One of these hypotheses is gender bias, which suggests that doctors are more likely to diagnose depression in women and prescribe antidepressants to them than to men, even if both have similar scores on standardised measures for depression (Almohammed et al. 2022). Furthermore, women are more likely to disclose mental health problems and seek help from primary health care providers compared to males (Thornton 2019; Almohammed et al. 2022), who might find it difficult to communicate, particularly if they have severe depression and dementia. Also, menopause and hormonal changes in female hormones such as oestrogen might have a role in the higher prevalence of depression in women (Albert 2015; Alblooshi et al. 2023).

In addition, it has been found that, through the lifespan, females display more depression, anxiety, and verbal abuse; while males display more physical aggression

(Christiansen 2015; Björkqvist 2018; Tao et al. 2018). This might explain why females generally receive more antidepressants than males, and males receive more antipsychotics (Ruths et al. 2013).

3.4.4.2 Other factors

In addition to age and gender, the severity of depression and dementia might affect the prescribing of antidepressants. NICE has recommended that antidepressants should only be prescribed to patients with dementia if the depression is severe (National Institute for Health and Care Excellence [NICE] 2018). Determining the severity of the condition depends on the scale and cut-off point selected, which might then influence the identification of the disease, which can be under- or over-estimated.

Furthermore, location and staff training might also influence the identification and treatment of depression in residents with dementia. Giebel et al. (2015) found that Germany and Finland had the highest and lowest prevalence of depression, respectively, while the highest and lowest rates of antidepressant use were in Spain and Estonia, respectively. These variations might be attributed to differences in staff training, especially with a focus on dementia, knowledge, identification and management and sample size between each country. In Giebel et al. (2015), however, the settings with the highest and lowest prevalences of depression and antidepressant use were not clear in each country. In the literature, antidepressant prescriptions were found to be higher in people with dementia living in long-term care facilities compared to those living in the community (David et al. 2016b).

3.5 Limitations

This review originally intended to focus only on one type of dementia, Alzheimer's disease (AD), to limit variation and facilitate comparisons between studies. However, most of the articles did not specify the type of dementia, so this review is not specific to AD but instead covers all types of dementia. Also, drugs were identified from the BNF, which means that some drugs that have not been registered in the UK will have been missed. As the researcher doing this review is in the UK, the BNF was used. To help overcome this limitation, generic drug names were used, which would be common

across all countries. Although 10% of the identified articles were screened at full-text stage by a second reviewer, the majority of the review process and analysis was conducted by a single researcher. While the quality of 4 of the studies was identified as 'good', the remaining 9 studies had 'moderate' quality which will also have affected the findings and their interpretation. Also, 11 of the studies were cross-sectional, thus providing the lowest quality evidence (**Figure 3.1).** Furthermore, NICE guidelines (National Institute for Health and Care Excellence [NICE] 2018) recommend that antidepressants are only prescribed for severe depression and dementia. However, NICE guidelines only apply to the UK, while the studies included in this review were conducted outside the UK (primarily in Australia, Europe, and the United States) where guidelines may differ slightly. Therefore, the relevance of the NICE recommendations to these studies might be limited, and the findings of this review should be interpreted within the context of different international guidelines.

3.6 Conclusion

It is difficult to draw an overall conclusion due to conflicting data, different designs, different scales, and the fact that some articles were limited to patients with severe dementia. However, it can be concluded from this review that psychotropic medications (particularly antidepressants) are widely prescribed in care home settings and are more commonly used among residents with dementia. SSRIs, such as citalopram and sertraline, along with mirtazapine, appear to be more frequently prescribed than other antidepressants. There were also clear indications that residents' age and gender may influence prescribing patterns and potentially inappropriate psychotropic prescriptions were identified. These may reflect an over-reliance on these medications in care homes.

Building on the findings of this review, **Chapter 4** describes the investigation of the prescribing of psychotropic medications for care home residents in over 300 care homes in the UK using data from an electronic medicine management database.

Chapter 4: Demographic Characteristics of Care Home Residents and Their Medications - With a Focus on Psychotropic Medication (antidepressants, antipsychotics and anxiolytics) Prescribing

4.1 Introduction

Previous chapters highlighted that there are approximately 16,700 care homes in the UK, with around half a million people (441,479) living in these care homes (Berg 2025) (Sections 1.5 and 1.6). In the UK, most care home residents are aged 65 and over (82%). Of these residents, 56.4% are aged 85 years or older (Barrett 2023b; Storey 2023b). Women significantly outnumber men in this age group (65 years and over), with approximately 23 female residents for every 10 male residents (Storey 2023b). However men tend to be younger than women in care homes, with a higher percentage of males under the age of 85 (59%) compared to women aged 85 and above (63%) (Storey 2023b). The median age for male residents aged 65 and over is 82 years, while for females, it is 87 years (Storey 2023b). This difference might be due to women generally living longer than men, with a life expectancy of an additional 20.8 years at age 65 in the UK, compared to 18.3 years for men (Buxton 2024). Among care home residents aged 65 and over, women also tend to have a higher life expectancy than men (Barrett 2023b). As discussed in the previous chapter (**Chapter 3: Systematic Review**), all included studies indicated that residents had a mean age equal to or greater than 80 years, and the proportion of females was higher than that of males thus supporting life expectancy as a main underlying explanation. The typical care home resident is a woman over the age of 85 with six or more clinical diagnoses, taking multiple medications, and experiencing physical disabilities, mental health challenges, and cognitive impairments (Gordon et al. 2013; British Geriatrics Society 2020) .

In care homes, polypharmacy (usually defined as taking five or more medications) has a major impact on residents (Jokanovic et al. 2015). It is usually associated with potentially inappropriate prescribing and adverse events such as falls and fractures, particularly amongst people in care homes taking psychotropic medications (Jokanovic et al. 2015; Izza et al. 2020; Albertsen et al. 2022).

As mentioned previously (Section 1.4), psychotropic medications affect behaviour, perception, and mood. They are used to treat a range of mental disorders, such as

depression and psychosis. (Lindsey 2009; Resnick et al. 2023; World Health Organization 2024b). Many people with dementia in care homes, up to 90%, experience BPSD, which are commonly treated with psychotropic medications (including antidepressants, antipsychotics, and anxiolytics), although National Institute for Health and Care Excellence (NICE) guidelines recommend treating BPSD primarily with non-pharmacological interventions (National Institute for Health and Care Excellence [NICE] 2018; Almutairi et al. 2021; Alzheimer's Association 2024).

The prescribing of psychotropic medications in care homes is increasing, with two-thirds of residents being administered psychotropic medications, although they have only modest efficacy and serious adverse events, such as stroke and increased mortality associated with antipsychotics (Ruths et al. 2013; Szczepura et al. 2016; Brimelow et al. 2019; Grill et al. 2021). In Australia, 84.3% of care home residents were prescribed these psychotropic medications (Almutairi et al. 2021). In Norway, from 1997 to 2009, the rate of prescribing of psychotropic medications in care homes increased from 57.6% to 70% (Ruths et al. 2013). Among the three classes of psychotropic medications (antidepressants, antipsychotics, and anxiolytics), antidepressants are the most commonly prescribed in care homes, followed by antipsychotics, with anxiolytics being the least commonly prescribed (Hosia-Randell and Pitkälä 2005; Ruths et al. 2013; van der Spek et al. 2018b).

Gender and age may influence the prescribing of psychotropic medications, although there are limited studies on this topic. In Norwegian nursing homes, psychotropic medications were more likely to be used by women (except for antipsychotics), residents who were under 80 years old, and residents who lived in special care units (Ruths et al. 2013). Antidepressant use is associated with female residents (Ruths et al. 2013; Grill et al. 2021). Also, older women with AD have been shown to use more psychotropic medications than older men with the same condition among community-dwelling older adults (Moga et al. 2017).

In **Chapter 3**, two studies included in the systematic review found that older individuals (over 80) with dementia were less likely to be prescribed psychotropic medications (Nijk

et al. 2009; McMaster et al. 2017). Also, it was found that females were significantly more likely to be prescribed antidepressants than males in care homes (Nijk et al. 2009; Midlöv et al. 2014; Hiltunen et al. 2016). Thus, gender and age seem to impact the prescribing of psychotropic medications.

These psychotropic medications, which are commonly used to treat BPSD, are frequently prescribed in care homes and, as their use often increases over time, this may lead to inappropriate prescribing. There is a need to explore how these medications are prescribed in UK care homes, and how such prescribing is influenced by age and gender.

4.1.1 Aim

This chapter aims to determine the extent of medication prescribing, with a focus on psychotropic medications (antidepressants, antipsychotics, and anxiolytics) in UK care homes, and to explore how this is affected by demographic characteristics of the residents across 310 care homes, using data from electronic medication administration record software.

4.1.2 Objectives

1. To identify the demographic characteristics of residents included in the study dataset.
2. To identify the medications prescribed to care home residents, with a particular focus on psychotropic medications.
3. To explore the associations of gender and age group with the prescribing of psychotropic medications.

4.2 Methods

The secondary data used in this study were collected using the electronic medicine administration record (eMAR) system from Invatech Health Ltd (https://invatechhealth.com/). The eMAR system is a digital system that utilises barcode technology to identify medications prescribed, access medicine

administration records, record administration attempts, and perform safety checks. The dispensing pharmacy, using an associated medicines dispensing system, adds unique barcodes to medication labels that are particular to the resident and medication combination. At the home, the resident's unique barcode in their room is linked to the barcode on their medication labels. Barcode scanning with the portable eMAR device then checks that the medication is correct for that resident and records the administration. Thus, this system collects prescribing data, administration data, and errors that might occur.

Secondary cross-sectional, pseudonymised data for residents in 310 care homes across the UK were collected by eMAR from 2014 to 2020 and deposited in a Structured Query Language (SQL) database. SQL is a programming language that is used to perform operations such as data extraction, organisation, manipulation, and management in relational databases (Kanade 2022). The long timeframe was used because it was able to provide a large sample size and thus enable the detection of significant associations and the sample was further divided into categories to provide more detailed results. Moreover, the eMAR data from 2014 to 2020 was cleaned up by a previous researcher (Headley 2021), who categorised resident titles to gender and converted date of birth into age. This eMAR system has been used in care homes since 2014. Medications were classified using the British National Formulary (BNF) (National Institute for Health and Care Excellence [NICE] 2022b).

4.2.1 Inclusion criteria

- All residents who did not have archived records.
- Gender was clearly categorised as either male or female.
- Residents aged ages 65–105 were included.
- Medication status was active.

Inclusion criteria consisted of all residents who were not archived, and were stratified by gender as either male, female or other, based on their titles. For example, if the title

was “Mr” it was assumed that the resident was male, while if it was “Mrs” or “Ms” it was assumed that they were female, but if, for example, the title was “Dr”, it was unclear whether the resident was male or female, so they were categorised as “other”. In this current study, only those who were classified as male or female (using resident titles as a proxy for gender) were included, while 22 residents with unknown gender, who could not be categorised, were excluded. This was because the association between gender and prescribing was an important objective in the current study. As the focus of this study was on older adults, only residents aged between 65 and 105 were included. Age was calculated by subtracting the year of birth from 2020. The data included 650 residents aged below 65 years and 211 residents aged over 105 who were excluded. There was a concern that ages over 105 might result from data entry errors and thus be inaccurate. If the date of birth is not recorded, the system will automatically populate this field with the year 1900, giving an age of 120 years at the time of data collection, which was very unlikely.

In terms of age classification, individuals in late adulthood are generally categorised as youngest-old (ages 65–84), oldest-old (ages 85–99), and centenarians for those 100 and above (Lally 2019). In this current study, a cutoff of 85 years old was set, categorising those who were below 85 (65–84 years) as youngest-old and those who were 85 and older (85–105 years) as oldest-old. As such, each group comprised approximately a 20-year age range for comparison. The centenarian age group was not included as there were too few residents aged 100 or more to allow for meaningful statistical analysis.

In addition, active medication prescribing status was included, and any medications that had been stopped or were inactive were excluded. This was to ensure that the prescribing was active and residents were still in care homes when the sample was taken (between 30 October 2014 and 27 October 2020), so any resident with active medications were included (**Figure 4.1**). All residents who met the four criteria were included. All medications were classified using the BNF according to the body system where they have their main effect, (e.g. antidepressant medications under Nervous System). Residents who were taking psychotropic medications were further separated by their medication (BNF classes: antidepressants, antipsychotics, and anxiolytics).

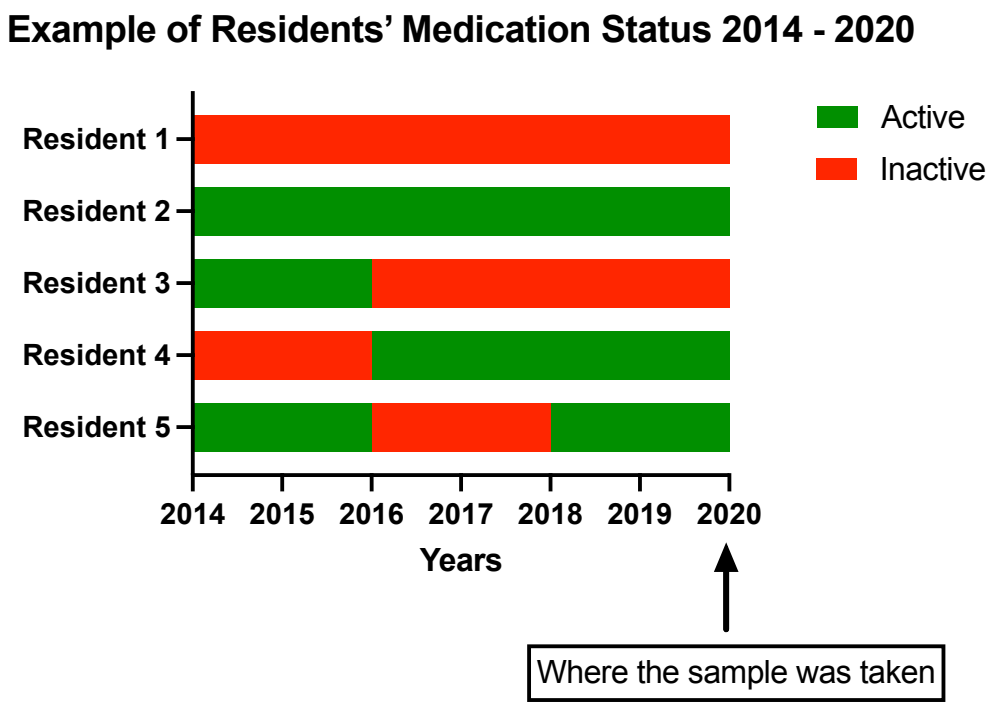


***Figure 4.1**: Residents' medication timelines (2014–2020) showing examples of active (residents 2, 4 and 5) and inactive (residents 1 and 3) status.*

Figure 4.1 shows a timeline (2014–2020) of medication status for five different example residents, showing which were included or excluded from the study. Since it is not possible to determine the exact timeline of medication usage or the specific dates when residents left the care home or died, the focus was placed on whether the medication status was active or inactive throughout the period. It was assumed that the last recorded entry for medication status reflected the status at the end of the study. Any medication that remained active until the end of the period was considered Active, while medications that were stopped before the end of the study were considered Stopped. To capture residents who were in the care home at the time when the sample was taken, only residents with active medications at the end of the period were included.

Examples:

- Resident 1 – No active medication during the entire period (e.g. not being prescribed or following a non-medication approach); they were excluded.
- Resident 2 – Medication status was active throughout the period (being prescribed the entire time); they were included.

- Resident 3 – Medication status was initially active but then stopped and remained stopped until the end of the period; they were excluded.
- Resident 4 – Medication was initially not prescribed but was later prescribed and remained active until the end of the period; they were included.
- Resident 5 – Medication status was initially active, then stopped, but became active again before the end of the period; they were included (although the exact dates of stopping and restarting are unknown due to issues with data entry).

Therefore, residents 2, 4, and 5 were included but residents 1 and 3 were excluded, and medication status was used as a proxy for determining whether the resident was still in the care home at the time when the sample was taken.

4.2.2 Database Tables

The database comprised four primary tables including data on the residents, their medications, administration records, and dispensing records. The residents' table was for demographic information, the medicine table was for prescribed medication information, the administration table was for information on administration timing and success, and the dispensing table was about the process of medicines supply. Residents' pseudonymised IDs served as primary keys, enabling the linking of tables. A filtered table was created from the residents' table by converting residents' titles to gender (male, female, other) and year of birth to age. For this study focusing on prescribing data, only the tables with data on the residents and their medications were used.

Since this study was based on secondary data, the analysis was limited by the availability of the information (**Table 4.1).** For example, only prescribed medication and administration data were available, while clinical and diagnosis data were not. Importantly, it was not possible to identify when medications were started and stopped, nor the type of care home involved.

Table 4.1: *Available and unavailable information in the database*

	Available	Unavailable
Data	- Prescribed medication and administration data.	- Clinical and diagnosis data.
Residents	- Resident ID (primary key of the resident table). - Year of birth (used to calculate age by subtracting from 2020). - Title (used as a proxy for gender). - Archive status (yes vs no), so anyone without an archive record was included.	- Ethnicity. - Date when the resident was archived, left or died.
Medication	- Resident medication ID. - Generic name and dose. - BNF category. - Medication status (active vs stopped), so anyone with an active status was included.	- Due to data quality issues with recording information, the exact start and stop dates were inaccurate because if any field was left blank, it was populated by default as 01/01/1900.
Care home	- Care home ID (number).	- Type of care home (nursing vs residential) was not available. - From a safeguarding perspective, in the data sharing agreement, geographical locations were not provided. - Specialist nature of care home (e.g., dementia care) was not available.

4.2.3 Creation of Dataset

SQL was used to retrieve data from the database by performing queries. A dataset was created by linking the residents' table (mainly the filtered table) with the patients' medication table based on the residents' IDs in both tables using an inner join. This included matching residents' ID in both tables with the required fields. Thus, a dataset table was created according to the inclusion criteria, which helped system performance.

As the focus of the study was on psychotropic medications, residents on psychotropic medications were extracted after the initial characterisation of residents on all medications. They were identified based on their medication and their data was imported to an Excel sheet and SPSS for further analysis. Then, a table was created with each class of psychotropic medication to extract residents who were only on one type without combination with other tables. Combining these tables provided data on the combination of psychotropic medications. This meant that a table was created for antidepressants, which included all types of antidepressants; a table for antipsychotics; and a table for anxiolytics. Then, data on each type of psychotropic medication alone was extracted, and finally, data on combinations of psychotropic medications were extracted (see Appendix 2).

4.2.3.1 Technical Terms

To merge the tables, the residents' IDs from both tables were used via an inner join clause (W3schools 2023b), This included only residents with matching IDs in both tables (for example, residents in both the "Residents" table and the "Medications" table). To eliminate duplicates, the DISTINCT function was applied, ensuring that each resident's ID appeared only once (W3schools 2023d). For instance, the query "SELECT DISTINCT ID from the antidepressants table" was used to retrieve unique residents without duplicates who had been prescribed antidepressant medications. The WHERE clause was then used to filter the data according to specific criteria, while the IN function allowed for selecting multiple values within this clause, such as identifying residents who were on psychotropic medications (either antidepressants, antipsychotics, or anxiolytics). Conversely, the NOT function helped to exclude certain results, such as identifying residents who were on antidepressant medications but not on antipsychotics.

Also, the ORDER BY clause was employed to sort the results in ascending or descending order, improving clarity and to make the table easy to follow. Aggregation functions such as count, minimum (MIN), maximum (MAX), and average (AVG) were used to perform calculations on the data and return single values (Integrate.io 2023). For example, the AVG function was used to calculate the average age of residents. The

GROUP BY clause was used to group data by specific values and was often applied with aggregation functions (W3schools 2023a). Therefore, organising these queries was critical to obtaining accurate results. Once the necessary tables were merged and all queries were performed, the next step was quality assurance.

4.2.3.2 Quality Assurance

Quality assurance procedures were carried out after performing queries and combining tables. For instance, when the Antidepressants table was created, a random verification of the first, middle, and last rows was conducted to ensure that the residents listed were on antidepressant medications. Also, a random selection of resident ID numbers from the Antidepressants table was checked against the Patient Medication table to confirm that these individuals had been prescribed antidepressants.

Moreover, most prior studies (as seen in the systematic review in **Chapter 3**) have indicated that there are more females than males in care homes, which was consistent with the data in this current study, thus demonstrating face validity and suggesting that queries had been performed appropriately. Once the necessary tables had been created, merged, and the required data extracted, data was exported to Excel and SPSS for further analysis.

4.2.4 Ethics

The data used in this thesis was provided by Invatech Health Ltd. in a pseudonymised form. It was stored on a Cardiff University-owned SQL server 2016 database (Microsoft) on an encrypted, access-controlled server pursuant to a data-sharing agreement between Cardiff University and Invatech Health Ltd. The database was viewed remotely utilising a Virtual Private Network (VPN) connection and unique login credentials. Access to the pseudonymisation key was retained solely by Invatech Health Ltd., and Cardiff University was not provided access. The data-sharing agreement included additional safeguards against re-identification of individuals, such as password-protected access being granted to a limited number of named individuals; and restrictions on combining data with other individual-level data sources. The secondary

data described in this thesis therefore did not require ethical approval because it was pseudonymised data, was not publicly available, and did not cause harm or impact negatively on specific groups or individuals (Research Integrity and Ethics Committee 2021).

4.2.5 Statistical Analysis

SPSS was used to analyse the data. Descriptive analysis was used to describe the population and Pearson's Chi-square test was used to test associations between gender, age groups, and different types of psychotropics (Laerd Statistics 2016b; Giganc 2019).

Phi and Cramer's V were used to measure strength of association. Phi is more suitable for dichotomous variables (2*2 tables) while Cramer's V is more suitable for tables larger than 2*2 (Laerd Statistics 2016b; Giganc 2019). Cramer's V was used to measure strength of association. It ranges in value from 0 to 1, where 0 indicates no association and 1 indicates complete association. Cohen (1988) suggested that a value of 0.1 indicates a weak or small association, 0.3 indicates a medium association, and 0.5 and above indicates a strong or large association (Cohen 1988; Laerd Statistics 2016b).

In order to determine which specific types of psychotropic medication had statistically significant associations, follow-up (post-hoc) analysis was conducted, using a Bonferroni correction to avoid familywise error, one or more Type 1 errors across a collection of statistical analysis performed on the same sample of data (Armstrong 2014; Giganc 2019).

Since the data were not normally distributed, a non-parametric test (the Mann-Whitney U test) was used to determine whether there were differences between genders (male versus female) or age groups (youngest-old versus oldest-old) in the number of medications prescribed (Laerd Statistics 2016c). This difference was tested via the Mann-Whitney U test, by using mean-rank, which ranks all values from low to high and

then compares the mean rank to assess the significance of any differences observed (Laerd Statistics 2016c).

4.3 Results

4.3.1 Residents

In total, 9,060 residents living in 310 care homes across the UK were included, with a mean age of 86.16 years (SD 7.93). The largest groups were female (71%) and oldest-old residents (62%) (**Figure 4.2A and 4.2B**). In the male group, 51% of residents were classed as youngest-old and 49% as oldest-old, whereas in the female group, 32% were classed as youngest-old and 68% as oldest-old (**Figure 4.2C**).

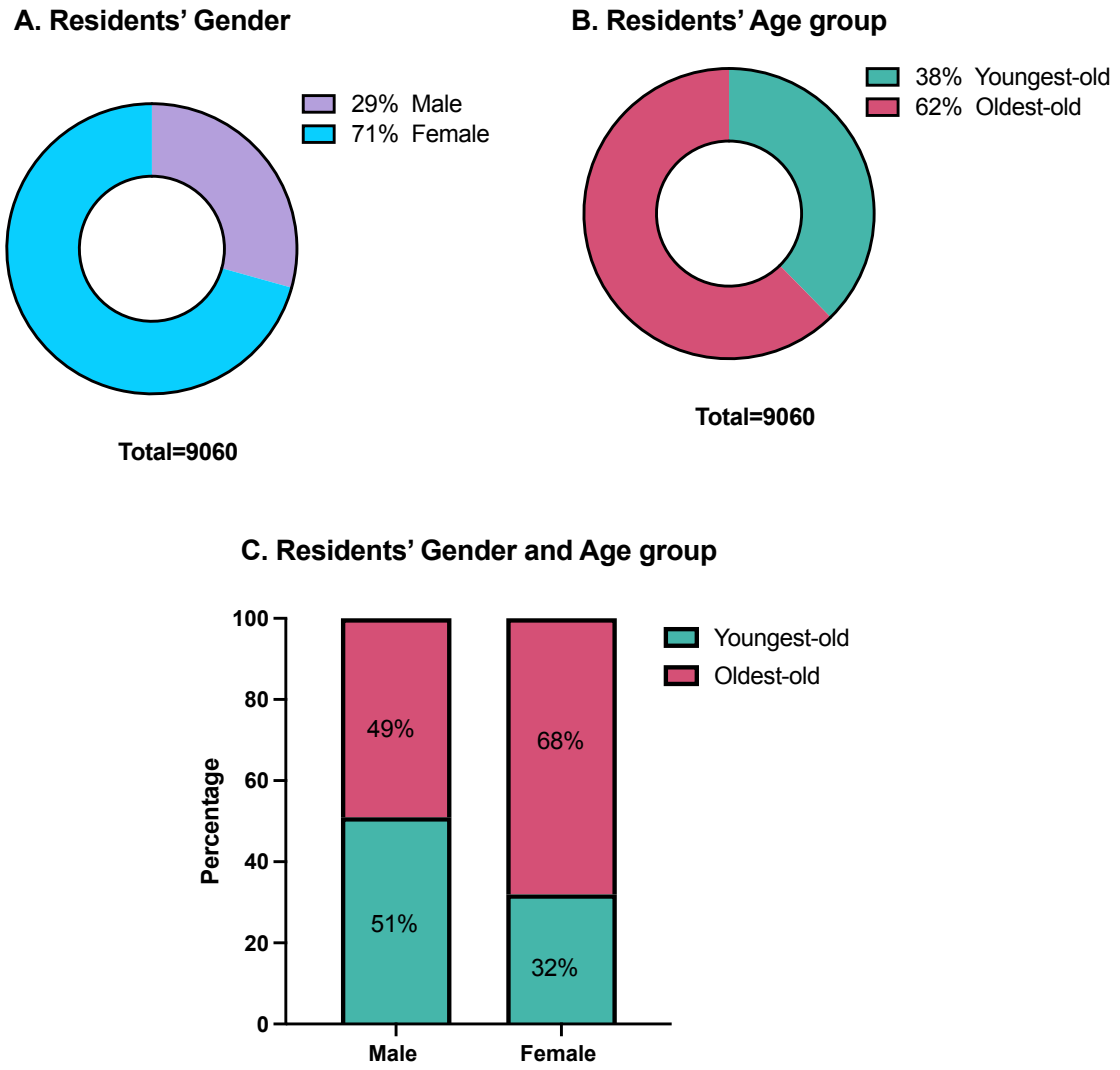


***Figure 4.2**: Residents' Demographic Characteristics. Figures 4.2A and B show the total number of all residents living in the care homes grouped according to gender and age, respectively, with more female and oldest-old residents. The youngest-old group was defined as residents aged 65–84, while the oldest-old were aged 85–105. Figure 4.2C shows the distribution of age by gender, with the largest age group in males being the youngest-old (51%) while in females it was the oldest-old (68%).*

4.3.2 Active Medications

There were 93,884 active medications prescribed for the 9,060 residents. The top three classes were for the nervous (28%), gastrointestinal (19%), and cardiovascular (14%) systems (**Figure 4.3A**). Since the nervous system was the highest class, it was further broken down into different sub-classes (**Figure 4.3B**). In total, 26,084 active nervous system medications were prescribed for 8,629 residents. The largest class among nervous system medications was analgesics (44%) (66.5% non-opioid vs 33.5% opioid analgesics), with 92% of the non-opioid class being paracetamol. The second largest class was antidepressants (17%) (**Figure 4.3B**).

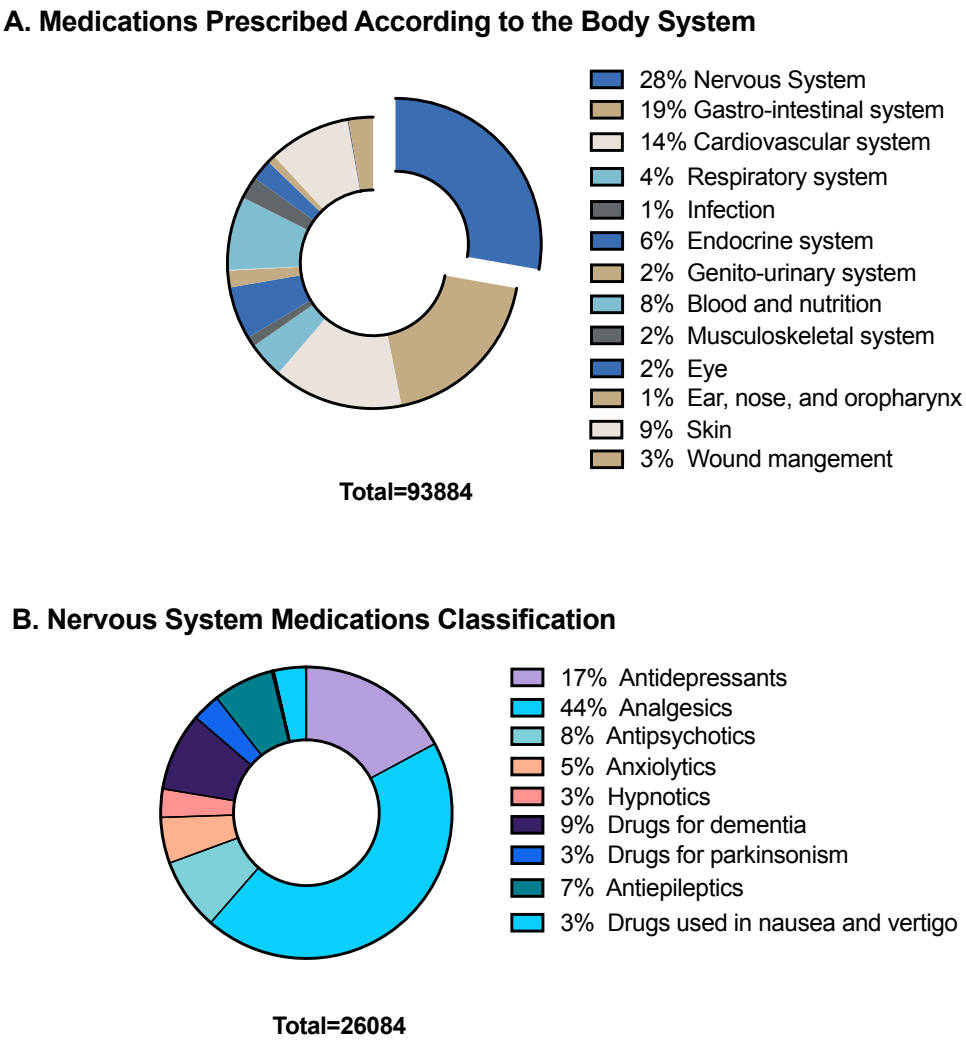


***Figure 4.3**: Percentage of different classes of medications prescribed in the care homes. Figure 4.3A shows that 93,884 medications were prescribed in the care homes, and the highest class was nervous system medications (28%). In Figure 4.3B, nervous system medications were broken down into sub-classes, with the top classes prescribed being analgesics (44%), followed by antidepressants (17%).*

The mean number of active medications per resident was 10.36 (SD 4.9), with a spread of 1–45. The mean number of active medications in males (10.85) and the youngest-old (10.77) were higher than in females (10.16) and the oldest-old (10.12), respectively (**Table 4.2** and **Figure 4.4**). The number of medications for males (**mean rank = 4793.76**) was significantly higher than for females (mean rank = 4421.26) (**Mann-Whitney U test, p value<0.001, Z score = -6.186**) **(Table 4.3)**. Also, the number of medications for the youngest-old group (**mean rank = 4730.98**) was significantly higher than for the oldest-

old group (mean rank = 4409) (**Mann-Whitney U test, p < 0.001, Z score = -5.684**) (**Table 4.3**).

***Table 4.2**: Descriptive analysis of all medications prescribed.*

		Number of residents (%)	Mean [a] (SD)	95% CI for mean	Median	Min	Max	Range	Sum
All Residents		9,060	10.36 (4.95)	(10.26 – 10.46)	10	1	45	44	93,884
Gender group	Male	2,657 (29%)	10.85 (5.083)	(10.65 - 11.04)	10	1	45	44	28,817
	Female	6,403 (71%)	10.16 (4.881)	(10.04 – 10.28)	10	1	44	43	65,067
Age group	Youngest-old	3,412 (38%)	10.77 (5.148)	(10.59 – 10.94)	10	1	45	44	36,738
	Oldest-old	5,648 (62%)	10.12 (4.811)	(9.99 – 10.24)	10	1	44	43	57,146

[a]Note that the descriptive statistics for the number of medications are not affected by the number of residents.

***Table 4.3**: Mann-Whitney U tests comparing the number of medications in the gender and age groups*

		Mean Rank
Gender	Male	**4,793.76***
	Female	4,421.26
	Z-score	-6.186
	p-value	**<0.001**
Age group	Youngest- old	**4,730.98***
	Oldest- old	4,409.39
	Z-score	-5.684
	p-value	**< 0.001**

**Bold numbers indicate statistically significant data.*

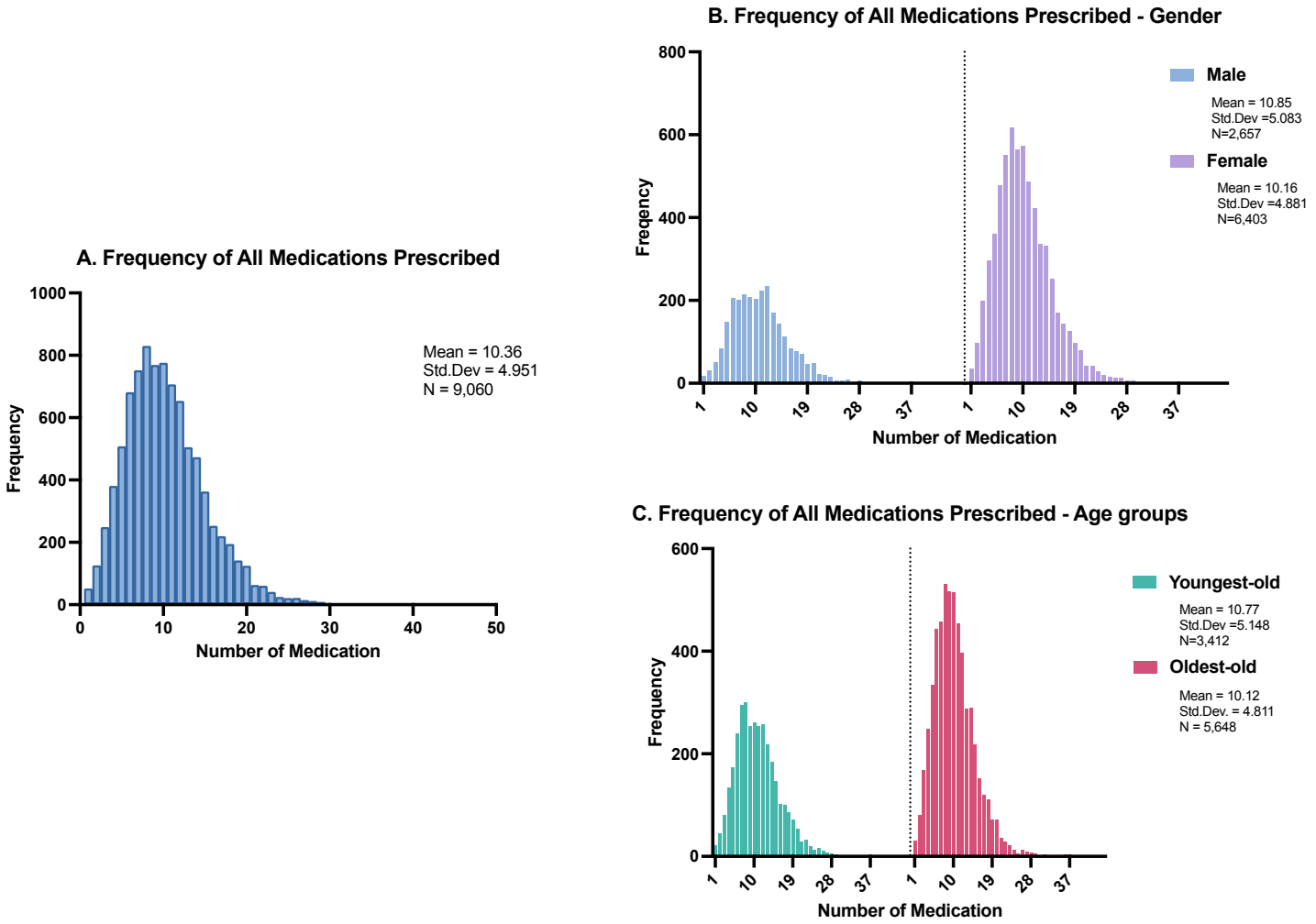


Figure 4.4: *Frequency plots of all medications prescribed. In Figure 4.4A, the mean number of all medications per resident was 10.36. In Figures 4.4B and 4.4C, the frequency of all medications prescribed was classified according to gender and age groups, respectively: the mean number of medications in males and the youngest-old were higher than in females and the oldest-old, respectively. Dotted lines separate the groups.*

In more detailed analysis, male and female groups were broken down further by age into youngest-old and oldest-old (**Table 4.4**). The mean number of active medications and the median in the youngest-old group for both males (mean=11.11, median=11) and females (mean=10.54, median=10) were higher than in the oldest-old group for males (mean=10.56, median=10) and females (mean=9.99, median=9), respectively (**Table 4.4**).

In **Table 4.5**, the Mann-Whitney U tests showed that the mean ranks of active medications in the youngest-old group for both males (1,369.10) and females (3,326.11) were significantly higher than in the oldest-old group for males (1,286.7) and females (3,143.59). In **Table 4.6**, the Mann-Whitney U tests showed that the mean ranks of active medications in the male group for both youngest-old (1,777.91) and oldest-old (2,979.10) residents were significantly higher than in the female group for youngest-old (1,659) and oldest-old (2,778.55) residents. Thus, youngest-old residents within each gender were prescribed significantly higher numbers of medications than oldest-old residents (**Table 4.5**). Also, within each age group, males prescribed significantly higher numbers of medications than females (**Table 4.6**).

***Table 4.4**: Descriptive analysis of all medications prescribed by gender and age group.*

Group		Number of residents (%)	Mean (SD)	95% CI for mean	Median	Min	Max	Range	Sum
Male	Youngest-old	1,363 (51%)	**11.11 (5.191)**	(10.83–11.39)	**11**	1	45	44	15,149
	Oldest-old	1,294 (49%)	10.56 (4.952)	(10.29–10.83)	10	1	39	38	13,668
Female	Youngest-old	2,049 (32%)	**10.54 (5.108)**	(10.31–10.75)	**10**	1	44	43	21,589
	Oldest-old	4,354 (68%)	9.99 (4.761)	(9.84 – 10.12)	9	1	44	43	43,478

***Table 4.5**: Mann-Whitney U tests comparing the number of medications in the 'youngest-old' versus the 'oldest-old' group within each gender.*

		Mean Rank
Male	Youngest-old	**1,369.10***
	Oldest-old	1,286.76
	Z-score	-2.771
	p-value	**0.006***
Female	Youngest-old	**3,326.11***
	Oldest-old	3,143.59
	Z-score	-3.694
	p-value	**<0.001***

**Bold numbers indicate statistically significant data*

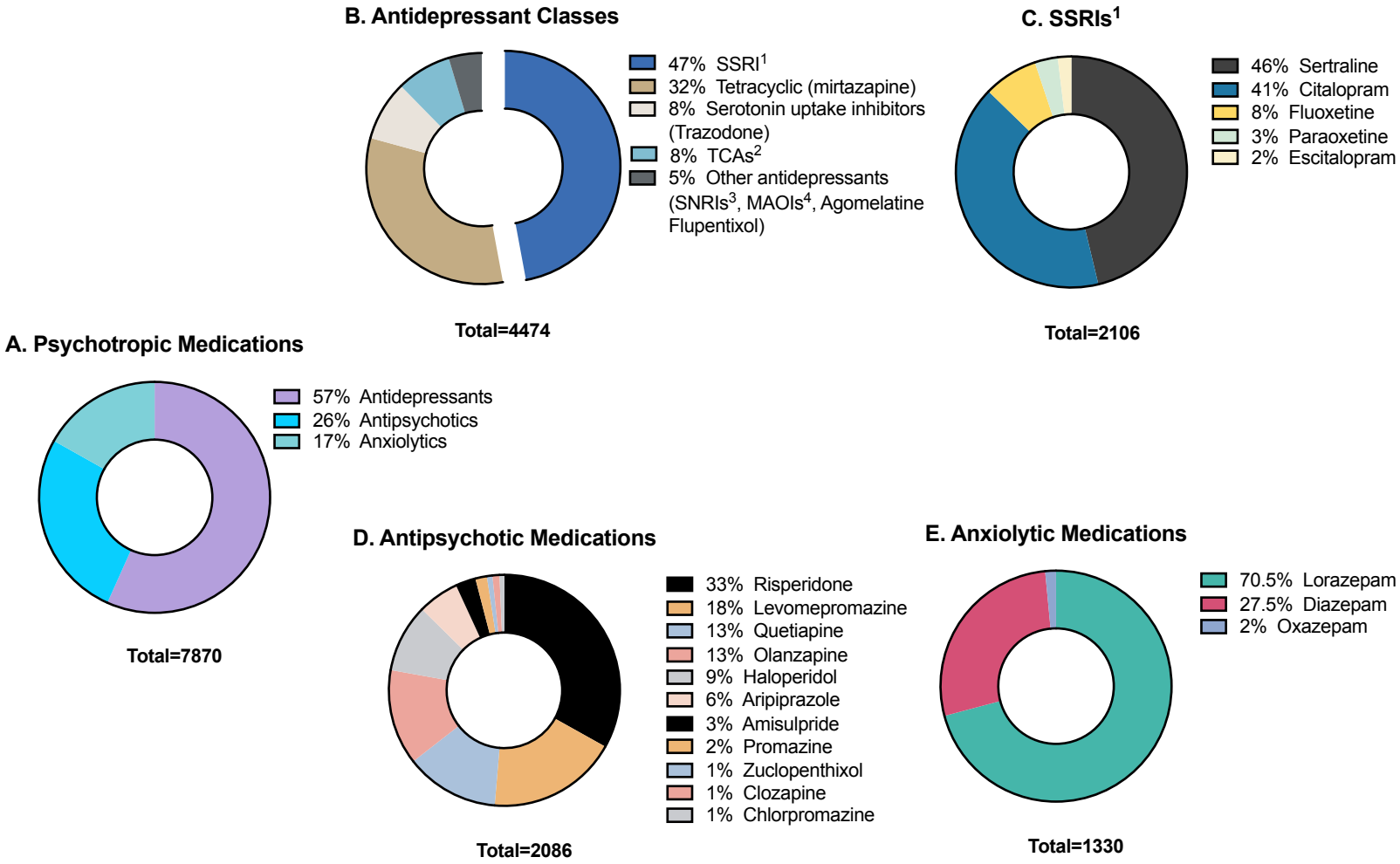
***Table 4.6**: Mann-Whitney U tests comparing the number of medications in males versus females within each age group*

		Mean Rank
Youngest-old	Male	**1,777.91***
	Female	1,659.00
	Z-score	-3.46
	p-value	**<0.001***
Oldest-old	Male	**2,979.10***
	Female	2,778.55
	Z-score	-3.894
	p-value	**<0.001***

**Bold numbers indicate statistically significant data*

4.3.3 Psychotropic Medications

The focus of the present study is on psychotropic medications that can be used to treat BPSD in patients with dementia (antidepressants, antipsychotics, and anxiolytics), so these drug classes were evaluated separately. There were 7,870 active psychotropic medications (30% of all nervous system medications and 8.4% of total medications) prescribed for 5,123 residents (**Figure 4.5A, Table 4.7**). Antidepressants made up 57% of the psychotropic medications prescribed, with Selective Serotonin Reuptake Inhibitors (SSRIs) (47%) and tetracyclic drugs (mirtazapine: 32%) being the most frequently prescribed antidepressant classes (**Figure 4.5A** and **4.5B**). The most frequently prescribed SSRI was sertraline at 46%, followed by citalopram at 41% (**Figure 4.5C**). Risperidone (33%) was the most frequently prescribed antipsychotic drug, and lorazepam (70.5%) was the most frequently prescribed anxiolytic drug (**Figure 4.5D** and **4.5E**).



[1]SSRIs = Selective Serotonin Reuptake Inhibitors, [2]TCAs = Tricyclic Antidepressants, [3]SNRIs = Serotonin and Norepinephrine Reuptake Inhibitors, [4]MAOIs = Monoamine Oxidase Inhibitors

Figure 4.5: *Percentage of psychotropic medications and individual drug classes prescribed to care home residents. In Figure 4.5A, of all psychotropic medications, antidepressants were the highest class prescribed (57%). In Figure 4.5B, of antidepressant classes, SSRIs were the highest (47%), and in Figure 4.5C, SSRIs were broken down into separate drugs, with sertraline (46%) and citalopram (41%) being the top SSRIs prescribed. Figures 4.5D and 4.5E show the percentage of each drug prescribed in the antipsychotic and anxiolytic classes, respectively. Risperidone (33%) was the most frequently prescribed antipsychotic drug, and lorazepam (70.5%) was the most frequently prescribed anxiolytic drug.*

4.3.3.1 Residents on Psychotropic Medications

In total, 56.5% of all residents were prescribed psychotropic medications. Most residents on psychotropic medications were female (69.5%) and in the oldest-old (55.5%) age group, higher than males (30.5%) and the youngest-old age group (44.5%), respectively. In the male group, the youngest-old age group (58%) was higher than oldest-old males (42%). Conversely, in the female group, the oldest-old age group (61%) was higher than the youngest-old females (39%). This pattern was also observed when considering all residents including both those prescribed psychotropic medications and those not prescribed such drugs (n = 9,060) **(Table 4.7).**

***Table 4.7**: Demographic and descriptive data for residents prescribed psychotropic medications (n = 5,123) compared with all residents (n = 9,060).*

	Residents on psychotropic medications (n= 5,123)	All residents (n = 9,060)
Gender		
Male	1,564 / 5,123 (30.5%)	1,564 / 9,060 (17.3%) *
Female	3,559 / 5,123 (69.5%)	3,559 / 9,060 (39.3%) *
Age group		
Youngest-old (65 – 84)	2,279 / 5,123 (44.5%)	2,279 / 9,060 (25.2%) *
Oldest-old (85 – 105)	2,844 / 5,123 (55.5%)	2,844 / 9,060 (31.4%) *
Males by age group		
Youngest-old males	903 / 1,564 (58%)	903 / 2,657 (34%)
Oldest-old males	661 / 1,564 (42%)	661 / 2,657 (25%)
Females by age group		
Youngest-old females	1,376 / 3,559 (39%)	1,376 / 6,403 (21.5%)
Oldest-old females	2,183 / 3,559 (61%)	2,183 / 6,403 (34%)
Psychotropic medication		
Yes	5123 (100%)	5123 (56.5%)
No	0	3937 (43.5%)
Residents on each type of psychotropic alone and in combination (n=5123)		
Antidepressants alone	2,493 (48.7%)	2,493 (27.5%)
Antipsychotics alone	708 (13.8%)	708 (7.8%)
Anxiolytics alone	332 (6.5%)	332 (3.7%)
Antidepressants + Antipsychotics	635 (12.4%)	635 (7.0%)
Antidepressants + Anxiolytics	464 (9.1%)	464 (5.1%)
Antidepressants + Antipsychotics + Anxiolytics	276 (5.4%)	276 (3.0%)
Antipsychotics + Anxiolytics	215 (4.2%)	215 (2.4%)
Total residents on one class alone	3,533 (68.9%)	3,533 (38.9%)
Total residents on combinations	1,590 (31.1%)	1,590 (17.55%)
Residents on at least one type of psychotropic (n=6989) * **		
Total antidepressants	3,868 (55.3%)	3,868 (43%)
Total antipsychotics	1,834 (26.2%)	1,834 (20.2%)
Total anxiolytics	1,287 (18.4%)	1,287 (14.2%)
Number of medications	**Psychotropic medications n = 7870**	**All medications n = 93884**
Antidepressants	4,474 (57%)	4,474 (4.8%)
Antipsychotics	2,066 (26%)	2,066 (2.2%)
Anxiolytics	1,330 (17%)	1,330 (1.4%)

* Specific gender or age prescribed psychotropic medications among all residents (e.g. 17.3% of male residents were prescribed psychotropic medications.

***This shows the number of residents prescribed at least one type of psychotropic medication. Since some residents were prescribed multiple psychotropic medications and counted in more than one class, the total number of residents on psychotropics (6,989) includes duplicates.

Over half of all residents (56.5%: 5,123 of 9060 residents) were prescribed **psychotropic medication**, whereas **43.5% of residents** were not, and this was statistically significant (**Chi-square test, p-value < 0.001).** There was a statistically significant association between gender and psychotropic medication use (**Chi-square test, p-value = 0.004**); however, this association was weak, as indicated by a Phi value of 0.03. Males (58.9%) were slightly but significantly more likely to be prescribed psychotropic medication compared to females (55.6%) **(Table 4.8 and Figure 4.6).**

Table 4.8: *Residents' genders and psychotropic medications prescribed*

			Psychotropic medications		Total	p-value
			Yes	No		<0.001
All Residents			5,123 (56.5%)	3,937 (43.5%)	9060	
Gender	Male	Count	1,564	1,093	2657	0.004
		% within total of all male residents (n=2,657)*	58.90%	41.10%		
		% within psychotropic medications (n=5123 for Yes, n=3,937 for No)**	30.50%	27.80%		
		% within total of all residents (n=9,060)**	17.30%	12.10%		
		Adjusted residual	2.9	-2.9		
	Female	Count	3,559	2,844	6403	
		% within total of all female residents (n=6,403)	55.60%	44.40%		
		% within psychotropic medications (n=5,123 for Yes, n=3,937 for No)	69.50%	72.20%		
		% within total of all residents (n=9,060)	39.30%	31.40%		
		Adjusted residual	-2.9	2.9		

Note: There was a significant association between psychotropic medication use and gender. Males (58.9%) were slightly more likely to be prescribed psychotropic medication compared to females (55.6%). In addition, most residents in the psychotropic medication population (n=5,123) and the total resident population (n=9,060) were female.
*This percentage is calculated based on the total number of male residents to avoid the influence of the large number of female residents (i.e., to control for gender imbalance).
**This percentage is calculated based on the total number of residents on psychotropic medication and the total resident population, regardless of gender. Therefore, it is influenced by the high number of female residents.

Also, there was a statistically significant association between age group and psychotropic medication use (**Chi-square test, p-value < 0.001, Phi = 0.161**). The youngest-old (66.8%) were more likely to be prescribed psychotropic medications compared to the oldest-old (50.4%) **(Table 4.9 and Figure 4.6).**

***Table 4.9**: Residents' age groups and psychotropic medications prescribed*

			Psychotropic medications		Total	p-value
			Yes	No		<0.001
All Residents			5,123 (56.5%)	3,937 (43.5%)	9,060	
Age group	Youngest-old (65-84)	Count	2,279	1,133	3,412	<0.001
		% within total of all youngest-old (n=3,412)*	66.80%	33.20%	100.00%	
		% within Psychotropic medications (n=5,123 for Yes, n=3,937 for No)**	44.50%	28.80%		
		% within total of all residents (n=9,060)**	25.20%	12.50%		
		Adjusted Residual	15.3	-15.3		
	Oldest-old (85-105)	Count	2844	2804	5648	
		% within total of all oldest-old (n=5,648)	50.40%	49.60%	100.00%	
		% within psychotropic medications (n=5,123 for Yes, n=3,937 for No)	55.50%	71.20%		
		% within total of all residents (n=9,060)	31.40%	30.90%		
		Adjusted Residual	-15.3	15.3		

Note: There was a significant association between psychotropic medication use and age group. Residents in the youngest-old group (66.8%) were more likely to be prescribed psychotropic medication compared to those in the oldest-old group (50.4%). In addition, most residents in the psychotropic medication population (n = 5,123) and the total resident population (n = 9,060) were in the oldest-old group.

*This percentage is calculated based on the total number of youngest-old residents to avoid the influence of the number of oldest-old residents (i.e., to control for age group imbalance).

**This percentage is calculated based on the total number of residents on psychotropic medication and the total resident population, regardless of age group. Therefore, it is influenced by the high number of oldest-old residents.

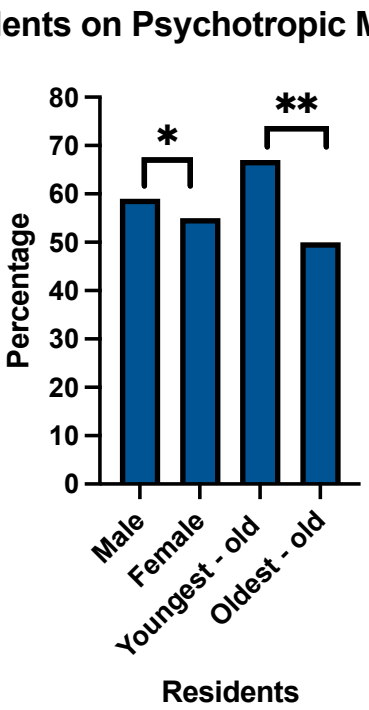


Figure 4.6: *Residents on psychotropic medications. Male and youngest-old residents were more likely to be prescribed psychotropic medications compared to female and oldest-old residents, respectively. *p-value < 0.01, **p-value < 0.001*

Furthermore, after dividing each gender into age groups, youngest-old males (66.3%) and youngest-old females (67.2%) were more likely to be prescribed psychotropic medications compared to oldest-old males (51.1%) and oldest-old females (50.1%), respectively (**Chi-square test for both genders, p-value < 0.001, Phi for male = 0.15, Phi for female =0.16**). (**Tables 4.10 and 4.11**).

Table 4.10: *Male residents' age groups and psychotropic medications prescribed*

			Psychotropic medications		Total	p-value (psychotropic medications and age group in males)
			Yes	No		<0.001
All Male Residents			1,564 (59%)	1,093 (41%)	2,657	
Age group	Youngest-old males	Count	903	460	1,363	<0.001
		% within total of all youngest-old males (n=1,363)*	66.30%	33.70%		
		% within psychotropic medications in males (n=1,564 for Yes, n=1,093 for No)**	57.70%	42.10%		
		% within total of all male residents (n=2,657)**	34.00%	17.30%		
		Adjusted Residual	7.9	-7.9		
	Oldest-old males	Count	661	633	1294	
		% within total of all oldest-old males (n=1,294)	51.10%	48.90%		
		% within psychotropic medications in males (n=1,564 for Yes, n=1,093 for No)	42.30%	57.90%		
		% within total of all male residents (n=2,657)	24.90%	23.80%		
		Adjusted Residual	-7.9	7.9		

Note: There was a significant association between psychotropic medication use and age group in males. Youngest-old males (66.3%) were more likely to be prescribed psychotropic medication compared to oldest-old males (51.1%). In addition, most male residents on psychotropic medications (n = 1,564) and in the total male population (n = 2,657) belonged to the youngest-old group.

*This percentage is calculated based on the total number of youngest-old males (n=1363).

**This percentage is calculated based on the total number of male residents on psychotropic medications and the total male resident population.

Table 4.11 *Female residents' age groups and psychotropic medications prescribed*

			Psychotropic medications		Total	p-value (psychotropic medications and age group in females)
			Yes	No		<0. 001
All Female Residents			3,559 (56%)	2,844 (44%)	6,403	
Age	Youngest-old females	Count	1,376	673	2,049	<0.001
		% within total of all youngest-old females (n=2,049)*	67.20%	32.80%		
		% within psychotropic medications in females (n=3,559 for Yes, n=2,844 for No)**	38.70%	23.70%		
		% within total of all female residents (n=6,403)**	21.50%	10.50%		
		Adjusted Residual	12.8	-12.8		
	Oldest-old females	Count	2183	2171	4354	
		% within total of all oldest-old females (n=4,354)	50.10%	49.90%		
		% within psychotropic medications in females (n=3,559 for Yes, n=2,844 for No)	61.30%	76.30%		
		% within total of all female residents (n=6,403)	34.10%	33.90%		
		Adjusted Residual	-12.8	12.8		

Note: There was a significant association between psychotropic medication use and age group in females. Youngest-old females (67.2%) were more likely to be prescribed psychotropic medications compared to oldest-old females (50.1%). In addition, most female residents on psychotropic medications (n = 3,559) and in the total female population (n = 6,403) belonged to the oldest-old group.

*This percentage is calculated based on the total number of youngest-old females (n=2,049).

**This percentage is calculated based on the total number of female residents on psychotropic medication and the total female resident population.

4.3.3.2 Residents on Different Classes of Psychotropic Medications

Most of the residents on psychotropic medications were on one type of psychotropic (69%) – mainly antidepressants alone (48.7%), followed by antipsychotics alone (13.8%), and finally anxiolytics alone (6.5%), while 31.1% of residents were on combinations of these psychotropics, of which “antidepressants plus antipsychotics” was the most frequently prescribed combination (12.4%) (**Table 4.7**). This pattern was also observed among the overall residents’ population **(Table 4.7).**

In addition, it was observed that the number of residents on antidepressants alone or in combination (55.3%) was the highest among residents on at least one psychotropic class, followed by antipsychotics (26.2%), and finally anxiolytics (18.4%) (**Table 4.7).** Since some residents were prescribed multiple psychotropic medication and were therefore counted in more than one class, the total number of residents on psychotropic medications (6,989) includes duplicates, whereas the actual number of unique residents is 5,123. For example, a resident on antidepressants + antipsychotics was counted twice in residents on at least antidepressants and residents on at least antipsychotics. To avoid double-counting residents and thus distorting the results, the analysis therefore focused on each psychotropic class separately. For example, residents prescribed antidepressants alone were not compared with those on "antidepressants + antipsychotics," "antidepressants + anxiolytics," or "antidepressants + antipsychotics + anxiolytics."

Among residents prescribed psychotropic medications, there was a significant association between gender and different types and combinations of psychotropics (**Chi-square, $p < 0.001$**), although this association was weak because Cramer’s V value was 0.11.

The prescribing of antidepressants alone (50.7% vs 44%) and the combination of antidepressants plus anxiolytics (9.9% vs 7.1%) were significantly higher in females than in males of all ages among those on psychotropic medications. In contrast, the

prescribing of antipsychotics alone (16% vs 12.8%) and the combination of antipsychotics plus anxiolytics (6.5% vs 3.2%) were significantly higher in males than in females of all ages (**Table 4.12** and **Figure 4.7A**).

Among all residents, including those not prescribed psychotropic medications, there was also a significant association between gender and the types and combinations of psychotropics (**Chi-square, $p < 0.001$, Cramer's V = 0.089**). Females (44.4%) were significantly more likely than males (41.1%) not to be prescribed psychotropic medications. However, males (9.4%) were significantly more likely than females (7.1%) to be prescribed antipsychotics alone, the combination of antidepressants plus antipsychotics plus anxiolytics (3.8% vs 2.7%), and the combination of antipsychotics plus anxiolytics (3.8% vs 1.8%) (**Table 4.13).**

***Table 4.12**: Residents' gender with different types and combinations of psychotropic medications – males versus females among residents on psychotropic medications*

		AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Male	Count	688	251	112	199	111	102	101	1,564
	% within males on psychotropics (n=1,564)	44.0%	16.0%	7.20%	12.70%	7.10%	6.50%	6.50%	100%
	Adjusted Residual	-4.44	3.06	1.31	0.47	-3.24	2.38	5.35	
Female	Count	1,805	457	220	436	353	174	114	3,559
	% within females on psychotropics (n=3,559)	50.70%	12.80%	6.20%	12.30%	9.90%	4.90%	3.20%	100%
	Adjusted Residual	4.44	-3.06	-1.31	-0.47	3.24	-2.38	-5.35	
Significance	Adj. p-value*	< 0.001	< 0.05	1.0	1.0	< 0.01	0.12	<0.001	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between males and females for each type of psychotropic medication.

***Table 4.13**: Residents' gender with different types and combinations of psychotropic medications – males versus females among all residents*

		No Psychotropics	AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Males	Count	1,093	688	251	112	199	111	102	101	2,657
	% within all males (n=2,657)	41.10%	25.90%	9.40%	4.20%	7.50%	4.20%	3.80%	3.80%	100%
	Adjusted Residual	-2.9	-2.2	3.7	1.8	1.2	-2.6	2.8	5.8	
Females	Count	2,844	1,805	457	220	436	353	174	114	6,403
	% within all females (n=6,403)	44.40%	28.20%	7.10%	3.40%	6.80%	5.50%	2.70%	1.80%	100%
	Adjusted Residual	2.9	2.2	-3.7	-1.8	-1.2	2.6	-2.8	-5.8	
Significance	Adj. p-value*	<0.05	0.23	<0.01	0.57	1.0	0.08	<0.05	<0.001	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between males and females for each type of psychotropic medication.

Among residents prescribed psychotropic medications, there was a significant association between age groups and different types and combinations of psychotropics, regardless of gender (**Chi-square, p < 0.001**). However, this association was weak, with a Cramer's V score of 0.156. The prescribing of antidepressants alone (53.4% vs 42.7%) and anxiolytics alone (7.5% vs 5.2%) was significantly higher in the oldest-old age group compared to the youngest-old group among those on psychotropic medications. In contrast, the combination of antidepressants plus antipsychotics (14.5% vs 10.7%), antidepressants plus antipsychotics plus anxiolytics (8.1% vs 3.2%) and antipsychotics plus anxiolytics (5.3% vs 3.3%) was significantly higher in the youngest-old age group (**Table 4.14** and **Figure 4.7B**)

Among all residents, including those not prescribed psychotropic medications, there was also a significant association between age groups and the different types and combinations of psychotropics (**Chi-square, p < 0.001, Cramer's V = 0.201**). The oldest-old (49.6%) were significantly more likely than the youngest-old (33.2%) not to be prescribed psychotropic medications. However, the youngest-old were significantly more likely to be prescribed antipsychotics alone (9.6% vs 6.5%) and all combinations of classes – antidepressants plus antipsychotics (9.7% vs 5.4%), antidepressants plus anxiolytics (6.2% vs 4.5%), antidepressants plus antipsychotics plus anxiolytics (5.4% vs 1.6%) and antipsychotics plus anxiolytics (3.5% vs 1.7%) – than the oldest-old (**Table 4.15**).

***Table 4.14**: Residents' age group with different types and combinations of psychotropic medications – youngest-old versus oldest-old among residents on psychotropic medications*

		AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old	Count	974	339	119	330	212	184	121	2,279
	% within youngest-old on psychotropics (n=2279)	42.70%	14.90%	5.20%	14.50%	9.30%	8.10%	5.30%	100%
	Adjusted Residual	-7.6	2	-3.28	4.05	0.55	7.62	3.56	
Oldest-old	Count	1,519	369	213	305	252	92	94	2,844
	% within oldest-old on psychotropics (n=2844)	53.40%	13.0%	7.50%	10.70%	8.90%	3.20%	3.30%	100%
	Adjusted Residual	7.6	-2	3.3	-4.1	-0.5	-7.6	-3.6	
Significance	Adj. p-value*	<0.001	0.35	<0.01	<0.001	1.0	<0.001	<0.01	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old and oldest-old for each type of psychotropic medication.

***Table 4.15**: Residents' age group with different types and combinations of psychotropic medications – youngest-old versus oldest-old among all residents*

		No Psychotropics	AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old	Count	1,133	974	339	119	330	212	184	121	3,412
	% within all youngest-old (n=3,412)	33.20%	28.50%	9.90%	3.50%	9.70%	6.20%	5.40%	3.50%	100%
	Adjusted Residual	-15.3	1.7	5.8	-0.7	7.7	3.7	10.1	5.7	
Oldest-old	Count	2,804	1,519	369	213	305	252	92	94	5,648
	% within all oldest-old (n=5,648)	49.60%	26.90%	6.50%	3.80%	5.40%	4.50%	1.60%	1.70%	100.%
	Adjusted Residual	15.3	-1.7	-5.8	0.7	-7.7	-3.7	-10.1	-5.7	
Significance	Adj. p-value*	<0.001	0.7	<0.001	1.0	<0.001	<0.01	<0.001	<0.001	

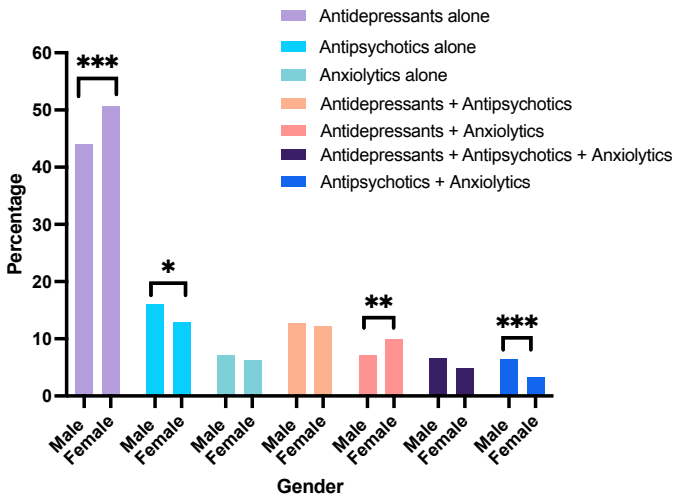
[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

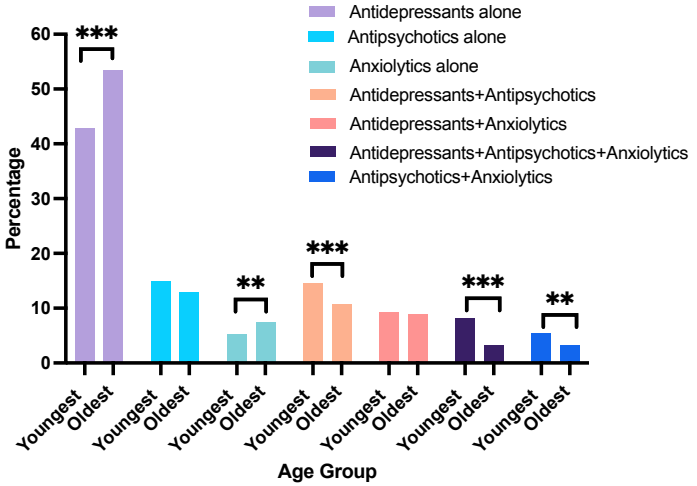
Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old and oldest-old for each type of psychotropic medication.

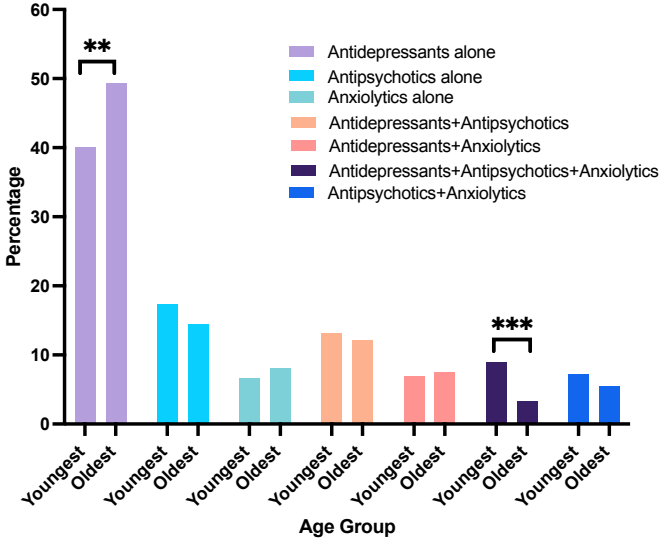
A. Percentage of Gender with Psychotropic Medications



B. Percentage of Age Group with Psychotropic Medications



C. Percentage of Age Group with Psychotropic Medications - Male



D. Percentage of Age Group with Psychotropic Medications - Female

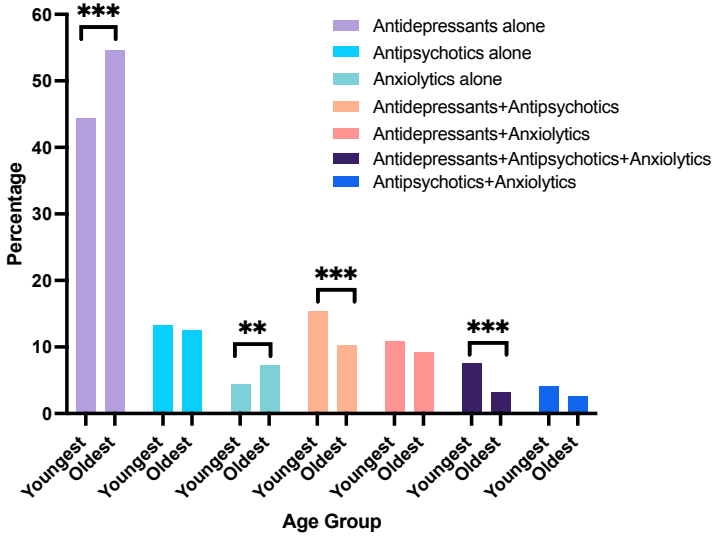


Figure 4.7: *Percentage of residents on different types and combinations of psychotropics among residents on psychotropics (n=5,123). Figure 4.7A shows that antidepressants alone and antidepressants + anxiolytics were significantly higher in females, while antipsychotics alone and antipsychotics + anxiolytics were significantly higher in males. Figure 4.7B indicates that antidepressants alone and anxiolytics alone were significantly higher in the oldest-old, while all combinations were significantly higher in the youngest-old, except antidepressants + anxiolytics. In more depth, in Figure 4.7C the male group was broken down to reveal that antidepressants alone were significantly higher in the oldest males. In contrast, antidepressants + antipsychotics + anxiolytics were significantly higher in the youngest males. In Figure 4.7D, the female group was broken down to reveal that antidepressants alone and anxiolytics alone were significantly higher in the oldest females. In contrast, antidepressants + antipsychotics and antidepressants + antipsychotics + anxiolytics were significantly higher in the youngest females. *adj. p-value <0.05, **adj. p-value <0.01, ***adj. p-value <0.001.*

Among residents on psychotropic medications, within each gender, the oldest-old were significantly more likely to be prescribed antidepressants alone than the youngest-old in both males (49.3% vs 40.1%) and females (54.6% vs 44.5%). In contrast, the youngest-old were significantly more likely to be prescribed the combination of antidepressants plus antipsychotics plus anxiolytics than the oldest-old in both genders (males 8.9% vs 3.3%, females 7.6% vs 3.2%) **(Tables 4.16 and 4.18; Figures 4.7C and 4.7D**).

Moreover, oldest-old females (7.3%) were significantly more likely to be prescribed anxiolytics alone compared to youngest-old females (4.4%) among residents on psychotropic medications. On the other hand, youngest-old females (15.3%) were significantly more likely to be prescribed antidepressants plus antipsychotics compared to oldest-old females (10.3%) among residents on psychotropic medications (**Table 4.18; Figure 4.7D).**

Among all residents, including those not prescribed psychotropic medications, within each gender, the oldest-old were significantly more likely not to be prescribed psychotropic medications compared to the youngest-old in both males (48.9% vs 33.7%) and females (49.9% vs 32.8%). However, youngest-old males (11.4 vs 7.3%) and females (8.9% vs 6.3%) were significantly more likely to be prescribed antipsychotics alone, as well as the combination of antidepressants plus antipsychotics plus anxiolytics (males 5.9% vs 1.7%, females 5.1% vs 1.6%), compared to oldest-old males and females among all residents **(Tables 4.17 and 4.19**). Furthermore, youngest-old females were significantly more likely to be prescribed combinations of antidepressants plus antipsychotics (10.3% vs 5.2%), antidepressants plus anxiolytics (7.3% vs 4.7%), and antipsychotics plus anxiolytics (2.7% vs 1.3%) than oldest-old females (**Table 4.19)**.

***Table 4.16**: Residents' gender and age group with different types and combinations of psychotropic medications – youngest-old males versus oldest-old males among residents on psychotropic medications*

		AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old males	Count	362	156	59	119	62	80	65	903
	% within youngest-old males on psychotropics (n = 903)	40.10%	17.30%	6.50%	13.20%	6.90%	8.90%	7.20%	100%
	Adjusted Residual	-3.6	1.5	-1.1	0.6	-0.4	4.4	1.4	
Oldest-old males	Count	326	95	53	80	49	22	36	661
	% within oldest-old males on psychotropics (n = 661)	49.30%	14.40%	8.0%	12.10%	7.40%	3.30%	5.40%	100%
	Adjusted Residual	3.6	-1.5	1.1	-0.6	0.4	-4.4	-1.4	
Significance	Adj. p-value*	<0.01	0.85	1.0	1.0	1.0	<0.001	1.0	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old males and oldest-old males for each type of psychotropic medication.

Table 4.17: *Residents' gender and age group with different types and combinations of psychotropic medications – youngest-old males versus oldest-old males among all residents*

		No Psychotropics	AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old males	Count	460	362	156	59	119	62	80	65	1,363
	% within all youngest-old males (n = 1,363)	33.70%	26.60%	11.40%	4.30%	8.70%	4.50%	5.90%	4.80%	100%
	Adjusted Residual	-7.9	0.8	3.6	0.3	2.5	1	5.6	2.7	
Oldest-old males	Count	633	326	95	53	80	49	22	36	1,294
	% within all oldest-old males (n = 1,249)	48.90%	25.20%	7.30%	4.10%	6.20%	3.80%	1.70%	2.80%	100.%
	Adjusted Residual	7.9	-0.8	-3.6	-0.3	-2.5	-1	-5.6	-2.7	
Significance	Adj. p-value*	<0.001	1.0	0.01	1.0	0.1	1.0	<0.001	0.06	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old males and oldest-old males for each type of psychotropic medication.

***Table 4.18**: Residents' gender and age group with different types and combinations of psychotropic medications – youngest-old females versus oldest-old females among residents on psychotropic medications*

		AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old Females	Count	612	183	60	211	150	104	56	1,376
	% within youngest-old females on psychotropics (n = 1,376)	44.50%	13.30%	4.40%	15.30%	10.90%	7.60%	4.10%	100%
	Adjusted Residual	-5.9	0.6	-3.6	4.5	1.6	5.9	2.3	
Oldest-old Females	Count	1193	274	160	225	203	70	58	2,183
	% within oldest-old females on psychotropics (n = 2,183)	54.60%	12.60%	7.30%	10.30%	9.30%	3.20%	2.70%	100%
	Adjusted Residual	5.9	-0.6	3.6	-4.5	-1.6	-5.9	-2.3	
Significance	Adj. p-value*	<0.001	1.0	<0.01	<0.001	0.83	<0.001	0.14	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old females vs oldest-old females for each type of psychotropic medication.

Table 4.19: *Residents' gender and age group with different types and combinations of psychotropic medications – youngest-old females versus oldest-old females among all residents*

		No Psychotropics	AntiDep[1] alone	AntiPsy[2] alone	Anxio[3] alone	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio	Total
Youngest-old females	Count	673	612	183	60	211	150	104	56	2,049
	% within all youngest-old females (n = 2049)	32.80%	29.90%	8.90%	2.90%	10.30%	7.30%	5.10%	2.70%	100%
	Adjusted Residual	-12.8	2	3.8	-1.5	7.6	4.3	8	4	
Oldest-old females	Count	2,171	1,193	274	160	225	203	70	58	4,354
	% within all oldest-old females (n = 4354)	49.90%	27.40%	6.30%	3.70%	5.20%	4.70%	1.60%	1.30%	100%
	Adjusted Residual	12.8	-2	-3.8	1.5	-7.6	-4.3	-8	-4	
Significance	Adj. p-value*	<0.001	0.36	<0.01	1.0	<0.001	<0.001	<0.001	<0.001	

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher percentage and statistically significant data.

Green shading indicates a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction) between youngest-old females vs oldest-old females for each type of psychotropic medication.

4.3.3.3 Number of active psychotropic medications

In total, 7,870 active psychotropic medications were administered to 5,123 residents, representing 56.6% of all residents, as mentioned previously (section 4.3.4.1). These residents were typically prescribed only one psychotropic agent, with a mean number of 1.54 active psychotropic medications per resident (SD = 0.794) (**Table 4.20, Figure 4.8A**). Descriptively, the mean number of psychotropic medications in males (1.57) was higher than females (1.52) and was also higher in the youngest-old (1.67) than in the oldest-old (1.43) residents (**Table 4.20, Figure 4.8B, Figure 4.8C**). These comparisons are descriptive, and statistical significance testing is presented in a subsequent table **(Table 4.26**).

***Table 4.20**: Descriptive analysis of psychotropic medications prescribed*

Group		Residents on Psychotropics (n=5,123)	Mean[a] (SD)	95% CI for mean	Median	Min	Max	Range	Sum of psychotropic medications
Residents on psychotropic medications		5,123 (100%)	1.54 (0.794)	(1.51 – 1.55)	1	1	6	5	7,870
Gender group	Males	1,564 (30.5%)	1.57 (0.80)	(1.53 – 1.61)	1	1	5	4	2,450
	Females	3,559 (69.5%)	1.52 (0.791)	(1.49 – 1.54)	1	1	6	5	5,420
Age group	Youngest-old	2,279 (44.5%)	1.67 (0.868)	(1.63 – 1.70)	1	1	6	5	3,803
	Oldest-old	2,844 (55.5%)	1.43 (0.711)	(1.40 – 1.46)	1	1	6	5	4,067

[a]Note that the descriptive statistics for the number of psychotropic medications are not affected by the number of residents.

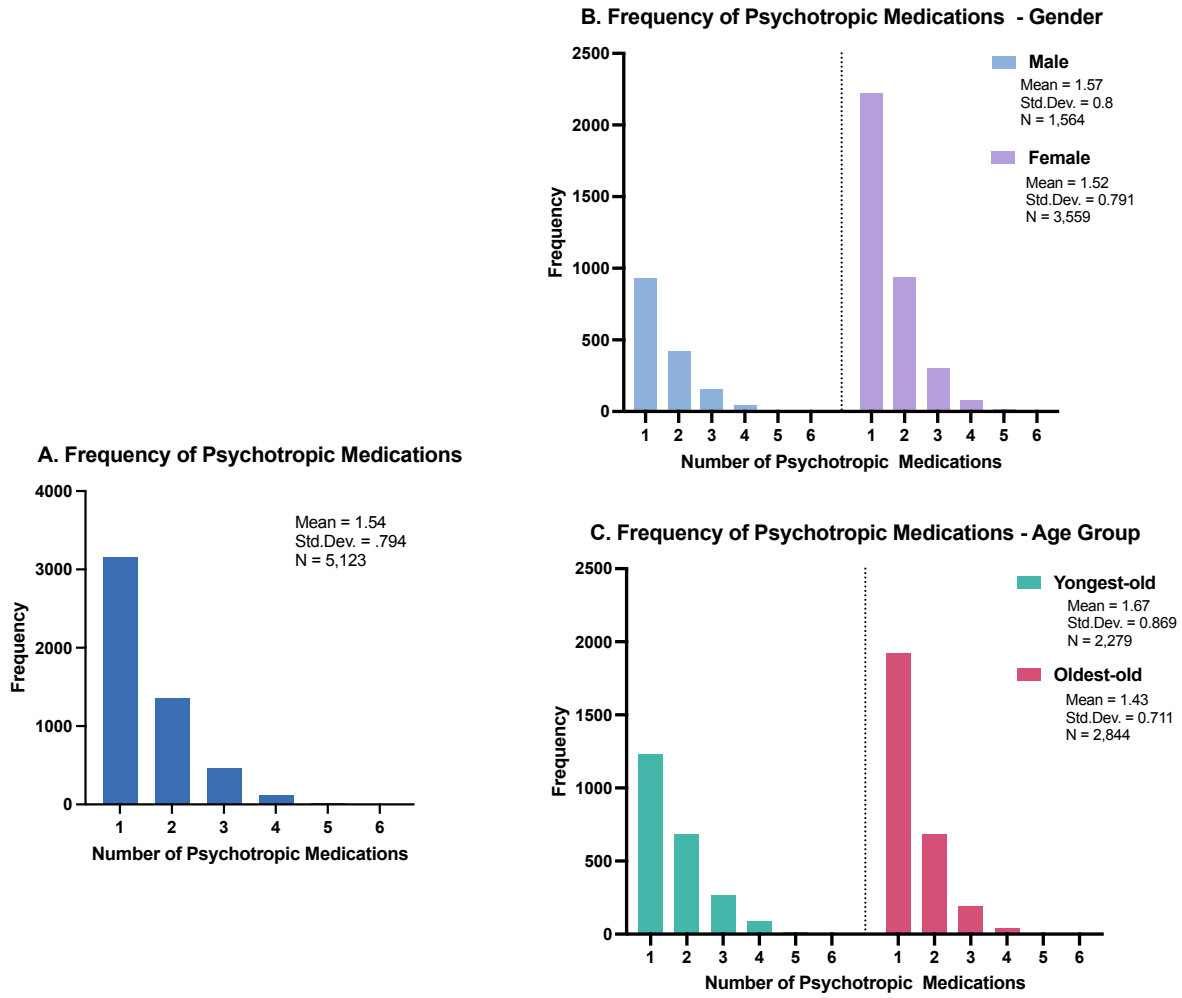


***Figure 4.8**: Frequency of psychotropic medications. Figure 4.8A shows that the mean number of psychotropic medications per resident was 1.54. In Figure 4.8B, residents were classified according to gender and the mean number of psychotropic medications in males was higher than in females. In Figure 4.8C, residents were divided according to age group and the mean number of psychotropic medications in the youngest-old was higher than in the oldest-old residents. Dotted lines separate the groups.*

As mentioned previously (section 4.3.4.2), most residents prescribed psychotropic medications were on one type of psychotropic medication (69%). Among them, the majority were prescribed antidepressants alone (48.7%), with a mean of 1.14 per resident, followed by antipsychotics alone (13.8%), with a mean of 1.10, and finally anxiolytics alone (6.5%), with a mean of 1.02. However, 31.1% of residents were prescribed combinations of psychotropic medications, mainly antidepressants plus antipsychotics (12.4%), with a mean of 2.29 per resident (**Tables 4.7 and 4.21, Figure 4.9).**

Table 4.21: *Descriptive analysis of each type and combination of psychotropic medication*

Type of psychotropic	Residents on psychotropics (n=5,123)	Mean[a] (SD)	95% confidence interval for mean	Median	Min	Max	Range	Sum of psychotropic medications
Antidepressants alone	2,493 (48.7%)	1.14 (0.390)	(1.13 – 1.16)	1	1	4	3	2,843
Antipsychotics alone	708 (13.8%)	1.10 (0.343)	(1.07 – 1.12)	1	1	4	3	778
Anxiolytics alone	332 (6.5%)	1.02 (0.133)	(1.00 -1.03)	1	1	2	1	338
Antidepressants + Antipsychotics	635 (12.4%)	2.29 (0.555)	(2.24 – 2.33)	2	2	5	3	1,451
Antidepressants + anxiolytics	464 (9.1%)	2.22 (0.453)	(2.18 – 2.26)	2	2	4	2	1,029
Antidepressants + Antipsychotics + Anxiolytics	276 (5.4%)	3.45 (0.650)	(3.37 – 3.53)	3	3	6	3	952
Antipsychotics + Anxiolytics	215 (4.2%)	2.23 (0.511)	(2.16 – 2.30)	2	2	5	3	479
Total	5,123	1.54 (0.794)	(1.51 – 1.56)	1	1	6	5	7,870

[a]Note that the descriptive statistics for the number of psychotropic medications are not affected by the number of residents.

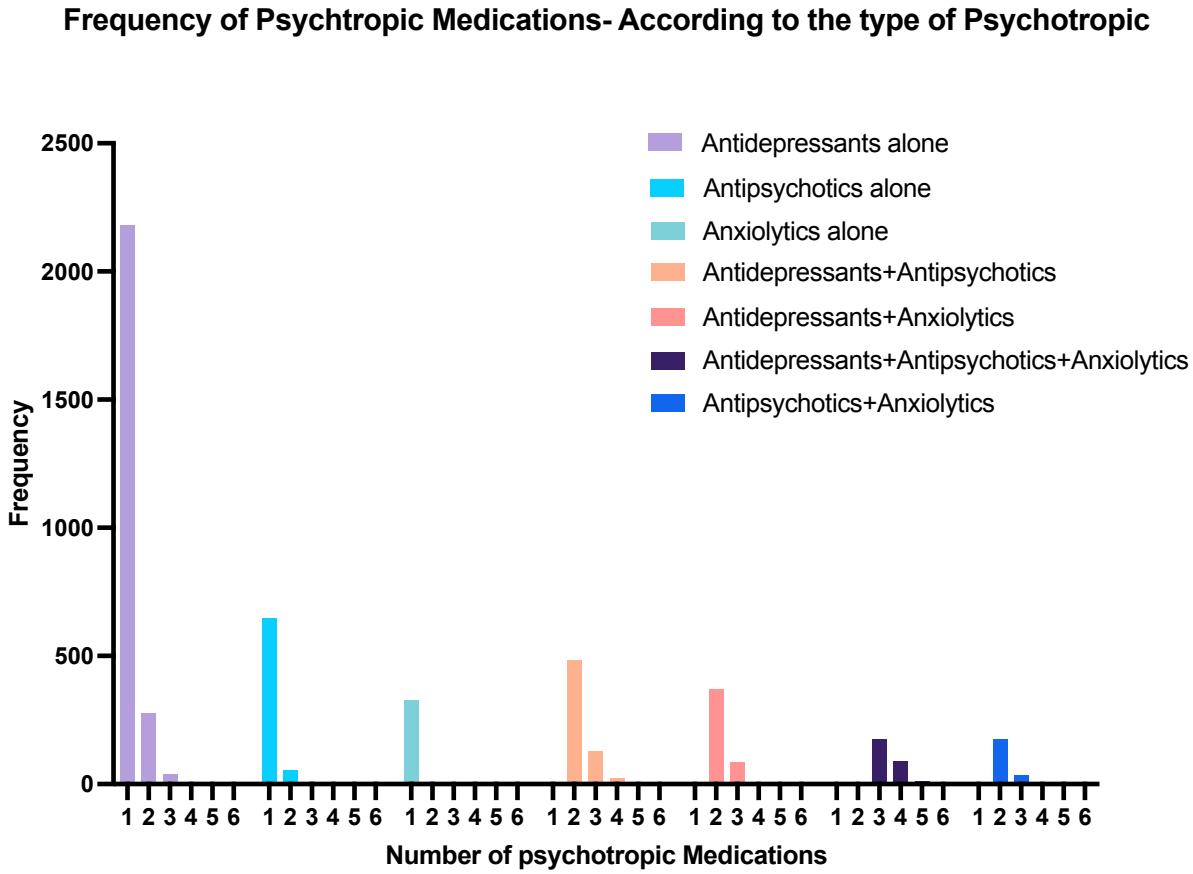


Figure 4.9: *Frequency of each type of psychotropic medication per resident. The results show that most residents were prescribed one drug of each type, while some were given a combination of types. Antidepressants were the most frequently prescribed medications.*

The mean number of antidepressants alone was the highest among the types of psychotropic medications across both genders (male: 1.15; female: 1.14) and age groups (youngest-old: 1.18; oldest-old: 1.11) (**Tables 4.22 and 4.23**).
These results were consistent when each gender was further broken down by age group. The mean number of psychotropic medications in youngest-old males (1.65) and youngest-old females (1.68) was higher than in oldest-old males (1.45) and oldest-old females (1.42), respectively (**Tables 4.24 and 4.25).**

Table 4.22: *Descriptive analysis of each type and combination of psychotropic medication - gender*

Gender	Type of psychotropic	Mean (SD)	95% CI for mean	Median	Min	Max	Range	Sum of psychotropic medications
Males	Antidepressants alone	1.15 (0.397)	(1.12 - 1.18)	1	1	4	3	789
	Antipsychotics alone	1.11 (0.394)	(1.06 - 1.16)	1	1	4	3	279
	Anxiolytics alone	1.04 (0.186)	(1 - 1.07)	1	1	2	1	116
	Antidepressants + Antipsychotics	2.31 (0.554)	(2.23 - 2.39)	2	2	4	2	460
	Antidepressants + anxiolytics	2.19 (0.416)	(2.11 - 2.27)	2	2	4	2	243
	Antidepressants + Antipsychotics + Anxiolytics	3.36 (0.523)	(3.26 - 3.47)	3	3	5	2	343
	Antipsychotics + Anxiolytics	2.18 (.41)	(2.1 - 2.26)	2	2	4	2	220
	Total	1.57 (0.8)	(1.53 – 1.61)	1	1	5	4	2,450
Females	Antidepressants alone	1.14 (0.387)	(1.12 - 1.56)	1	1	3	2	2,054
	Antipsychotics alone	1.09 (0.311)	(1.06 - 1.12)	1	1	3	2	499
	Anxiolytics alone	1.01 (0.095)	0.99 - 1.02)	1	1	2	1	222
	Antidepressants + Antipsychotics	2.27 (0.556)	(2.22 - 2.32)	2	2	5	3	991
	Antidepressants + anxiolytics	2.23 (0.464)	(2.18 - 2.27)	2	2	4	2	786
	Antidepressants + Antipsychotics + Anxiolytics	3.5 (0.711)	(3.39 - 3.61)	3	3	6	3	609
	Antipsychotics + Anxiolytics	2.27 (0.584)	(2.16 - 2.38)	2	2	5	3	259
	Total	1.52 (0.791)	(1.50 – 1.55)	1	1	6	5	5,420

Table 4.23: *Descriptive analysis of each type and combination of psychotropic medication – age group*

Age group	Type of psychotropic	Mean (SD)	95% CI for mean	Median	Min	Max	Range	Sum of psychotropic medications
Youngest-old	Antidepressants alone	1.18 (0.452)	(1.16 - 1.21)	1	1	4	3	1,154
	Antipsychotics alone	1.15 (0.433)	(1.1 - 1.2)	1	1	4	3	390
	Anxiolytics alone	1.03 (0.157)	(1 - 1.05)	1	1	2	1	122
	Antidepressants + Antipsychotics	2.33 (0.611)	(2.26 - 2.4)	2	2	5	3	769
	Antidepressants + anxiolytics	2.21 (0.461)	(2.14 - 2.27)	2	2	4	2	468
	Antidepressants + Antipsychotics + Anxiolytics	3.42 (0.631)	(3.33 - 3.51)	3	3	6	3	629
	Antipsychotics + Anxiolytics	2.24 (0.548)	(2.14 - 2.34)	2	2	5	3	271
	Total	1.67 (0.869)	(1.63 - 1.7)	1	1	6	5	3,803
Oldest-old	Antidepressants alone	1.11 (0.341)	(1.1 - 1.13)	1	1	3	2	1689
	Antipsychotics alone	1.05 (0.221)	(1.03 - 1.07)	1	1	2	1	388
	Anxiolytics alone	1.01 (0.118)	(1 - 1.03)	1	1	2	1	216
	Antidepressants + Antipsychotics	2.24 (0.483)	(2.18 - 2.29)	2	2	5	3	682
	Antidepressants + anxiolytics	2.23 (0.447)	(2.17 - 2.28)	2	2	4	2	561
	Antidepressants + Antipsychotics + Anxiolytics	3.51 (0.687)	(3.37 - 3.65)	3	3	6	3	323
	Antipsychotics + Anxiolytics	2.21 (0.461)	(2.12 - 2.31)	2	2	4	2	208
	Total	1.43 (0.711)	(1.40 – 1.46)	1	1	6	5	4067

Table 4.24: *Descriptive analysis of each type and combination of psychotropic medication - males*

	Type of psychotropic	Mean (SD)	95% confidence interval for mean	Median	Min	Max	Range	Sum of psychotropic medications
Youngest-old males	Antidepressants alone	1.19 (0.458)	(1.14 – 1.24)	1.00	1	4	3	431
	Antipsychotics alone	1.15 (0.466)	(1.07 – 1.22)	1.00	1	4	3	179
	Anxiolytics alone	1.05 (0.222)	(1.0 – 1.1)	1.00	1	2	1	62
	Antidepressants + Antipsychotics	2.33 (0.584)	(2.22 – 2.43)	2.00	2	4	2	277
	Antidepressants + anxiolytics	2.16 (0.371)	2.07 – 2.26)	2.00	2	3	1	134
	Antidepressants + Antipsychotics + Anxiolytics	3.33 (0.497)	(3.22 – 3.44)	3.00	3	5	2	266
	Antipsychotics + Anxiolytics	2.17 (0.417)	(2.07 – 2.27)	2.00	2	4	2	141
	Total	1.65 (0.843)	1.59 – 1.71)	1	1	5	4	1,490
Oldest-old males	Antidepressants alone	1.10 (0.308)	(1.07 – 1.14)	1.00	1	3		358
	Antipsychotics alone	1.05 (0.224)	(1.01 – 1.1)	1.00	1	2		100
	Anxiolytics alone	1.02 (0.137)	(0.1 – 1.06)	1.00	1	2		54
	Antidepressants + Antipsychotics	2.29 (0.508)	(2.17 – 2.40)	2.00	2	4		183
	Antidepressants + anxiolytics	2.22 (0.468)	(2.1 – 2.36)	2.00	2	4		109
	Antidepressants + Antipsychotics + Anxiolytics	3.50 (0.598)	(3.24 – 3.77)	3.00	3	5		77
	Antipsychotics + Anxiolytics	2.19 (0.401)	(2.06 – 2.33)	2.00	2	3		79
	Total	1.45 (0.722)	(1.40 – 1.51)	1	1	5	4	960

Table 4.25: *Descriptive analysis of each type and combination of psychotropic medication - females*

	Type of psychotropic	Mean (SD)	95% confidence interval for mean	Median	Min	Max	Range	Sum of psychotropic medications
Youngest-old females	Antidepressants alone	1.18 (0.448)	(1.15 – 1.22)	1.00	1	3	2	723
	Antipsychotics alone	1.15 (0.404)	(1.1 - 1.21	1.00	1	3	2	211
	Anxiolytics alone	1.00 (0.000)	(1 – 1)	1.00	1	1	0	60
	Antidepressants + Antipsychotics	2.33 (0.628)	(2.25 – 2.42)	2.00	2	5	3	492
	Antidepressants + anxiolytics	2.23 (0.494)	(2.15 – 2.31)	2.00	2	4	2	334
	Antidepressants + Antipsychotics + Anxiolytics	3.49 (0.710)	(3.35 – 3.61)	3.00	3	6	3	363
	Antipsychotics + Anxiolytics	2.32 (0.664)	(2.14 – 2.5)	2.00	2	5	3	130
	Total	1.68 (0.885)	(1.64 -1.73)	1	1	6	5	2313
Oldest-old females	Antidepressants alone	1.12 (0.350)	(1.09 – 1.13)	1.00	1	3	2	1,331
	Antipsychotics alone	1.05 (0.221)	(1.02 – 1.07)	1.00	1	2	1	288
	Anxiolytics alone	1.01 (0.111)	(0.99 – 1.03)	1.00	1	2	1	162
	Antidepressants + Antipsychotics	2.22 (0.474)	(2.15 – 2.28)	2.00	2	5	3	499
	Antidepressants + anxiolytics	2.23 (0.443)	(2.16 – 2.28)	2.00	2	4	2	452
	Antidepressants + Antipsychotics + Anxiolytics	3.51 (0717)	(3.34 – 3.68)	3.00	3	6	3	246
	Antipsychotics + Anxiolytics	2.22 (0.497)	(2.09 – 2.35)	2.00	2	4	2	129
	Total	1.42 (0.708)	(1.40 -1.45)	1	1	6	5	3,107

By gender, a Mann-Whitney U test showed that the overall mean rank of psychotropic medications prescribed for males (mean rank = 2,616.19) was significantly higher than for females (mean rank = 2,538.19) (**p = 0.044, Z score = -2.011**) (**Table 4.26**). However, when divided into the different classes of psychotropic medications, the mean rank for each type of psychotropic medication and the different combinations were not significantly different between males and females (**Table 4.27**).

By age group, a Mann-Whitney U test showed that the overall mean rank of psychotropic medications prescribed for the youngest-old (mean rank = 2773.69) was significantly higher than for the oldest-old (mean rank = 2392.36) (**p < 0.001, Z score = -10.61**) (**Table 4.26**). When divided into classes of psychotropics, the mean ranks of antidepressants alone (mean rank = 1290.27) and antipsychotics alone (mean rank = 368.08) prescribed in the youngest-old were significantly higher than in the oldest-old (mean rank = 1219.25) (**p < 0.001, Z score = -4.19**) (mean rank = 342.02) (**p < 0.001, Z score = -3.483**), respectively (**Table 4.28**).

***Table 4.26**: Mann-Whitney U test comparing the number of psychotropic medications by gender and age groups*

		Mean Rank
Gender	Males	**2616.19***
	Females	2538.19
	Z-score	-2.01
	p-value	**0.044**
Age group	Youngest-old	**2773.69***
	Oldest-old	2392.36
	Z-score	-10.61
	P-value	**< 0.001**

***Bold numbers are statistically significant data.**

Table 4.27: *Mann-Whitney U tests comparing the number and combinations of psychotropic medications – gender*

		AntiDep[1]	AntiPsy[2]	Anxio[3]	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio
Males	Mean Rank	1,255.49	355.29	169.43	326.58	227.5	132.09	105.2
Females	Mean Rank	1,243.77	354.07	165	314.08	234.07	142.26	110.48
Statistical test	Z-score	-0.633	-0.157	-1.719	-1.072	-0.648	-1.200	-0.909
	p-value	0.526	0.857	0.086	0.284	0.517	0.230	0.363

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Green shading indicates a higher number but not statistically significant data.

Table 4.28: *Mann-Whitney U tests comparing the number and combinations of psychotropic medications - age group*

		AntiDep[1]	AntiPsy[2]	Anxio[3]	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio
Youngest – old	Mean Rank	1,290.27	368.08	167.68	326.78	229.04	135.43	108.12
Oldest – old	Mean Rank	1,219.25	342.02	165.84	308.5	235.41	144.63	107.84
Statistical test	Z-score	-4.190	-3.483	-0.729	-1.689	-0.734	-1.059	-0.049
	p-value	<0.001	<0.001	0.466	0.091	0.463	0.289	0.961

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher number and statistically significant data.

Green shading indicates a higher number but not statistically significant data.

Within each gender, the mean rank of antidepressants prescribed in the youngest-old age group (males: mean rank = 356.28; females: mean rank = 933.31) was significantly higher than in the oldest-old age group for both males (mean rank = 331.42) (**p < 0.01, Z score = -2.789**) and females (mean rank = 887.45) (**p < 0.01, Z score = -3.114**). Also, the number of antipsychotics prescribed was significantly higher in youngest-old females (mean rank 240.83) than in oldest-old females (mean rank 221.1) (**p < 0.001, Z score = -3.233**), but this difference was not significant in males (**Table 4.29**). However, within each age group, there were no significant differences between males and females for any separate psychotropic medications or combinations (**Table 4.30**).

Table 4.29: *Mann-Whitney U tests comparing the number and combination of psychotropic medications by age group in each gender*

			AntiDep[1]	AntiPsy[2]	Anxio[3]	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio
Male	Youngest-old	Mean Rank	356.28	128.76	57.35	100.61	54.87	49.84	50.32
	Oldest-old	Mean Rank	331.42	121.47	55.56	99.1	57.43	57.52	52.22
	Mann-Whitney test	Z-score	-2.789	-1.573	-0.906	-0.234	-0.624	-1.305	-0.481
		p-value	<0.01	0.116	0.365	0.815	0.533	0.192	0.631
Female	Youngest-old	Mean Rank	933.31	240.83	109.5	226.55	175.16	86.93	58.91
	Oldest-old	Mean Rank	887.45	221.1	110.88	210.95	178.36	88.35	56.14
	Mann-Whitney test	Z-score	-3.114	-3.233	-0.868	-1.773	-0.413	-0.211	-0.631
		p-value	<0.01	<0.001	0.385	0.076	0.679	0.833	0.528

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Orange shading indicates a higher number and statistically significant data.

Green shading indicates a higher number but not statistically significant data.

Table 4.30: *Mann-Whitney U tests comparing the number and combinations of psychotropic medications by gender in each age group*

			AntiDep[1]	AntiPsy[2]	Anxio[3]	AntiDep + AntiPsy	AntiDep + Anxio	AntiDep + AntiPsy + Anxio	AntiPsy + Anxio
Youngest-old	Males	Mean Rank	490.46	167.72	61.53	166.29	103.69	87.39	58.59
	Females	Mean Rank	485.75	171.95	58.5	165.06	107.66	96.43	63.79
	Mann-Whitney test	Z-score	-0.398	-0.693	-1.762	-0.146	-0.637	-1.359	-1.192
		p-value	0.690	0.488	0.078	0.884	0.524	0.174	0.233
Oldest-old	Males	Mean Rank	753.35	185.21	107.51	160.54	125.46	47.43	47.44
	Females	Mean Rank	761.82	184.93	106.83	150.32	126.75	46.21	47.53
	Mann-Whitney test	Z-score	-0.586	-0.058	-0.340	-1.253	-0.156	-0.215	-.023
		p-value	0.558	0.953	0.734	0.210	0.876	0.830	0.982

[1]AntiDep = antidepressants, [2]AntiPsy = antipsychotics, [3]Anxio = anxiolytics

Green shading indicates a higher number but not statistically significant data.

4.4 Discussion

This study aimed to determine the extent of medication prescribing, with a focus on psychotropic medications and to examine how prescribing patterns were affected by age and gender in care homes. The findings show that the largest class of medications prescribed in care homes were those acting on the nervous system (28%). Of these, 30% were psychotropic medications, including antidepressants, antipsychotics, and anxiolytics. Among these, antidepressants were the most frequently prescribed psychotropic medication.

Overall, 56.5% of all residents were prescribed at least one psychotropic medication, which was significantly higher than the 43.5% who were not prescribed such medications. A significant association was also found between psychotropic prescribing and gender, with 58.9% of males prescribed psychotropic medications compared with 55.6% of females. Similarly, a significant association was observed between psychotropic prescribing and age group, with 66.8% of youngest-old residents prescribed psychotropic medications compared with 50.4% of oldest-old residents.

4.4.1 Care Home Residents

Understanding the demographic characteristics of care home residents is important for examining how these factors influence prescribing. This study found that most of the care home residents in the sample analysed were female (71%) and in the oldest-old age group (62%). In the female group, there were more oldest-old residents than youngest-old residents, while in the male group, there were slightly more youngest-old than oldest-old residents. These findings are consistent with UK data, which show that there are more women than men living in care homes, with approximately 23 female residents for every 10 male residents aged 65 and over (Barrett 2023b; Storey 2023b). Also, among residents aged 65 and over, 56.4% are aged 85 and over (Storey 2023b). Male residents tend to be younger than female residents, leading to a higher proportion of men aged under 85 years (59%) compared to women aged 85 and above (63%), which indicates the higher life expectancy of women (Barrett 2023b; Storey 2023b). Thus, these demographic similarities suggest that the sample in this current study broadly

reflects the age and gender distribution from the 2021 census and are thus likely to be representative of care home residents in the UK and can be used to draw conclusions about care home residents more generally.

These data also support other studies where it has been found that approximately two-thirds of care home residents were women (Gordon et al. 2013; Howley 2020; Resnick et al. 2021). This reflects the fact that that women live longer than men and agree with data showing that the most common risk factors for care home admission were older age and female sex (Sinclair et al. 1988; McCann et al. 2012). The high percentage of youngest-old males in care homes may be due to men being more dependent on women for home tasks, such as cooking and laundry. If their spouse dies at an earlier age, they may require someone to care for them and may end up in a care home, even without significant health issues. This theory is supported by previous work showing that men are more likely than women to be admitted to care homes after the loss of their spouse (Noël-Miller 2010).

4.4.1.1 Medications Prescribed in Care Homes

This study found that the largest class of medications prescribed for care home residents was those that act on the nervous system (28%), followed by medications that act on the gastro-intestinal system (19%) and the cardiovascular system (14%). Analgesics (44%), which included non-opioids (66.5%) and opioids (33.5%), were the highest among nervous system medications, with paracetamol the highest (92%) among non-opioid analgesics.

This observation has also been noted in other studies from the UK, where 36.4% of prescriptions for care home medications were for those affecting the nervous system, and from Denmark, where 78% of residents were prescribed these medications (Ryan et al. 2013; Albertsen et al. 2022). The high use of analgesics, particularly paracetamol, could be explained by the high prevalence of pain in care homes, with approximately 80% of care home residents said to suffer from pain (Schofield 2018). Also, paracetamol is often prescribed “as required” due to its lower association with severe

side effects (Abdulla et al. 2013; Clot-Faybesse et al. 2017), potentially leading to more frequent prescribing. Furthermore, the prescription of analgesics, particularly paracetamol, has increased over time, rising from 35% in 2000 to 58% in 2011 in Norwegian nursing homes (Sandvik et al. 2016), probably contributing to the large number of prescriptions seen here.

Pain tends to increase with advancing age and is often seen as an expected aspect of aging (Sandvik et al. 2016; Schofield 2018). It has also been noted that analgesic use increases with age, and women tend to receive more analgesic prescriptions compared to men, probably due to the higher prevalence of pain-related diseases, such as osteoporosis and arthritis, in women (Sandvik et al. 2016). The majority of residents in the present study were female residents and in the oldest-old group, which may explain the higher prescribing of analgesics, particularly paracetamol. However, as no diagnostic or clinical data were available, this conclusion cannot be confirmed.

4.4.2 Psychotropic Medications used for BPSD

In this study, 30% of the nervous system medications prescribed were psychotropic medications, which included antidepressants (17%), antipsychotics (8%), and anxiolytics (5%). These psychotropic medications represented the second-largest category of nervous system medications after analgesics. As the focus of this study was on the treatment of BPSD, other classes of drugs identified representing 16% of nervous system medications (hypnotics, drugs for parkinsonism, antiepileptics and drugs used in nausea and vertigo) were not considered further as they are not used to treat BPSD. Drugs for dementia (9% of nervous system medications) will be considered in Chapter 5. A total of 56.5% of all residents were prescribed at least one psychotropic medication, which was significantly higher than the 43.5% of residents who were not prescribed such medications ($p < 0.001$).

Among those prescribed psychotropic medications, 69% were taking one type alone, while 31% were on combinations. Across all residents, 39% were taking one type of

psychotropic medication alone, and 17.5% were on combinations. Nearly half of residents on psychotropic medications were on antidepressants alone (48.7%), of which SSRIs were the most commonly prescribed, while the lowest percentage were residents on anxiolytics alone (6.5%). Similar patterns with smaller percentages were observed when considering all residents.

Similar findings were reported in a variety of studies showing that most care home residents were prescribed psychotropic medications (antidepressants, antipsychotics and anxiolytics) (Ruths et al. 2013; Helvik et al. 2017; Almutairi et al. 2021). In Australia, 84.3% of care home residents were prescribed these psychotropic medications, while 15.6% were not (Almutairi et al. 2021). In the UK, across 147 care homes, 63% of residents were prescribed at least one psychotropic medication, with 27% on combinations. However, this study also included other psychotropics such as opioids and gabapentinoids (Grill et al. 2021). Antidepressants, particularly SSRIs, were the most commonly prescribed (Ruths et al. 2013; Helvik et al. 2017; Almutairi et al. 2021; Grill et al. 2021).

Also, the combination of antidepressants plus antipsychotics was the most commonly prescribed among residents on combinations of psychotropic drugs (Almutairi et al. 2021). This finding was consistent with the present study, which found that residents on this combination of medications was the highest among both residents on psychotropic medications (12.4%) and among all residents (7%).

The high percentage of prescribing psychotropic medication in care homes might be attributed to the treatment of BPSD, such as depression, given that 70% of care home residents are suggested to have dementia (Alzheimer's Society 2025b). However, these medications have modest efficacy and are associated with severe side effects, including stroke, substance dependence, falls, fractures, and mortality (Ruths et al. 2013; Defrancesco et al. 2015; Jennum et al. 2015; Kalisch Ellett and Lim 2020; Alzheimer's Association 2024). Guidelines from organisations such as NICE recommend treating BPSD initially with non-pharmacological strategies (National Institute for Health and Care Excellence [NICE] 2018). However, the lack of regular

medication reviews, staff shortages, pressure from staff and relatives, and limited access to non-pharmacological interventions may all contribute to the increased prescribing of psychotropic medications in care homes (Cousins et al. 2017; Moth et al. 2021; Yoon et al. 2022).

It has been reported that the rate of prescribing psychotropic medications with the exception of antipsychotics, has increased, particularly for antidepressants (Ruths et al. 2013; Donegan et al. 2017). The present study showed that the prescribing of antipsychotic medications was not particularly high (8%) among nervous system medications. This may result from initiatives to reduce the use of antipsychotics, especially in people with dementia (Medicines and Healthcare products Regulatory Agency 2014; Szczepura et al. 2016). Generally, antipsychotics are considered potentially inappropriate for use in older people due to their side effects, such as stroke and increased mortality, and should therefore be avoided, unless they have a specific diagnosis such as schizophrenia (American Geriatrics Society Beers Criteria Update Expert 2023). However, in limited situations, when a resident poses a threat to themselves or others, and when non-pharmacological approaches have failed, they can be used for a short duration (National Institute for Health and Care Excellence [NICE] 2018). For example, in the UK, risperidone is approved for no more than six weeks for the treatment of BPSD (National Institute for Health and Care Excellence [NICE] 2018).

Among the three classes of psychotropic medications examined in this study, anxiolytics were the least prescribed (5% of all nervous system medications). This is likely to be due to their association with an increased risk of falls and fractures (Bourgeois et al. 2012a; National Institute for Health and Care Excellence [NICE] 2024b). Also, long-term use of these medications may induce dependence and withdrawal symptoms, as well as increase the risk of cognitive decline and dementia (Bourgeois et al. 2012a; Rosenberg et al. 2012; He et al. 2019; Rijksen et al. 2021). Similarly, in the literature, anxiolytics were prescribed less frequently in care homes than antidepressants and antipsychotics (Ruths et al. 2013; Smeets et al. 2018; Westbury et al. 2019).

NICE guidelines advise against using antidepressants for mild depression due to the poor risk–benefit ratio and emphasise the use of psychological treatments (e.g. CBT) as the first line of treatment. However, 70% of people with depression continue to be prescribed antidepressants (National Institute for Health and Care Excellence [NICE] 2009; Kendrick et al. 2022). There are several potential explanations for the higher percentage of antidepressant use compared to other psychotropic medications in care homes. There is growing awareness that depression might be undertreated, and antidepressants are not only prescribed for depression but may also be used for anxiety, neuropathic pain, insomnia or agitation (Bourgeois et al. 2012b; Midlöv et al. 2014; Hiltunen et al. 2016; Helvik et al. 2017; Phan et al. 2019). One limitation of the present study is that the indications for the prescribed medications were not available so the clinical rationale for prescriptions cannot be determined. However, it has been found that in Belgian nursing homes, only 66% of antidepressant use was specifically for depression, with SSRIs being the most commonly prescribed (Bourgeois et al. 2012b) as was also seen here.

Furthermore, in care homes, initiating antidepressant prescribing often relies on observations by care home staff rather than on a clinical diagnosis of depression (Iden et al. 2011). As a result, doctors may feel pressured to prescribe antidepressants due to a lack of time for thorough diagnostic work, and follow-up is frequently lacking (Hoek et al. 2003; Wood-Mitchell et al. 2008; Iden et al. 2011). Restrictions on the use of antipsychotics may also lead to an increased use of antidepressants, due to the relatively better safety profile of antidepressants, especially SSRIs (Ruths et al. 2013; Riese 2015; Brimelow et al. 2019). Nevertheless, SSRIs have been associated with side effects such as falls, bone loss, and fractures (Bloch et al. 2011; Coupland et al. 2011; Ruths et al. 2013; Van Asch et al. 2013). All these factors may contribute to the increased use of antidepressants in care homes.

4.4.3 Factors Influencing the Number of Medications Prescribed:

In the present study, the mean number of medications prescribed per resident was around 10 medications for 9,060 residents across 310 care homes. In the literature, the

mean number of medications prescribed per care home resident was found to be eight medications with 6.2 diagnoses (Hosia-Randell et al. 2008; Barber et al. 2009; Gordon et al. 2013; British Geriatrics Society 2020). This difference is probably related to the greater number of residents and care homes in this study, the increases in medications prescribed in recent years, and differences between countries. For example, Barber et al. (2009) recruited 256 residents across 55 care homes, and Gordon et al. (2013) conducted their study in 11 care homes with 227 residents. Both studies were conducted in the UK and found that the average number of medications prescribed per resident was eight, so the higher numbers of residents and care homes in this study's sample might explain the slight increase in the mean number of medications prescribed per resident. Furniss (2002) found that the mean number of medications prescribed per resident in Ireland was around five, while this number was 6.5 in the USA (Furniss 2002) and 4.4 in Sweden (Haider et al. 2008), highlighting differences between countries. Most of these studies were published 10 or more years ago and, as highlighted in 4.4.2 above, prescribing of psychotropics has increased in recent years which could also explain some of the differences. Overall, these results suggest a high prevalence of polypharmacy in care home residents. Drug–drug reactions, potentially inappropriate medications, and serious side effects are the most common polypharmacy issues. The most common side effects of polypharmacy reported in care home residents are cognitive impairment, falls and fractures (Jokanovic et al. 2015; Ćurković et al. 2016; Izza et al. 2020; Albertsen et al. 2022). Regarding psychotropic medications in particular in care homes, a study in Sweden found that the mean number of psychotropic medications at baseline was 1.2 (SD 1.2) and increased slightly to 1.3 (SD 1.2) after 12 months (Midlöv et al. 2014). This is comparable to the findings of the present study, where the mean number of psychotropic medications per resident was 1.54 (SD 0.794) across the period from 2014 to 2020. However, determining how the mean number in this study changed with time was not possible as residents' exact admission and discharge dates were unknown.

Living in a care home might be a risk factor for an increase in the number of diseases and thus medications. Koopmans et al. (2003) in the Netherlands found that the mean number of medications increased from 5.6 following care home admission to 5.8 six

weeks later (Koopmans et al. 2003). Haider et al. (2008) found that the mean number of medications prescribed in the community in Sweden was four, while in care homes, the mean number was 6.3. In the UK, the prevalence of depression was found to be higher in care homes (40%) than in the community (20%) (Mental Health Foundation 2022). In France, the prescribing of antidepressants in care homes (35.2%) was higher than in the community (29.5%), especially for residents with AD (David et al. 2016a). Therefore, living in a care home might be a factor in the increase in diseases and medications, probably due to the challenges of adapting to a new environment and lifestyle, which can be distressing for residents (Harrison et al. 2020b).

4.4.3.1 Gender and Age

The data from the current study showed that the mean ranks of all medications in male and youngest-old care home residents were significantly higher than in female and oldest-old residents, respectively. Also, the data were consistent within each gender, so the number of medications in the youngest-old age group was significantly higher than in the oldest-old age group in both males and females. Data were also consistent within each age group, with the number of medications being significantly higher in males than in females in both the youngest-old and oldest-old age groups. This trend was similar when focusing on psychotropic medications; the mean rank of psychotropic medications in male and in youngest-old care home residents was significantly higher than in female and in oldest-old residents, respectively.

Also in the present study, a significant association was found between the prescribing of psychotropic medications and gender, with 58.9% of males being prescribed psychotropic medications compared to 55.6% of females. There was also a significant association between psychotropic medications and age group, with 66.8% of youngest-old residents being prescribed psychotropic medications compared to 50.4% of oldest-old residents.

Globally, it has been found that males experience a greater overall burden of disease than females and suffer from more fatal conditions (e.g., cancer, cardiovascular disease, and respiratory illnesses), which often lead to premature death (Patwardhan et

al. 2024; Taylor 2024). Conversely, females tend to experience more non-fatal illnesses throughout their lives (e.g. depression, musculoskeletal disorders, and lower back pain) (Patwardhan et al. 2024; Taylor 2024). Since men generally face more severe disease burdens, they may require more medications. This difference could explain why men were prescribed more medications than women in this study.

Similarly, in the Netherlands, it was found that the mean number of medications on admission to Dutch nursing homes was 5.7 for men and 5.5 for women. After six weeks, these figures increased to 5.9 and 5.8 for men and women, respectively (Koopmans et al. 2003). However, in the literature, polypharmacy is more commonly associated with being female and with old age (Haider et al. 2008; Hosia-Randell et al. 2008; Albertsen et al. 2022). Albertsen et al. (2022) found that the number of medications prescribed for women in care homes in Greenland was significantly higher than for men (a median of six versus five medications). In their study, however, 62% of participants were women, and the median age was 77 years, with only 9% being over 85, so this might not represent the oldest-old, and the women in their study could be considered as the youngest-old, who would be expected to have a higher number of medications according to this study's findings. Polypharmacy (five or more medications) was higher in females (68%) than in males (54%), while non-polypharmacy (one to four medications) was more common in males (46%) than in females (32%) (Albertsen et al. 2022). In this study, mean rank was used instead of the definition of polypharmacy, which may explain the difference in findings from the Greenland study.

Published studies of psychotropic medication prescribing with regards to age and gender are scarce. Thus, although gender and age variations in the prescribing of psychotropic medications have not been investigated in detail and thus are not fully understood, a number of reasons may be responsible for these phenomena. Firstly, it has been found that care home staff view male behavioural symptoms as frightening, distressing, and difficult to handle, and these behaviours are therefore usually reported, whereas female behavioural symptoms are commonly viewed as typical of care home residents and may not be reported (Resnick et al. 2021). So, if behavioural symptoms that occur in males are treated with psychotropic medications but those in females are

not, this may explain in part the greater number of psychotropic medications in males described above. Secondly, in general, youngest-old people are likely to be stronger and more active, while oldest-old people tend to be calmer (Lindsey 2009) which could also help to explain these findings.

Thirdly, the incidence of adverse events rises significantly with age (Lindsey 2009). Prior studies have found that the use of psychotropic medications decreases with the increasing age of residents in care homes (Nijk et al. 2009; Ruths et al. 2013; David et al. 2016a; McMaster et al. 2017; van der Spek et al. 2018a). This might be due to age-related changes: advanced age may alter drug metabolism and increase susceptibility to side effects (Mangoni and Jackson 2004; Lindsey 2009). The current study found that the majority of males were youngest-old and the majority of females were oldest-old, so this might also explain the higher prescribing of psychotropic medications in the youngest-old who, as males, were more likely to be prescribed psychotropic medications.

4.4.3.2 Different Classes of Psychotropic Medications

Dividing psychotropic medication prescribing into each type alone and combinations revealed that among all residents, including those not prescribed psychotropic medications, and among residents who were only on psychotropic medications, male residents and those in the youngest-old age group were more likely to be prescribed psychotropic medications, particularly antipsychotics alone and combinations. Including all residents in the analysis will increase statistical power by increasing the sample size to detect small differences, however, it is also likely to dilute the effect by incorporating those who have not been prescribed psychotropic medications. Also, since most of the residents were female and in the oldest-old group, the data were skewed. Thus, the data for psychotropic medications in all residents do not always mirror the data from residents prescribed these drugs and need to be interpreted with care.

Regarding gender, among residents who were prescribed psychotropic medications, the prescribing of antidepressants alone, and antidepressants plus anxiolytics, was significantly higher in females than in males. While a similar pattern was observed

across the entire resident population, it did not reach statistical significance. Conversely, the prescribing of antipsychotics alone, and antipsychotics plus anxiolytics, was significantly higher in males than in females, both among those prescribed psychotropic medications and among all residents. In terms of age group, among residents who were prescribed psychotropic medications, the prescribing of antidepressants alone and anxiolytics alone was significantly higher in the oldest-old compared to the youngest-old residents. However, all combinations of psychotropic medications, except for antidepressants plus anxiolytics, were significantly more common in the youngest-old group. Among all residents, the prescribing of antipsychotics alone and all combinations was significantly higher in the youngest-old than in the oldest-old.

The data obtained here for differences in the prescribing of psychotropic drugs between men and women are supported by earlier studies. Males were reported to be more likely to display violent or disruptive behaviour during the course of their lives, whereas females were more likely to exhibit symptoms of depression, anxiety, or verbal abuse (Dorte 2015; Björkqvist 2018; Resnick et al. 2021). This may explain why more antidepressants were prescribed to women, whereas more antipsychotics were prescribed to men (Hosia-Randell and Pitkälä 2005; Ruths et al. 2013). Also, women in care homes had a higher prevalence of depression and antidepressant use than men (Nijk et al. 2009; Weitoft et al. 2012; Midlöv et al. 2014; David et al. 2016a; Hiltunen et al. 2016; Resnick et al. 2021). This higher prevalence might be because women are more likely to seek medical help, are more susceptible to stress and chronic conditions (e.g., osteoporosis), and are more likely to experience social isolation and loneliness (Lasaite and Krasauskiene 2009; Moore et al. 2012; Sendra-Gutiérrez et al. 2017; Payne 2022). A study in the UK focusing on residents with dementia found that females were prescribed more antidepressants than males (OR = 1.35, 95% CI: 1.14 – 1.59) (La Frenais et al. 2021). A Norwegian study conducted in nursing homes found that antipsychotics were prescribed more often in males (adjusted OR = 0.64, 95% CI: 0.44 – 0.93) (Helvik et al. 2017).

Anxiolytics were affected by the main driver (either antidepressants for women or antipsychotics for men) in this study; for example, being prescribed a combination of antipsychotics plus anxiolytics was more common in males because antipsychotics were primarily prescribed to males. Also, because most of the female residents in the sample were in the oldest-old age group, this might explain the higher prescribing of antidepressants alone and anxiolytics alone in this age group. Different diseases associated with residents and their severity, different practices, and differences in staff knowledge about psychotropic medications might explain these findings. These aspects will be explored in interviews with care home staff in **Chapter 6**.

4.5 Strengths and Limitations

Importantly, as all care homes in the UK using the eMAR system from Invatech were included in this study, this created a large sample size covering multiple care homes. Also, quality assurance checks were performed, and the results were discussed with the research team. However, as described in Section 4.2.2 and Table 4.1, the database contains prescribing data and lacks clinical notes which is a significant limitation. Thus, if a resident was prescribed antidepressants, it was assumed that they were taking the medication and had moderate or severe depression, as antidepressants should not be used for mild depression (National Institute for Health and Care Excellence [NICE] 2009). In addition, the resident could have been prescribed antidepressants for other conditions as described above (Section 4.4.2) but this could not be determined due to the lack of diagnostic information. Thus, using residents' prescribed medications as a proxy to identify their conditions represents a limitation, as residents who were treated non-pharmacologically or who were not prescribed medications for their condition would have been missed. Prescribing data were also assumed to have been captured accurately, however, it is possible that staff may have made mistakes.

Due to data quality issues, it was not possible to determine how long residents had lived in the care homes, or accuracy of the exact start and stop dates of medications. Medications recorded with an 'active' prescribing status at the time of data collection were used to indicate that residents were still living in the care home. According to the

literature, the average length of stay in a care home is typically one to two years (British Geriatrics Society 2020). Also, information about the type of care home (nursing or residential) and residents' ethnicity was not available, which represents another limitation. From a safeguarding perspective, and as specified in the data-sharing agreement, information on the identity and geographical location of the care homes, whether they were privately operated and the characteristics of the residents was not provided

Residents were grouped by age, with 85 years used as the cut-off. Those below 85 years were classified as the "youngest-old", and those aged 85 or older were classified as the "oldest-old". The small number of centenarians (aged 100 or more, approximately 213 residents) were included in the oldest-old group to maintain an approximately 20-year age range in each age group for comparison. In addition, gender was classified according to the residents' titles (e.g., "Mr." was assumed to indicate a male resident). while residents' titles may not have always reflected biological sex, it was considered unlikely that a significant number of study population were transgender. The data were also skewed by the higher proportion of oldest-old residents and females.

Finally, the BNF was used to classify medications, as the study was conducted in the UK. However, this may limit comparability with international studies that do not use the BNF. Using generic (scientific) drug names helped partially mitigate this limitation across countries.

4.6 Conclusions

The current study confirmed that most care home residents were female and in the oldest-old age group, which concurs with the 2021 census and previous literature; thus, the study sample is highly likely to be representative of the wider UK care home resident population. Also, the largest class of medications prescribed in the care homes was those acting on the nervous system suggesting that conditions affecting this system are very prevalent in care homes. More than half of the residents were prescribed at least one psychotropic medication, with antidepressants being the highest class prescribed

among psychotropic medications. Interestingly, there were differences between ages and genders: if a resident was a youngest-old male, he was more likely to be given antipsychotics, anxiolytics, or both, and more psychotropic medications. However, if a resident was an oldest-old female, she was more likely to be given antidepressants, anxiolytics, or both, with fewer psychotropic medications. These differences are likely to be related to gender differences in both behaviour and the prevalence of particular medical conditions.

Chapter 5 will develop these findings and focus on exploring how the prescribing of psychotropic medications among care home residents is affected in those who are also prescribed antidementia medications.

Chapter 5: Antidementia and Psychotropic Medication Prescribing in Care Home Residents

5.1 Introduction

In the UK, over two-thirds (70%) of people living in care homes have dementia, of which the most common type is Alzheimer's disease (AD) (Alzheimer's Society 2025b). Dementia has been identified as the leading causes of death in care homes (Eley 2023), with the majority of residents experiencing moderate to severe stages of dementia (McMaster et al. 2017; Wittenberg et al. 2020; La Frenais et al. 2021). People with dementia often display BPSD, which features for example depression, agitation or psychosis, can be difficult to manage at home and can lead to a care home admission (Wetzels et al. 2010; Toot et al. 2017). NICE guidelines recommend that BPSD should initially be treated using a non-pharmacological approach (National Institute for Health and Care Excellence [NICE] 2018; Alzheimer's Association 2024). Nevertheless, many psychotropic medications (antidepressants, antipsychotics, and anxiolytics) are commonly used off-label to treat BPSD, although they have modest efficacy and severe side effects such as stroke, falls, fractures and increased mortality (Ruths et al. 2013; Defrancesco et al. 2015; Jennum et al. 2015; Kalisch Ellett and Lim 2020; Alzheimer's Association 2024). Moreover, care home residents have a higher risk of adverse drug reactions, due to polypharmacy and age-related pharmacodynamics and pharmacokinetics (Hosia-Randell et al. 2008; Richter et al. 2012).

More than 50% of residents with dementia in care homes are prescribed at least one psychotropic medication (Selbaek et al. 2007b; van der Spek et al. 2016; Smeets et al. 2018; Ballard and Corbett 2020; Loftus et al. 2023). Further, residents with dementia in care homes are prescribed more psychotropic medications than those without dementia (Donegan et al. 2017; Helvik et al. 2017; Maust et al. 2018a). For example, in Norway, the prevalence of psychotropic prescribing for residents with dementia was 74.5%, compared to 66.5% for those without dementia (Helvik et al. 2017). Similarly, in the UK, the prescribing of antidepressant medications for residents with dementia increased from 28% in 2005 to 36.6% in 2015, although antipsychotics decreased from 22% to 11.4%, and there was no change in the use of anxiolytics (Donegan et al. 2017).

Both gender and age have been suggested to influence the prescribing of psychotropic medications in care home residents. Ruths et al. (2013) found that more women than men received anxiolytics and antidepressants, whereas more men than women were prescribed antipsychotics. Similarly, increasing residents age was associated with a decrease in the use of all psychotropic medications. The results presented in **Chapter 4** for all residents support this idea.

Despite these findings, the literature related to the prescribing of psychotropic medications to care home residents with dementia is now fairly out of date. This is against a context of growing concern about the increasing prescribing of psychotropic medications (antidepressants, antipsychotics, and anxiolytics). Ultimately, this may lead to potentially inappropriate prescribing and harm to residents, due to their modest efficacy and significant side effects. Building on previous studies, it is important to explore how these medications are prescribed in residents with and without anti-dementia medications in UK care homes, and how age and gender might influence such prescribing practices.

5.1.1 Aim and objectives

The aim of this study was to investigate the prescribing of psychotropic medications, specifically antidepressants, antipsychotics, and anxiolytics, which are commonly used to manage BPSD, among residents prescribed and not prescribed anti-dementia medications in UK care homes, using electronic medicine administration records (eMARs).

5.1.2 Objectives:

1. To identify residents who were prescribed and those who were not prescribed anti-dementia medications.
2. To investigate the association between anti-dementia and psychotropic medication prescribing.
3. To identify the number of psychotropic medications prescribed to residents both prescribed and not prescribed anti-dementia medications.

4. To identify and compare the classes and combinations of psychotropic medications prescribed among residents prescribed and not prescribed anti-dementia medications.
5. To compare gender and age groups among residents prescribed and not prescribed anti-dementia medications, in terms of psychotropic medication prescribing.
6. To identify the most common psychotropic medications prescribed among residents prescribed anti-dementia medications compared with those not prescribed such medications.

5.2 Methods

Secondary cross-sectional, pseudonymised data for residents in 310 care homes across the UK were collected via eMAR (Invatech Health Ltd., https://invatechhealth.com/) from 2014 to 2020 using SQL.

Although this chapter uses the same dataset as **Chapter 4**, the focus here is specifically on residents who were prescribed anti-dementia medications (donepezil, galantamine, rivastigmine, or memantine) and psychotropic medications (antidepressants, antipsychotics, and anxiolytics). Diagnostic data was not available to the researcher so it was not possible to determine conclusively if residents had dementia and therefore residents were classified into two groups based on their anti-dementia medication prescribing status:

- **Group 1**: Residents prescribed anti-dementia medications.
- **Group 2**: Residents not prescribed anti-dementia medications.

These groups were then further classified according to psychotropic medication prescribing.

5.2.1 Inclusion criteria:

Inclusion criteria were similar to those described in **Chapter 4**, briefly:

1. All residents who did not have archived records were included.
2. Gender was clearly documented as either male or female, based on resident's title.

3. Residents aged 65 to 105 were included, with those aged 65 to 84 being classified as 'youngest-old', and 85 to 105 years as 'oldest-old'.
4. Medication status was active i.e. not stopped or discontinued.

Medication classification was based on the BNF, as the study was conducted in the UK. It was assumed that residents prescribed anti-dementia medications were considered likely to have dementia, particularly AD, as these medications are primarily used for AD, as the most common type of dementia (Alzheimer's Disease International 2020b). Thus, the prescribing of anti-dementia medication served as a proxy for identifying potential dementia diagnoses, particularly AD. However, it is possible that some residents who were not prescribed anti-dementia medication had dementia and therefore data have been interpreted with care.

As described in **Chapter 4**, the database comprised four primary tables, which contained information regarding the residents, medications, administration, and dispensing. From the residents' table, a filtered table was created by converting year of birth to age and residents' titles to gender. Residents' pseudonymised IDs served as primary keys to link the tables.

5.2.2 Creation of the dataset:

As described in **Chapter 4**, a dataset was created by linking the residents' table (filtered) with patients' medications through matching residents' IDs, based on the inclusion and exclusion criteria. Also, tables for residents with each class of psychotropic medication were created based on residents' medication from this dataset. This meant that a table was created for: i) antidepressants; ii) antipsychotics; and iii) anxiolytics. These tables were then extracted to Excel.

In this **Chapter 5**, four additional tables were created based on the dataset using SQL queries, by inserting data to create new tables (see queries in Appendix 3).

a. Anti-dementia medication table: this group was identified based on anti-dementia medication prescribing (donepezil, galantamine, rivastigmine, or memantine).
b. No-anti-dementia medication table: anyone not prescribed anti-dementia medication(s).
c. Anti-dementia and psychotropic medications: any residents who were prescribed anti-dementia AND psychotropic medications (antidepressants, antipsychotics, or anxiolytics).
d. No-anti-dementia but with psychotropic medications: any residents prescribed psychotropic medication but not anti-dementia medications.

Thus, residents with anti-dementia and psychotropic medications were those who were prescribed at least one anti-dementia and one psychotropic medication (antidepressants, antipsychotics, or anxiolytics). Also, it was not always necessary to create a new table to extract the required data, but queries were written using the existing tables and then the results were extracted to Excel.

5.2.2.1 Technical terms

As described in **Chapter 4**,in order to combine tables together, residents' ID in both tables were used through an inner joint clause in SQL (W3schools 2023b). This only included residents with matched ID in both tables (e.g., for residents prescribed anti-dementia medication and antidepressants, the ID was the same in both tables, meaning that these residents were prescribed both anti-dementia and antidepressant medications. To avoid duplicates, the DISTINCT function was used: for example, Select DISTINCT ID from anti-dementia retrieved all unique residents without duplicates (W3schools 2023d). The IN and NOT functions were used: for example, to identify people prescribed anti-dementia and antidepressant medications but not prescribed antipsychotics.

Since writing queries is sensitive and requires exact matches for words, and to maximize search results, the LIKE clause with a percent sign was used (W3schools 2023c). For example, LIKE %donepezil% extracted anything before and anything after as long as it contained the word between the percent signs. If the sign was only at the end, LIKE donepezil%, would retrieve anything after the sign, but it must start with the same

word, whereases LIKE %donepezil would retrieve anything before the sign, but it must end with the same word. This search strategy helped to retrieve all types of doses and dosage forms for the same medication. Also, the ORDER BY clause was used to sort the results. The aggregate function, which is the set of calculations that are performed on data in order to obtain a singular value, was used, such as count, minimum, maximum, average (Integrate.io 2023). The GROUP BY clause was used to group results that had the same value, and was used with the AGGREGATE function (W3schools 2023a). Thus, the organising queries were vital to get the appropriate results. After combining the required tables, quality assurance processes were undertaken.

5.2.2.2 Quality assurance

After creating or combining tables, quality assurance was performed. For example, when the table of residents with anti-dementia medications was created, a random check of the first, middle and last row was conducted. The research team (TA, EK and MS) checked that the residents in each of these rows were prescribed anti-dementia medication(s). Also, some residents' ID numbers were randomly drawn from the 'antidepressants table' and checked in the patient medication table to ensure that they were being prescribed antidepressant medications. Several queries were also conducted across different tables to ensure that the outputs were the same: for example, the number of residents in the anti-dementia medication table was 2,082, and this was checked in the dataset by checking that the number of residents prescribed anti-dementia medications was also equal to 2,082.

Data from the tables were also compared with a range of published literature as a sense check. For example, most prior studies have found that the number of females in care homes is higher than the number of males, and this was similar to the results of this study. After creating and combining tables and extracting the required data from the database, it was exported to Excel and SPSS for further analysis.

5.2.3 Statistical analysis

The software SPSS 29 was utilized for data analysis and Prism 10 for drawing figures in this study. Pearson's Chi-square test was used to evaluate whether significant associations exist between anti-dementia medications, psychotropic medications, age, and gender (Laerd Statistics 2016b; Giganc 2019). To measure the strength of associations, two specific statistical measures were applied: Phi and Cramer's V, as described in **Chapter 4**.

In cases where the Chi-square test is performed on tables larger than 2x2, it becomes necessary to carry out post-hoc tests to identify the specific cells or categories that are contributing to the significant result (Hazra 2017; Giganc 2019). This is important for identifying exactly where differences lie (Giganc 2019). Furthermore, to maintain the integrity of the statistical analysis when multiple comparisons are made, a Bonferroni correction is typically applied, to prevent risk of familywise error (Armstrong 2014; Giganc 2019).

Moreover, because the distribution of data in this study was not normal, a non-parametric test, specifically the Mann-Whitney U test, was used (Laerd Statistics 2016c). The test was used to identify differences in the number of psychotropic medications used between two groups, i.e. residents prescribed anti-dementia and those not prescribed anti-dementia medications.

5.3 Results

5.3.1 Residents prescribed anti-dementia medications:

A total of 9,060 residents living in 310 care homes in the UK were included in this study (as described in detail in **Chapter 4**). As shown in **Table 5.1**, 23% of residents were in Group 1 (prescribed anti-dementia medication), with a mean age of 85.1 years (SD = 6.82), while 77% were in Group 2 (not prescribed anti-dementia medication), with a mean age of 86.5 years (SD = 8.2). The proportions of females and residents in the 'oldest-old' category were higher than those of males and residents in the 'youngest-old' category in both Groups 1 and 2. In Group 1, overall 65.8% of residents were prescribed psychotropic medications. Among residents prescribed psychotropic medications, those prescribed antidepressants alone, or at least an antidepressant, represented the highest proportion in both Groups 1 and 2. Since some residents were prescribed multiple psychotropic medication types and were therefore counted in more than one class, the total number of residents on psychotropic medications (6,989) includes duplicates, whereas the actual number of unique residents is 5,123. For example, a resident on antidepressants + antipsychotics was counted twice in residents on at least antidepressants and residents on at least antipsychotics. To avoid double-counting residents and thus distorting the results, the analysis therefore focused on each psychotropic class separately. For example, residents prescribed antidepressants alone were not compared with those on "antidepressants + antipsychotics," "antidepressants + anxiolytics," or "antidepressants + antipsychotics + anxiolytics."

***Table 5.1**: Descriptive statistic for residents prescribed and not prescribed antidementia medications.*

	Group 1: Residents prescribed anti-dementia medications	Group 2: Residents not prescribed anti-dementia medications
Residents (n=9060)	**2082 (23%)**	**6978 (77%)**
Gender:		
Male	612 (29.4%)	2045 (29.3)
Female	1470 (70.6%)	4933 (70.7)
Age group:		
Youngest-old (65 – 84)	892 (42.8%)	2520 (36.1%)
Oldest-old (85 – 105)	1190 (57.2)	4458 (63.9%)
Male with age group:		
Youngest-old male	310 (50.7%)	1053 (51.5%)
Oldest-old male	302 (49.3%)	992 (48.5%)
Female with age group:		
Youngest-old female	582 (39.6%)	1467 (29.7%)
Oldest-old female	888 (60.4%)	3466 (70.3%)
Psychotropic medication:		
Yes	1369 (65.8%)	3754(53.8%)
No	713 (34.2%)	3224 (46.2%)
Residents on each type of psychotropic alone and in combination (n=5,123):	**1369 (27%)**	**3754 (73%)**
Antidepressants alone	643 (47%)	1850 (49.3)
Antipsychotics alone	162 (11.8%)	564 (14.5%)
Anxiolytics alone	102 (7.5%)	230 (6.1%)
Antidepressants + Antipsychotics	167 (12.2%)	468 (12.5%)
Antidepressants + Anxiolytics	163 (12%)	301 (8%)
Antidepressants + Antipsychotics + Anxiolytics	78 (5.7%)	198 (5.3%)
Antipsychotics + Anxiolytics	54 (4%)	161(4.3%)
Total of residents on one class alone	907 (66.2%)	2644 (70%)
Total of residents on combinations	462 (33.7%)	1128 (30%)
Residents on at least one type of psychotropic (n=6,989): ***	**1909 (27%)**	**5080 (73%)**
Total antidepressants	1051 (55%)	2817 (55.5%)
Total antipsychotic	461 (24%)	1373 (27%)
Total anxiolytics	397 (21%)	890 (17.5%)
Number of all medications (n=93,884)	21,073 (22.4%)	72,811 (77.6%)
Number of psychotropic medications (n=7,870):	**2114 (27%)**	**5756 (73%).**
Antidepressants	1213 (57.4%)	3261 (56.7%)
Antipsychotics	495 (23.4%)	1571 (27.3%)
Anxiolytics	406 (19.2%)	924 (16.1%)

*** Number of residents prescribed at least one type of psychotropic medication (alone or in combinations). Since some residents were prescribed multiple psychotropic medications and counted in more than one class, the total number of residents on psychotropics (6,989) includes duplicates.

There was no association between gender and anti-dementia medication status (**chi-square, p > 0.05**). However, there was a significant association between age group and anti-dementia medication status (**chi-square, p < 0.001, Phi = 0.058**). The number of youngest-old residents in Group 1 (42.8%) was significantly higher than the number of youngest-old residents in Group 2 (36.1%).

For each gender, a further classification was performed according to age group and anti-dementia medications prescribing status. There was no association between male gender and anti-dementia medication status. However, there was a significant association between female gender and anti-dementia medication status (**chi-square, p < 0.001, Phi = 0.089**), so the number of youngest-old females in Group 1 (39.6%) was significantly higher than the number of youngest-old females in Group 2 (29.7%), and the opposite was true with the oldest-old females (Group 1: 60.4%, Group 2: 70.3%) (**Table 5.1**).

5.3.2 Residents prescribed anti-dementia and psychotropic medications:

There was a significant association between the prescribing of anti-dementia and psychotropic medications (antidepressants, antipsychotics, and anxiolytics) (**chi-square test, p <0.001, Phi = 0.101**). The proportion of residents prescribed psychotropic medications was significantly higher in Group 1 (65.8%) compared to Group 2 (53.8%) (**Table 5.2**, **Figure 5.1.B**) i.e. residents with anti-dementia medications were more likely to be prescribed psychotropic medications than those without. Specifically, residents prescribed antidementia medications were 1.649 times more likely to be prescribed psychotropic medications compared to those without antidementia medications (95% CI, 1.489 to 1.826). Even after controlling for gender and age, residents prescribed antidementia medications were 1.596 times more likely to be prescribed psychotropic medications compared to residents not prescribed antidementia (95% CI, 1.44 to 1.77). Conversely, residents not prescribed anti-dementia medications were more likely not to be prescribed psychotropic medications (**Table 5.2**). The number of psychotropic medications prescribed per resident did not differ significantly between the two Groups (1 and 2). Residents in Group 1 had a mean rank of 2611.14, while those in Group 2 had a mean rank of 2544.08 (**Mann–Whitney U test, p = 0.097**) (**Table 5.3**, **Figure 5.1.C**).

Table 5.2 *Psychotropic medications prescribed according to anti-dementia medication prescribing status.*

		Psychotropic medications		Total	p-value (Chi-square)	OR (95%CL)	Adjusted OR (95%CL)
Antidementia medication prescribing status:		Yes	No		<0.001	1.649 (1.489 - 1.826	1.596 (1.44 to 1.77)
Group 1: Residents prescribed anti-dementia medication (Yes)	Count (% within Group 1)	1369 (65.8%)	713 (34.2%)	2082			
	Adjusted residual	9.7	-9.7				
Group 2: Residents not prescribed anti-dementia medication (No)	Count (% within Group 2)	3754 (53.8%)	3224 (46.2%)	6978			
	Adjusted residual	-9.7	9.7				
Total		5123	3937	9060			

Note: There was a significant association between the prescribing of anti-dementia and psychotropic medications. The number of residents in Group 1 (65.8%) prescribed psychotropic medications was significantly higher than those in the Group 2 (53.8%). Residents prescribed anti-dementia medications were 1.596 times more likely to be prescribed psychotropic medications compared to residents who were not (95% CI, 1.44 to 1.77).

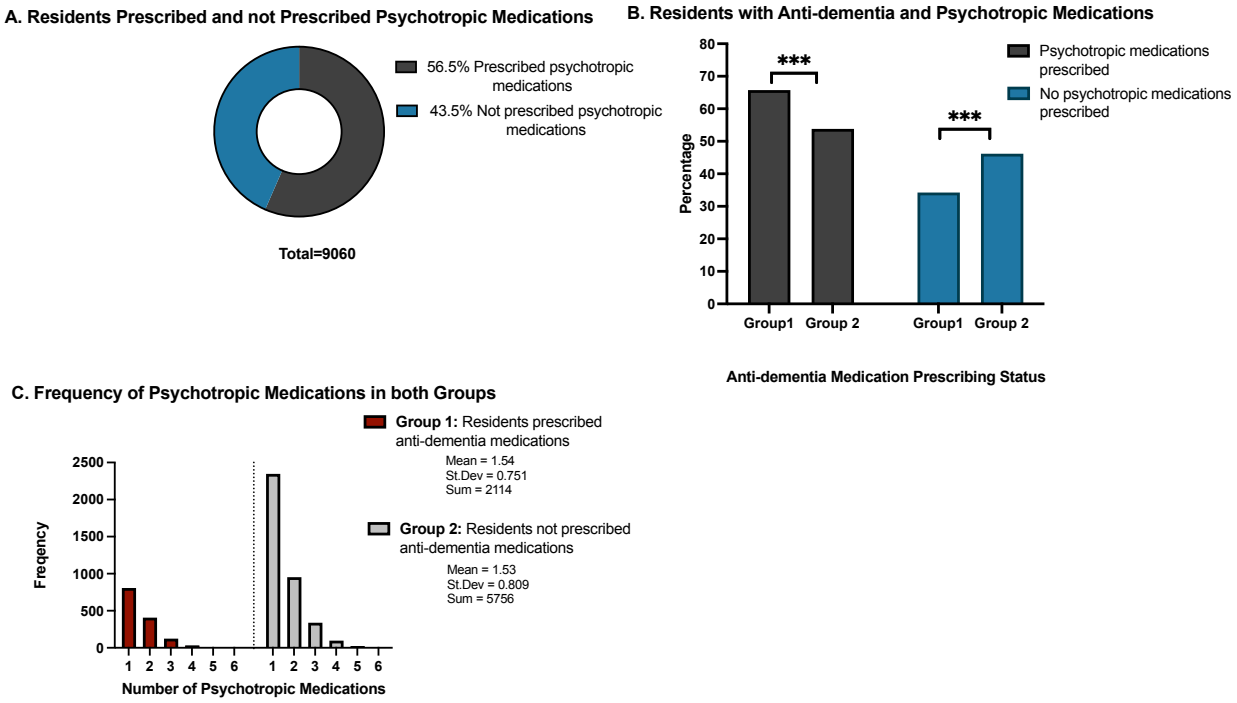


Figure 5.1: *(A) Residents prescribed psychotropic medications, irrespective of co-prescribing of anti-dementia medications. (B) Anti-dementia and psychotropic medications: residents in Group 1 (prescribed anti-dementia medications) were (65.8%) significantly more likely than those in Group 2 (no anti-dementia medications prescribed) (53.8%) to be prescribed psychotropic medications. (C) Frequency of psychotropic medications prescribed in both Groups: there were no significant differences between them.*

Table 5.3 *Frequency of psychotropic medications according to anti-dementia medication prescribing status*

Anti-dementia medication prescribing status:	Mean[a] (SD)	95% CI for mean	Median	Mean Rank	Min	Max	Range	Sum
Group 1: Residents prescribed anti-dementia medications (Yes)	1.54 (0.75)	(1.5 -1.58)	1	2611.14	1	5	4	2114
Group 2: Residents not prescribed anti-dementia medications (No)	1.53 (0.81)	(1.51 - 1.56)	1	2544.08	1	6	5	5756
Total	1.54 (0.794)	(1.51 - 1.56)	1		1	6	5	7870

[a] Mean number of psychotropic medications.

Note: The number of psychotropics prescribed per resident in Group 1 (mean rank 2611.14) was not significantly different compared to residents in Group 2 (mean rank 2544.08) (Mann-Whitney U test, p = 0.097).

5.3.2.1 Gender:

In both Groups 1and 2, regardless of anti-dementia medication prescribing status, males were prescribed more psychotropic medications than females, but this difference was only significant in Group 2, (**chi-square test of prescribing psychotropic medications and gender in Group 2, p < 0.05, Phi = 0.030**) (**Table 5.4**, **Figure 5.2 A and B**).

Comparing Group 1 versus Group 2, both males (68.1%) and females (64.8%) in Group 1 were significantly more likely to be prescribed psychotropic medications than males (56.1%) and females (52.8%) in Group 2, respectively (**chi-square test of prescribing antidementia and psychotropic medications in each gender: for both genders, p <0.001, Phi = 0.1**). (**Table 5.5**, **Figure 5.2 C and D**).

Table 5.4 *Residents' genders classified according to anti-dementia and psychotropic medication prescribing.*

		Psychotropic medications			Total	p-value (psychotropic medications and gender in Group 1)
Anti-dementia medication prescribing status	**Gender**		Yes	No		0.153
Group 1: Residents prescribed anti-dementia medications (Yes)	Male	Count	417	195	612	
		% within males in Group 1 (n=612) *	68.10%	31.90%	100.00%	
		% within total of Group 1 (n= 2082)**	20%	9.4%		
	Female	Count	952	518	1470	
		% within females in Group 1 (n=1470)	64.80%	35.20%	100.00%	
		% within total of Group 1 (n= 2082)**	45.7%	25%		
		Psychotropic medications			**Total**	**p-value** (psychotropic medications and gender in Group 2)
	Gender		Yes	No		0.015
Group 2: Residents not prescribed anti-dementia medications (No)	Male	Count	1147	898	2045	
		% within males in Group 2 (n=2045)*	56.10%	43.90%	100.00%	
		% within total of Group 2 (n= 6978)**	16.4%	13%		
	Female	Count	2607	2326	4933	
		% within females in Group 2 (n=4933)	52.80%	47.20%	100.00%	
		% within total of Group 2 (n= 6978)**	37.4%	33.3		

Note: Gender in Group 1 was not significantly associated with psychotropic medications; however, males were prescribed more than females. In Group 2, gender was significantly associated with psychotropic medications, with males prescribed significantly more psychotropic medications than females.
Orange shading indicates significance, while Green indicates higher values but not significant.
*This percentage is calculated based on the total number of male residents in that group to avoid the influence of the large number of female residents (i.e. controlling gender imbalance).
**This percentage is calculated based on the total number of residents in each group, regardless of gender. Therefore, it is influenced by the high number of female residents.

Table 5.5 *Comparison of psychotropic medication prescribing in Group 1 versus those in Group 2, according to residents' gender*

			Psychotropic medications		**Total**	**p-value** (psychotropic medications and anti-dementia status in males)
	Anti-dementia status		Yes	No		<0.001
Males	Group 1: Residents prescribed anti-dementia medications (Yes)	Count	417	195	612	
		% within males in Group 1	68.10%	31.90%	100.00%	
	Group 2: Residents not prescribed anti-dementia medications (No)	Count	1147	898	2045	
		% within males in Group 2	56.10%	43.90%	100.00%	
			Psychotropic medications		**Total**	**p-value** (psychotropic medications and anti-dementia status in females)
	Anti-dementia status		Yes	No		<0.001
Females	Group 1: Residents prescribed anti-dementia meds (Yes)	Count	952	518	1470	
		% within females in Group 2	64.80%	35.20%	100.00%	
	Group 2: Residents not prescribed anti-dementia meds (No)	Count	2607	2326	4933	
		% within females in Group 2	52.80%	47.20%	100.00%	

Note: Comparing Group 1 versus Group 2, both males (68.1%) and females (64.8%) in Group 1 were significantly more likely to be prescribed psychotropic medications than males (56.1%) and females (52.8%) in Group 2, respectively. Orange shading indicates significance.

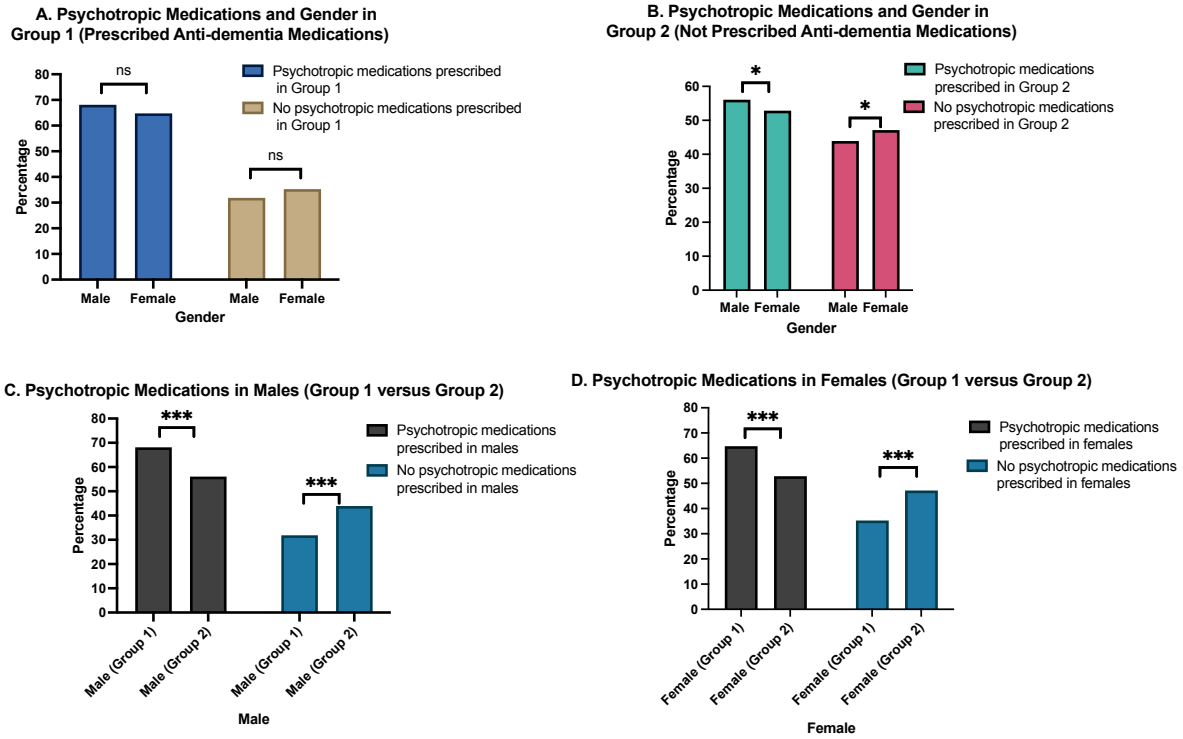


Figure 5.2: *Residents' genders were divided based on anti-dementia and psychotropic medication prescribing status. In both (A) Group 1 and (B) Group 2, males were more likely than females to be prescribed psychotropic medications but this was only significant in Group 2. In (C) and (D), both males and females in Group 1 (prescribed anti-dementia medication) were more likely to be prescribed psychotropic medications than males and females in Group 2 (not prescribed anti-dementia medications), respectively. *adj. p-value <0.05, ***adj. p-value <0.001.*

5.3.2.2 Age groups:

In both Groups (1 and 2), the youngest-old were significantly more likely to be prescribed psychotropic medications than the oldest-old (**chi-square test of psychotropic medications and age group in both groups, p < 0.001**). In Group 1, Phi was 0.118, while for Group 2, Phi was 0.167 (**Table 5.6**, **Figure 5.3 A and B**). Thus, the youngest- old were prescribed more psychotropic medications, regardless of anti-dementia medication status.

Comparing Group 1 versus Group 2, both youngest-old (72.2%) and oldest-old (60.9%) residents in Group 1 were significantly more likely than youngest-old (64.9%) and oldest old (47.5%) residents in Group 2 to be receiving psychotropic medications (**chi-square test of psychotropic medication and anti-dementia medications status in each age group: for both age groups, $p < 0.001$**). The Phi value for anti-dementia medication status for the youngest old group was 0.068, while for the oldest-old group, it was 0.12 (**Table 5.7**, **Figure 5.3 C and D**).

Table 5.6 *Residents' age classified according to anti-dementia and psychotropic medication prescribing.*

		Psychotropic medications			Total	p-value (psychotropics and age in Group 1)
Anti-dementia Status	**Age group**		Yes	No		<0.001
Group 1: Residents prescribed anti-dementia meds (Yes)	Youngest-old (65 – 84)	Count	644	248	892	
		% within youngest-old in Group 1 (n=892)*	72.20%	27.80%		
		% within total of Group 1 (n= 2082)**	31%	12%		
	Oldest-old (85 – 105)	Count	725	465	1190	
		% within oldest-old in Group 1 (n=1190)	60.90%	39.10%		
		% within total of Group 1 (n= 2082)**	35%	22.3%		
		Psychotropic medications			**Total**	**p-value (**psychotropics and age in Group 2)
	Age group		Yes	No		<0.001
Group 2: Residents not prescribed anti-dementia meds (No)	Youngest-old (65 - 84)	Count	1635	885	2520	
		% within youngest-old in Group 2 (n=2520)	64.90%	35.10%	100.00%	
		% within total of Group 2 (n=6978)**	23.4%	12.7%		
	Oldest-old (85 - 105)	Count	2119	2339	4458	
		% within oldest-old in Group 2	47.50%	52.50%	100.00%	
		% within total of Group 2 (n=6978)**	30.4%	33.5%		

Note: Age in both Groups was significantly associated with psychotropic medication prescribing. The youngest-old were significantly more likely to be prescribed psychotropic medications than the oldest-old in both Groups 1 and 2, regardless of anti-dementia medication prescribing status. Orange shading indicates significance

*This percentage is calculated based on the total number of youngest-old residents in that group to avoid the influence of the large number of oldest-old residents (i.e. to control age imbalance).

**This percentage is calculated based on the total number of residents in each group, regardless of age. Therefore, it is influenced by the high number of oldest-old residents.

***Table 5.7**: Comparison of psychotropic medication prescribing in Group 1 versus those in Group 2, according to residents' age*

			Psychotropic medications		Total	p-value (psychotropics and anti-dementia status in youngest-old)
	Anti-dementia status		Yes	No		<0.001
Youngest-old (65 – 84 years)	Group 1: Residents prescribed anti-dementia medications (Yes)	Count	644	248	892	
		% within Youngest-old in Group 1	72.20%	27.80%	100.00%	
	Group 2: Residents not prescribed anti-dementia medications (No)	Count	1635	885	2520	
		% within Youngest-old in Group 2	64.90%	35.10%	100.00%	

			Psychotropic medications		Total	p-value (psychotropics and anti-dementia status in oldest-old)
	Anti-dementia status		Yes	No		<0.001
Oldest-old (85 - 105 years)	Group 1: Residents prescribed anti-dementia medications (Yes)	Count	725	465	1190	
		% within oldest-old in Group 1	60.90%	39.10%	100.00%	
	Group 2: Residents not prescribed anti-dementia medications (No)	Count	2119	2339	4458	
		% within oldest-old in group 2	47.50%	52.50%	100.00%	

Note: Anti-dementia medication prescribing status in each age group was significantly associated with psychotropic medication prescribing. Both youngest-old (72.2%) and oldest-old (60.9%) residents in Group 1 (prescribed anti-dementia medications) were significantly more likely to be prescribed psychotropic medications than youngest-old (64.9%) and oldest-old (47.5%) residents in Group 2 (no anti-dementia medications prescribed). Orange shading indicates significance.

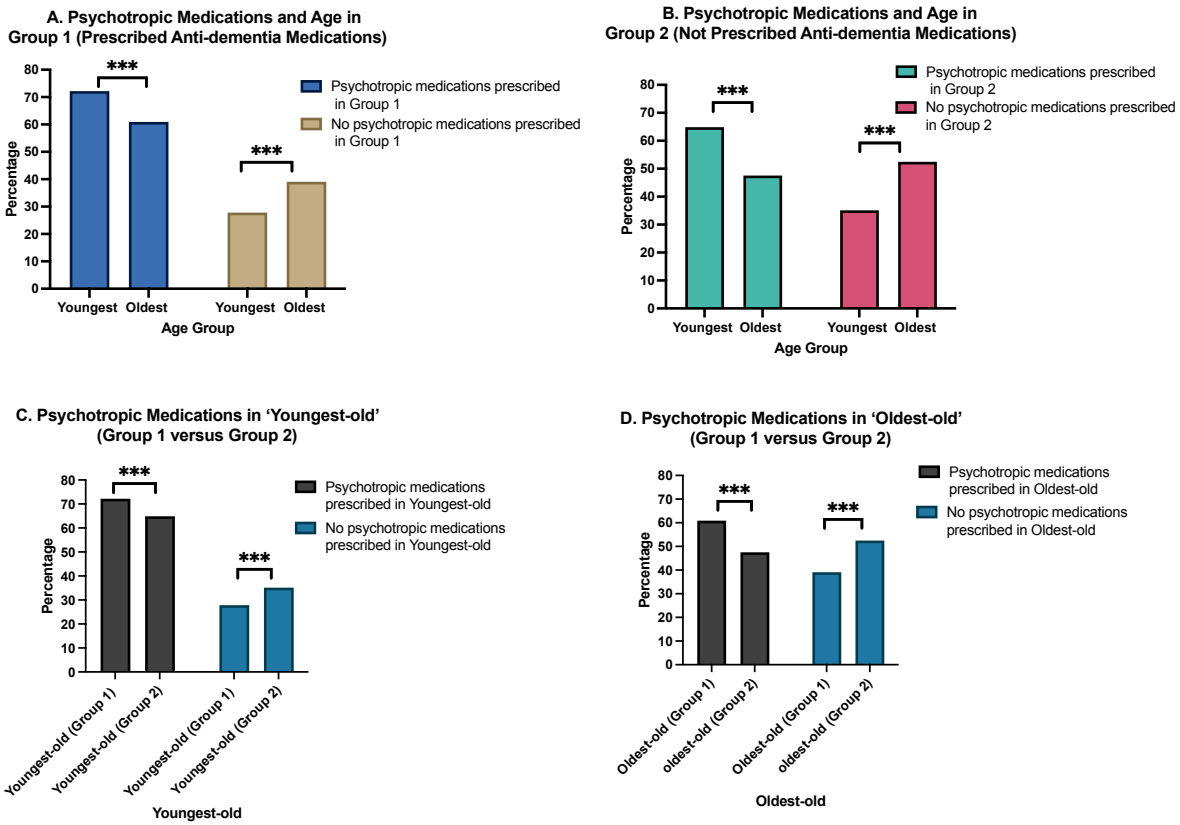


***Figure 5.3**: Residents' ages were compared based on prescribed anti-dementia and psychotropic medications. In (A and B) in both Groups 1 and 2, youngest-old residents were more likely to be prescribed psychotropic medications than oldest-old residents. In (C) and (D) both youngest-old and oldest-old residents in Group 1 (prescribed anti-dementia medications) were more likely to be prescribed psychotropic medications than youngest-old and oldest-old residents in Group 2, respectively, ***adj. p-value <0.001.*

5.3.2.3 Gender and age group:

A further classification was performed based on gender and age together. Youngest-old male and female residents in both Groups 1 and 2 (Group 1: males 76.5%, females 70%; Group 2: males 63.2%, females 66.1%,) were significantly more likely than the oldest-old residents (Group 1: males 59.6%, females 61.4%; Group 2: males 48.5%, females 47.3%) to be prescribed psychotropic medications, respectively (**chi-square test of psychotropic medications and age group for both males and females p < 0.001**) **(Tables 5.8 and 5.9**, and **Figure 5.4**).

Comparing age groups of males in Group1 versus Group 2, both youngest-old (76.5%) and oldest-old (59.6%) male residents in Group 1 were significantly more likely to be prescribed psychotropic medications than youngest-old (63.2%) and oldest old (48.5%) male residents in Group 2, respectively (**chi-square test of psychotropic and anti-dementia medications status for age group in males p < 0.001**) (**Tables 5.8 and 5.9**, and **Figure 5.5 A and B**). Also, by comparing age groups of females in Group 1 versus Group 2, oldest-old female residents in Group 1 (61.4%) were significantly more likely to be prescribed psychotropic medications than oldest-old female residents in Group 2 (47.3%) (**chi-square test of psychotropic and anti-dementia medications status for oldest-old in females, p < 0.001**). While female youngest-old residents in Group 1 (70%) were more likely than those in the youngest-old Group 2 (66.1%) to be prescribed psychotropic medications, this difference was not significant (**chi-square test of psychotropic and antidementia medications status for youngest-old in females, chi-square test, p = 0.092**) (**Tables 5.8 and 5.9**, **Figure 5.5 C and D**).

***Table 5.8**: Residents' gender and age classification together according to psychotropic medication prescribing in Group 1 (residents prescribed anti-dementia medications)*

			Psychotropic medications		Total	p-value (psychotropics and male age groups in Group 1)
Group 1: Residents prescribed anti-dementia medications (Yes)	**Males - age groups**		Yes	No		<0.001
	Youngest-old	Count	237	73	310	
		% within youngest-old male- Group 1 (n=310)	76.50%	23.50%	100.00%	
		% within total of male in Group 1 (n=612)	38.7%	11.9%		
	Oldest-old	Count	180	122	302	
		% within oldest-old male- group 1 (n=302)	59.60%	40.40%	100.00%	
		% within total of male in Group 1 (n=612)	29.4%	19.9%		
			Psychotropic medications		**Total**	**p-value** (psychotropics and female age groups in Group 1)
	Females - age groups		Yes	No		<0.001
	Youngest-old	Count	407	175	582	
		% within youngest-old female- Group 1 (n=582)	69.90%	30.10%	100.00%	
		% within total of female in Group 1 (n=1470)	27.7%	11.9%		
	Oldest-old	Count	545	343	888	
		% within oldest-old female- Group 1 (n=888)	61.40%	38.60%	100.00%	
		% within total of female in Group 1 (n=1470)	37.1%	23.3%		

Note: There was a significant association between psychotropic medications and age group for both males and females, within Group 1 (residents prescribed anti-dementia medications). The youngest-old (65 - 84 years) were significantly more likely to be prescribed psychotropic medications than the oldest-old (85 – 105 years) in both males and females within Group 1. Orange shading indicates significance.

***Table 5.9**: Residents' gender and age classification together according to psychotropic medication prescribing in Group 2 (residents not prescribed anti-dementia medications)*

			Psychotropic medications		Total	**p-value** (psychotropics and male age groups in Group 2**)**
Group 2: Residents not prescribed anti-dementia medications (No)	**Males - age group**		Yes	No		<0.001
	Youngest-old	Count	666	387	1053	
		% within youngest-old male- Group 2 (n=1053)	63.20%	36.80%	100.00%	
		% within total of male in Group 2 (n=2045)	32.6%	18.9%		
	Oldest-old	Count	481	511	992	
		% within oldest-old male- Group 2 (n=992)	48.50%	51.50%	100.00%	
		% within total of male in Group 2 (n=2045)	23.5%	25%		
			Psychotropic medications		**Total**	**p-value** (psychotropics and female age groups in Group 2)
	Females - age group		Yes	No		<0.001
	Youngest-old	Count	969	498	1467	
		% within youngest-old female- Group 2 (n=1467)	66.10%	33.90%	100.00%	
		% within total of female in Group 2 (n=4933)	19.6%	10.1%		
	Oldest-old	Count	1638	1828	3466	
		% within oldest-old female- Group 2 (n=3466)	47.30%	52.70%	100.00%	
		% within total of female in Group 2 (n=4933)	33.2%	37.1%		

Note: There was a significant association between psychotropic medications and age group within Group 2 (residents without anti-dementia medications) for both males and females. The youngest-old (65 – 84 years) were significantly more likely to be prescribed psychotropic medications than the oldest-old (85 – 105 years) in both males and females within Group 2. Orange shading indicates significance.

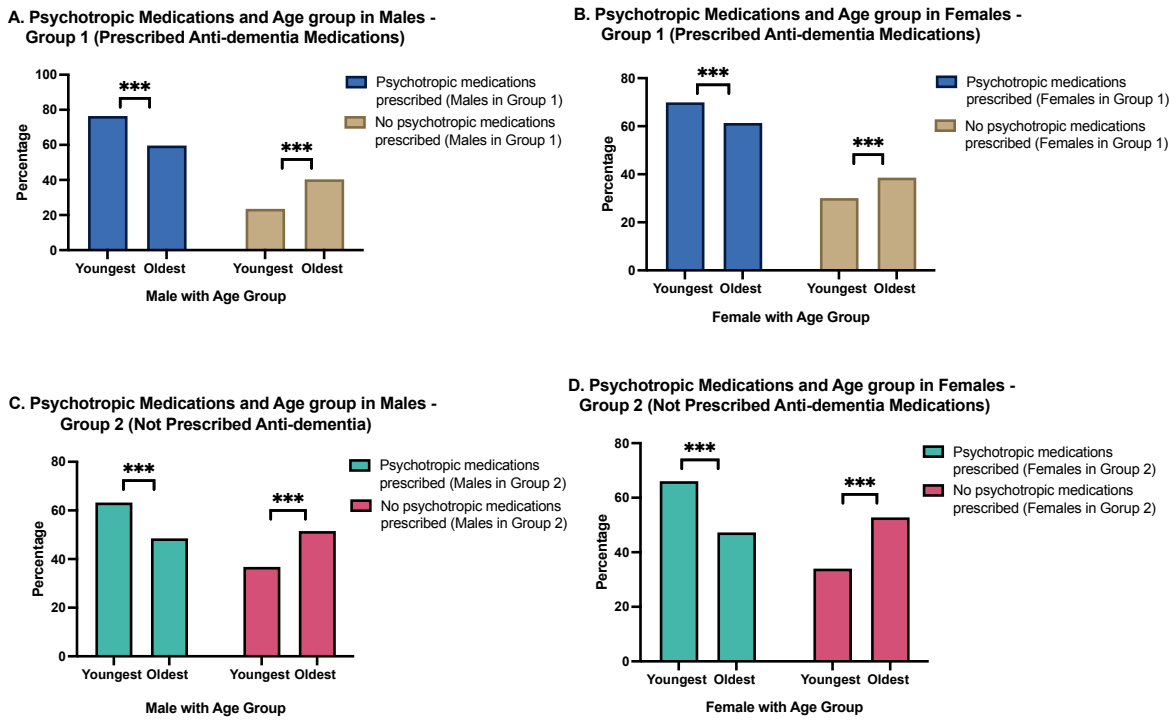


Figure 5.4: *Residents' gender and age together in Groups 1 and 2. In A and B: for both genders in Group 1 (prescribed anti-dementia medications), youngest-old residents were prescribed more psychotropic medications than oldest-old residents. In C and D: for both genders in Group 2 (no anti-dementia medications prescribed), youngest-old residents were prescribed more psychotropic medications than oldest-old residents. ***adj. p-value <0.001.*

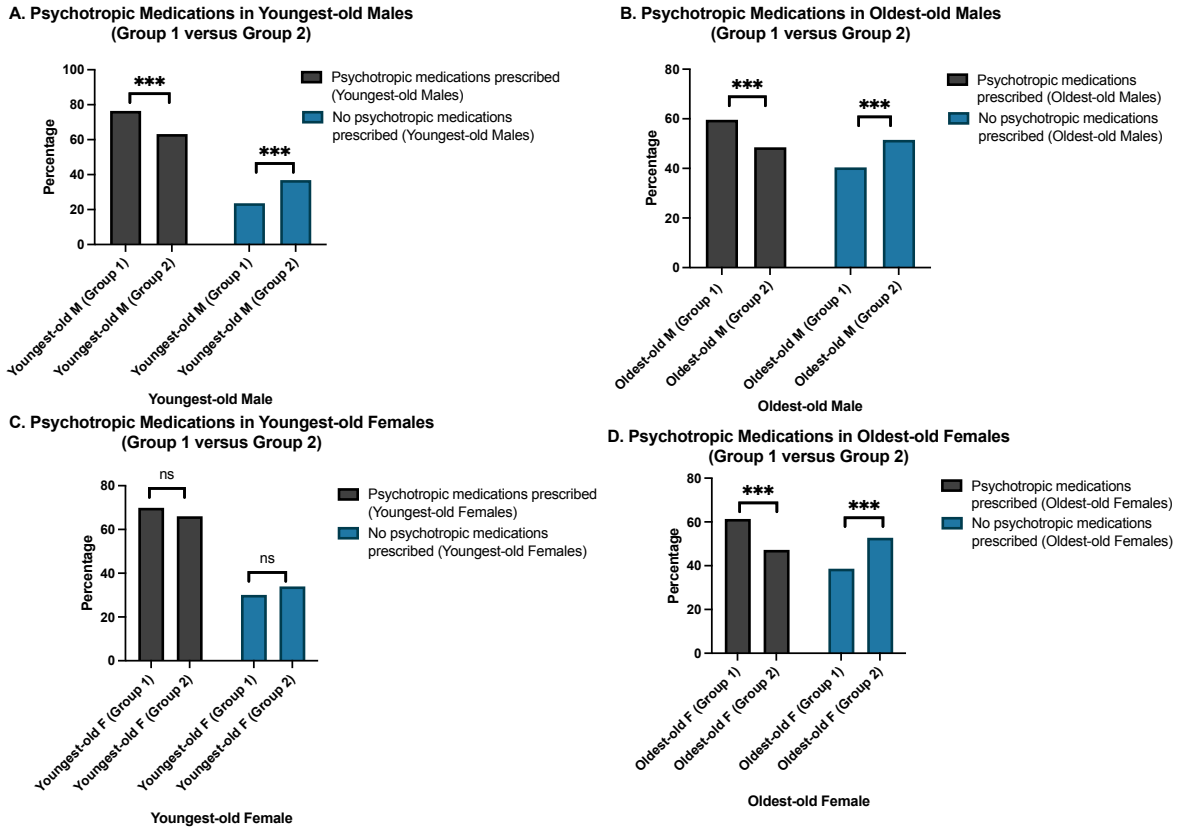


Figure 5.5 *Comparing residents' gender and age in Group 1 (residents prescribed anti-dementia medications) versus Group 2 (residents not prescribed anti-dementia medications). A and B: in males, both age groups (youngest and oldest) in Group 1 were prescribed more psychotropic medications than their counterparts in Group 2. C and D: in females, only the oldest-old in Group 1 were prescribed significantly more psychotropic medications than the oldest-old in Group 2. ***adj. p-value <0.001.*

5.3.3 Classes of psychotropic medications

As described in **Chapter 4**, which discussed classes of psychotropic medication, it is essential to examine further each class in relation to residents in Groups 1 and 2, i.e. those residents who are prescribed anti-dementia medications and those that are not, respectively.

5.3.3.1 Residents prescribed different classes of psychotropic medications

There was a significant association between residents prescribed different classes of psychotropic medications concurrently with anti-dementia medications (among residents on psychotropic medications only (n=5123), **chi-square test, p <0.01, Cramer's V = 0.051**, and across all residents (n = 9060) **chi-square test, p <0.001, Cramer's V = 0.109**) **(Table 5.10, Table 5.11).**

Among residents prescribed psychotropic medications (n=5123), those prescribed antidepressants alone represented the largest proportion in both Group 1 (47%) and Group 2 (49.3%), followed by residents prescribed a combination of psychotropic medications in Group 1 (33.7%) and Group 2 (30%) (**Table 5.10, Figure 5.6.A**).

A similar pattern of psychotropic medication prescribing was observed across all residents (n=9060). Those prescribed antidepressants alone represented the largest proportion in both Group 1 (30.9%) and Group 2 (26.5%), followed by residents prescribed combinations of psychotropic medications in both Group 1 (22.2%) and Group 2 (16.2%). However, in this broader sample, residents who were not prescribed psychotropic medications were also included, and they constituted the highest proportion overall in both Group 1 (34.2%) and Group 2 (46.2%) (**Table 5.11**).

When comparing Group 1 versus Group 2 among residents prescribed psychotropic medications (n = 5,123), residents in Group 1 were significantly more likely (**p < 0.05**) to be prescribed a combination of psychotropic medications (33.7%) compared to those in Group 2 (30%) **(Table 5.10; Figure 5.6.A).** Conversely, residents in Group 2 were significantly more likely (**p < 0.05**) to be prescribed antipsychotics alone (14.5%) compared to those in Group 1 (11.8%) **(Table 5.10; Figure 5.6).**

Also, across all residents (n = 9,060), those in Group 1 were significantly more likely to be prescribed antidepressants alone (30.9%), anxiolytics alone (4.9%), and a combination of psychotropic medications (22.2%) compared to those in Group 2 (26.5%, 3.3%, and 16.2%, respectively). However, residents in Group 2 were significantly more likely not to be prescribed psychotropic medications (**Table 5.11**).

***Table 5.10**: Number of residents prescribed different classes of psychotropic medications in Group 1 and Group 2 – among residents on psychotropic medications (n = 5123)*

		Classes of Psychotropic medications				Total	Chi-square, overall p-value
Anti-dementia medication prescribing status		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination		0.004
Group 1 Residents prescribed anti=dementia medications (Yes)	Count	643	162	102	462	1369	
	% within Group 1	47.00%	11.80%	7.50%	33.70%	100.00%	
	Adjusted Residual	-1.5	-2.5	1.7	2.5		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	1850	546	230	1128	3754	
	% within Group 2	49.30%	14.50%	6.10%	30.00%	100.00%	
	Adjusted Residual	1.5	2.5	-1.7	-2.5		
	Adj.p.value*	0.534	<0.05	0.356	<0.05		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: there was a significant association between residents on different classes of psychotropic and anti-dementia medications. Among residents on psychotropic medications, residents in Group 1 (prescribed anti-dementia medications) were significantly more likely to be prescribed a combination of psychotropic medications compared to those in Group 2 (not prescribed anti-dementia medications). However, residents in Group 2 were more likely to be prescribed antipsychotics alone compared to those in Group 1.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*Adjusted p-value (Bonferroni correction) between Group 1 vs Group 2 for each type of psychotropic medication.

***Table 5.11**: Number of residents prescribed different classes of psychotropic medications in Group 1 and Group 2 – across all residents (n = 9060)*

		Classes of Psychotropic medications						Chi-square, overall p-value
Anti-dementia medication prescribing status		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Group 1 Residents prescribed antidementia medications (Yes)	Count	713	643	162	102	462	2082	
	% within Group 1	34.20%	30.90%	7.80%	4.90%	22.20%	100.00%	
	Adjusted Residual	-9.7	3.9	-0.1	3.4	6.3		
Group 2 Residents not prescribed antidementia medications (No)	Count	3224	1850	546	230	1128	6978	
	% within Group 2	46.20%	26.50%	7.80%	3.30%	16.20%	100.00%	
	Adjusted Residual	9.7	-3.9	0.1	-3.4	-6.3		
	Adj.p.value*	<0.001	<0.001	1	<0.01	<0.001		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: there was a significant association between residents prescribed different classes of psychotropic and anti-dementia medications. Across all residents, residents in Group 1 (prescribed anti-dementia medications) were significantly more likely to be prescribed antidepressants alone, anxiolytics alone, and combinations of psychotropic medication compared to those in Group 2 (not prescribed anti-dementia medications). However, residents in Group 2 were more likely not to be prescribed psychotropic medications compared to those in Group 1.

Orange shading is a higher percentage and statistically significant data compared to the other group.

*Adjusted p-value (Bonferroni correction) between Group 1 vs Group 2 for each type of psychotropic medications.

After investigating the combination of psychotropic medications, there was a significant association between residents prescribed the combination of psychotropic and anti-dementia medications (**chi-square test, p <0.01, Cramer's V = 0.088**). 'Antidepressants + antipsychotics' and 'antidepressants + anxiolytics' represented the highest number within the combinations of psychotropic medications in both Groups 1 and 2 (**Table 5.12**, **Figure 5.6.B**). Comparing groups, residents in Group 1 were significantly more likely to be prescribed 'antidepressants + anxiolytics' than those in Group 2 (**Table 5.12**, **Figure 5.6.B**).

Table 5.12 *Number of residents prescribed combinations of psychotropic medications in Group 1 and Group 2*

		Type of Combinations				Total	Overall p-value
Anti-dementia medication prescribing status		AntiDep + AntiPsy[1]	AntiDep + Anxio[2]	antiDep+ AntiPsy+ Anxio[3]	AntiPsy+ Anxio[4]		0.006
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	167	163	78	54	462	
	% within Group 1	36.10%	35.30%	16.90%	11.70%	100.00%	
	Adjusted Residual	-2	3.4	-0.3	-1.4		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	468	301	198	161	1128	
	% within Group 2	41.50%	26.70%	17.60%	14.30%	100.10%	
	Adjusted Residual	2	-3.4	0.3	1.4		
	Adj.p.value*	0.182	<0.01	3.05	0.646		

[1]AntiDep+AntiPsy = antidepressants + antipsychotics, [2]AntiDep+Anxio = antidepressants + anxiolytics,[3]AntiDep+AntiPsy+Anxio = antidepressants + antipsychotics + anxiolytics, [4]AntiPsy+Anxio = antipsychotics + anxiolytics.
Note: there was a significant association between residents on the combination of psychotropic and anti-dementia medication. Residents in Group 1 were significantly more likely to be prescribed 'antidepressants + anxiolytics' compared to those in the Group 2.
Orange shading is a higher percentage and statistically significant data compared to the other group.
*adjusted p-value (Bonferroni correction) between Group 1 and Group 2 for each type of psychotropic medication.

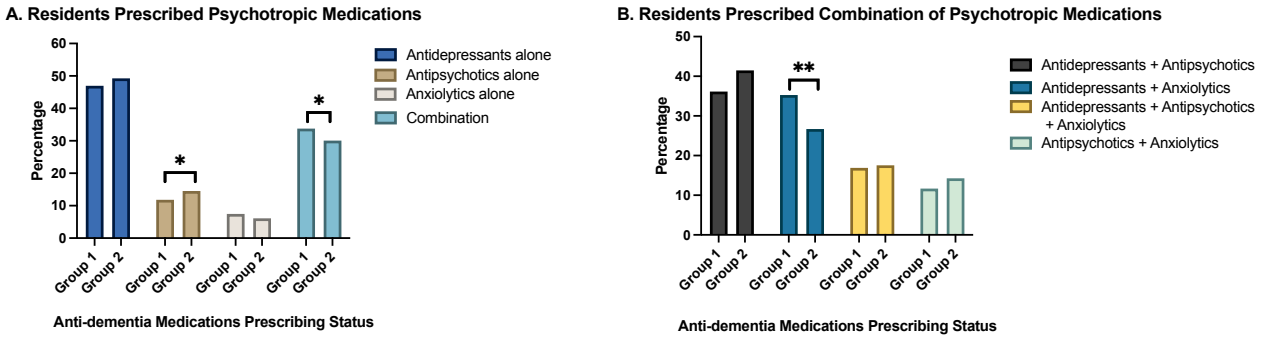


***Figure 5.6**:(A) Percentage of residents prescribed different classes of psychotropic medications alone or in combination – among those on psychotropic medications (n=5123). In (B)breakdown of combinations of psychotropics in both groups: Group 1 and Group 2. *adj. p-value <0.05, **adj. p-value <0.01.*

5.3.3.2 Gender

After dividing residents according to gender among resident on psychotropics (n=5123), gender (male vs. female) in both Groups 1 and 2 was significantly associated with the prescribing of different classes of psychotropic medications (**chi-square test, overall p-value in both groups < 0.05**). In both Groups 1 and 2 females (49.7% and 51.1%, respectively) were significantly more likely to be prescribed antidepressants alone than males (40.8% and 45.2%, respectively). However, males were more likely to be prescribed antipsychotics alone, anxiolytics alone and combinations of psychotropics than females in both groups, but the only significant difference was for antipsychotics alone in Group 2 (16.8% vs 13.5%) (**Table 5.13**, **Figure 5.7 A and B**).

Anti-dementia medication prescribing status in males was not significantly associated with prescribing different classes of psychotropic medications (**chi-square test, overall p-value = 0.69**). However, prescribing anxiolytics and combinations of medications tended to be more likely in males in Group 1 than males in Group 2, although this difference was not significant (**Table 5.14**, **Figure 5.7 C**). In contrast, anti-dementia medication prescribing status in females was significantly associated with prescribing different classes of psychotropic medications (**chi-square test, overall p-value = 0.048**). While females in Group 1 were more likely to be prescribed anxiolytics alone or combinations of medications compared to Group 2, these specific differences were not statistically significant. (**Table 5.14**, **Figure 5.7 D**).

***Table 5.13**: Residents' gender and different classes of psychotropic medication prescribed in Groups 1 and 2, among residents on psychotropic medications (n=5123)*

			Classes of Psychotropic medications					p-value (different psychotropics and gender in Group 1)
	Gender		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.02
Group 1 Residents prescribed anti-dementia medications (Yes)	Males	Count	170	58	33	156	417	
		% within males in Group 1	40.80%	13.90%	7.90%	37.40%	100.00%	
		Adjusted Residual	-3	1.6	0.4	1.9		
	Females	Count	473	104	69	306	952	
		% within females in Group 1	49.70%	10.90%	7.20%	32.10%	100.00%	
		Adjusted Residual	3	-1.6	-0.4	-1.9		
		Adj. P. value*	0.01	0.43	2.7	0.22		

			Classes of Psychotropic medications					p- value (different psychotropics and gender in Group 2)
	Gender		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.003
Group 2 Residents not prescribed anti-dementia medications (No)	Males	Count	518	193	79	357	1147	
		% within males in Group 2	45.20%	16.80%	6.90%	31.10%	100.00%	
		Adjusted Residual	-3.3	2.6	1.3	1		
	Females	Count	1332	353	151	771	2607	
		% within females in Group 2	51.10%	13.50%	5.80%	29.60%	100.00%	
		Adjusted Residual	3.3	-2.6	-1.3	-1		
		Adj. p-value*	<0.01	<0.05	0.77	1		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: There was a significant association between different classes of psychotropic medications and gender in both Groups 1 and 2. Females were significantly more likely to be prescribed antidepressants alone than males in both Groups 1 and 2. However, males were more likely to be prescribed antipsychotics alone than females, with this difference being significant only in Group 2.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage in male than female but not statistically significant data.

*adjusted p-value (Bonferroni correction).

***Table 5.14**: Comparing anti-dementia medication prescribing status with residents' gender for different classes of psychotropic medication, among residents on psychotropic medications (n=5123)*

			Classes of Psychotropic medications					p-value (different psychotropics and anti-dementia medication status in males)
	Anti-dementia status		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.69
Males	Group 1: prescribed anti-dementia medications	Count	170	58	33	156	417	
		% within Group 1 males	40.80%	13.90%	7.90%	37.40%	100%	
		Adjusted Residual	-1.5	-1.4	0.7	2.3	-1.5	
	Group 2: Not prescribed anti-dementia medications	Count	518	193	79	357	1147	
		% within Group 2 males	45.20%	16.80%	6.90%	31.10%	100%	
		Adjusted Residual	1.5	1.4	-0.7	-2.3		
		Adj.p-va*	0.5	0.6	1	0.08		
			Classes of Psychotropic medications					p-value (different psychotropics and antidementia medication status in females)
	Anti-dementia status		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.048
Females	Group 1: prescribed anti-dementia medications	Count	473	104	69	306	952	
		% within Group 1 females	49.70%	10.90%	7.20%	32.10%	100%	
		Adjusted Residual	-0.7	-2.1	1.6	1.5		
	Group 2: Not prescribed anti-dementia medications	Count	1332	353	151	771	2607	
		% within Group 2 females	51.10%	13.50%	5.80%	29.60%	100%	
		Adjusted Residual	0.7	2.1	-1.6	-1.5		
		Adj.p.va*	1	0.14	0.4	0.5		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: There was a significant association between different classes of psychotropic medications and anti-dementia medication status only in females. Residents in Group 1 were prescribed more anxiolytics alone, and in combination than Group 2, in both genders but this was not significant. Green shading is a higher percentage in Group 1 than Group 2 but not statistically significant data.

*adjusted p-value (Bonferroni correction).

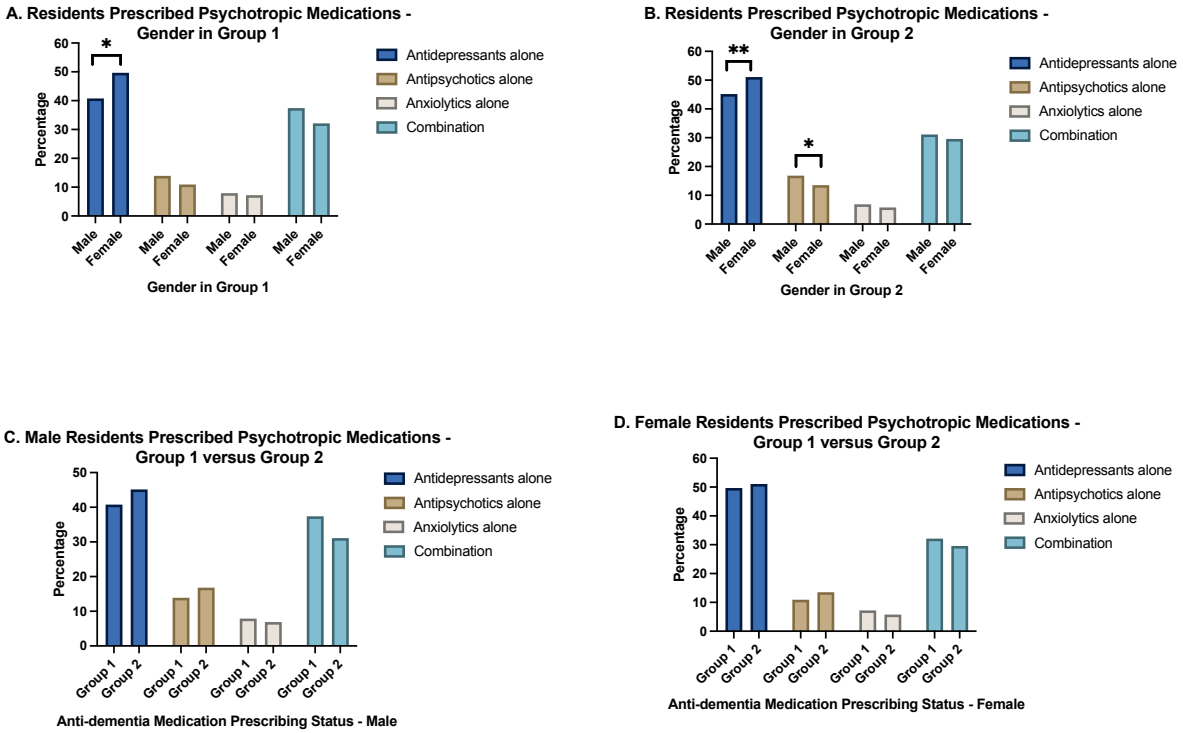


***Figure 5.7**: Residents' gender and different classes of psychotropic medication prescribed in Group 1 and Group 2, among those on psychotropic medications (n=5123). (A) Psychotropic medications by gender in Group1: females were prescribed significantly more antidepressants. (B) Psychotropic medications by gender in Group 2: females were prescribed significantly more antidepressants, whereas males were prescribed significantly more antipsychotics. (C) Different anti-dementia medication prescribing status in male residents: anxiolytics and combinations were more common in Group 1 but this was not significant. (D) Anti-dementia medication prescribing status in female residents: anxiolytics and combinations were more common in Group 1 but this was not significant. *adj. p-value <0.05, **adj. p-value <0.01.*

Across all residents (n=9,060), gender was significantly associated with the prescribing of different classes of psychotropic medications in both Groups 1 and 2 (**chi-square test, overall p-value < 0.05 for both groups**). Females tended to be more likely than males to not be prescribed any psychotropics and to be prescribed antidepressants alone in both groups; however, these differences were not statistically significant. Conversely, males tended to be prescribed antipsychotics alone, anxiolytics alone, and combinations of psychotropic medications more than females. The only statistically significant difference was in the prescribing of antipsychotics in Group 2 (males: 9.4% vs females: 7.2%) **(Table 5.15).**

Among male residents, anti-dementia medication prescribing status was significantly associated with prescribing different classes of psychotropic medications (**chi-square test, overall p-value < 0.001**). Males in Group 1 tended to be more likely than their counterparts in Group 2 to be prescribed antidepressants alone, antipsychotics alone, anxiolytics, and combinations of these medications, the only difference that was statistically significant, however, was for prescribing combinations of psychotropics (males in Group 1: 25.5% vs males in Group 2: 17.5%). However, males in Group 2 were significantly more likely to not be prescribed any psychotropic medications than those in Group 1 (43.9% vs 31.9%) **(Table 5.16).**

Similarly, in females, anti-dementia medication prescribing status was significantly associated with prescribing different classes of psychotropic medications (**chi-square test, overall p-value < 0.001**). Females in Group 1 were significantly more likely than those in Group 2 to be prescribed antidepressants alone (32.2% vs 27%), anxiolytics alone (4.7% vs 3.1%), and combinations (20.8% vs 15.6%). In contrast, females in Group 2 were more likely to not be prescribed any psychotropic medications compared to those in Group 1 (47.2% vs 35.2%) **(Table 5.16).**

Table 5.15: *Residents' gender and different classes of psychotropic medication prescribed in Group 1 and Group 2, across all residents (n=9060)*

			Classes of Psychotropic medications						p-value (different psychotropics and gender in Group 1)
	Gender		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.017
Group 1	Male	Count	195	170	58	33	156	612	
		% within male in Group 1	31.90%	27.80%	9.50%	5.40%	25.50%	100%	
		Adjusted Residual	-1.5	-2	1.9	0.7	2.3		
	Female	Count	518	473	104	69	306	1470	
		% within female in Group 1	35.20%	32.20%	7.10%	4.70%	20.80%	100%	
		Adjusted Residual	1.5	2	-1.9	-0.7	-2.3		
		Adj. P. value*	0.67	0.23	0.3	1	0.11		
			Classes of Psychotropic medications						**p-value (different psychotropics and gender in Group 2)**
	Gender		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Group 2	Male	Count	898	518	193	79	357	2045	
		% within Male Group 2	43.90%	25.30%	9.40%	3.90%	17.50%	100%	
		Adjusted Residual	-2.5	-1.4	3.2	1.7	1.9	-2.5	
	Female	Count	2326	1332	353	151	771	4933	
		% within Female Group 2	47.20%	27.00%	7.20%	3.10%	15.60%	100%	
		Adjusted Residual	2.5	1.4	-3.2	-1.7	-1.9		
		Adj. p-value*	0.062	0.8	<0.01	0.45	0.2		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: Considering all residents, there was a significant association between gender and the different classes of psychotropic medications prescribed in both Groups 1 and 2. Females were more likely than males to not be prescribed psychotropic medications or to be prescribed antidepressants, although these differences were not statistically significant. However, males were more likely than females to be prescribed antipsychotics alone, anxiolytics alone, and combinations of psychotropic medications, but these differences were also not statistically significant except for antipsychotic use in Group 2, which was significant.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction.

***Table 5.16**: Comparing anti-dementia medication prescribing status with residents' gender for different classes of psychotropic medication, across all residents (n=9060)*

			Classes of Psychotropic medications						p-value (different psychotropics and anti-dementia medications in males)
	Anti-dementia status		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Males	Group 1	Count	195	170	58	33	156	612	
		% within Group 1 males	31.90%	27.80%	9.50%	5.40%	25.50%	100%	
		Adjusted Residual	-5.3	1.2	0	1.7	4.4		
	Group 2	Count	898	518	193	79	357	2045	
		% within Group 2 males	43.90%	25.30%	9.40%	3.90%	17.50%	100%	
		Adjusted Residual	5.3	-1.2	0	-1.7	-4.4		
		Adj. p-v*	<0.001	1	1	0.45	<0.001		
			Classes of Psychotropic medications						p-value (different psychotropics and anti-dementia medications in females)
	Anti-dementia status		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Females	Group 1	Count	518	473	104	69	306	1470	
		% within Group 1 females	35.20%	32.20%	7.10%	4.70%	20.80%	100%	
		Adjusted Residual	-8.1	3.9	-0.1	3	4.7		
	Group 2	Count	2326	1332	353	151	771	4933	
		% within Group 2 females	47.20%	27.00%	7.20%	3.10%	15.60%	100%	
		Adjusted Residual	8.1	-3.9	0.1	-3	-4.7		
		Adj. p-v*	<0.001	<0.001	1	<0.05	<0.001		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: Among all residents, there was a significant association between the classes of psychotropic medications prescribed and anti-dementia medication status in both males and females. Residents in Group 2 (both male and female) were significantly more likely to not be prescribed psychotropic medications compared to those in Group 1. On the other hand, residents in Group 1 were significantly more likely to be prescribed combinations than those in Group 2. Also, antidepressants alone and anxiolytics alone were more likely to be prescribed in Group 1 than in Group 2; however, these differences were statistically significant only among females.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction).

5.3.3.3 Age

Residents were next classified according to age groups. Among residents prescribed psychotropic medications (n=5123), age group ('youngest-old' vs 'oldest-old') was significantly associated with the prescribing of different classes of psychotropic medications in both Group 1 and Group 2 (**chi-square test, overall p-value < 0.001 for both groups**). In both Groups (1and 2), oldest-old residents were significantly more likely to be prescribed antidepressants alone and anxiolytics alone (although the latter was not significant in Group 1) compared to the youngest-old residents. However, youngest-old residents were more likely to be prescribed antipsychotics alone (not significant in Group 2) and in combinations compared to the oldest-old residents for Groups 1 and 2 (**Table 5.17**, **Figure 5.8 A and B**).

Anti-dementia medication prescribing status in youngest-old residents was not significantly associated with the likelihood of prescribing different classes of psychotropic medications (**chi-square, overall p-value = 0.448**). Anxiolytics alone and in combinations appeared to be more likely in the youngest-old of Group 1 than the youngest-old of Group 2, but these were not significant (**Table 5.18**, **Figure 5.8.C**).
In contrast, anti-dementia medication prescribing in the oldest-old residents was significantly associated with prescribing different classes of psychotropic medications (**chi-square, overall p-value = 0.003**). Anxiolytics alone and combinations thereof appeared to be higher in the oldest-old in Group 1 than the oldest-old in Group 2, but these were not significant. However, antipsychotics were significantly higher in the oldest old of Group 2 compared to Group 1 (14.1% vs 9.7%) (**Table 5.18, Figure 5.8.D**).

***Table 5.17**: Residents' age and different classes of psychotropic medications prescribed in Group 1 and Group 2, among residents on psychotropic medications (n=5123)*

			Classes of Psychotropic medications					p-value (different psychotropics and age in Group 1)
	Age group		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.0001
Group 1	Youngest-old	Count	262	92	37	253	644	
		% within Youngest in Group 1	40.70%	14.30%	5.70%	39.30%	100.00%	
		Adjusted Residual	-4.4	2.6	-2.3	4.1		
	Oldest-old	Count	381	70	65	209	725	
		% within Oldest in Group 1	52.60%	9.70%	9.00%	28.80%		
		Adjusted Residual	4.4	-2.6	2.3	-4.1		
		Adj. p-value*	<0.001	<0.05	0.08	<0.001		

			Classes of Psychotropic medications					p-value (different psychotropics and age in Group 2)
	Age group		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.0001
Group 2	Youngest-old	Count	712	247	82	594	1635	
		% within Youngest in Group 2	43.50%	15.10%	5.00%	36.30%	100.00%	
		Adjusted Residual	-6.2	0.9	-2.5	7.4		
	Oldest-old	Count	1138	299	148	534	2119	
		% within Oldest in Group 2	53.70%	14.10%	7.00%	25.20%	100.00%	
		Adjusted Residual	6.2	-0.9	2.5	-7.4		
		Adj. p-value*	<0.001	1	<0.05	<0.001		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: There was a significant association between classes of psychotropic medications and age groups in both Groups 1 and 2. The oldest-old were prescribed more antidepressants alone and anxiolytics alone than the youngest-old (antidepressants were significant in both Groups 1 and 2, while anxiolytics were only significant in Group 2). However, the youngest-old were prescribed more antipsychotics alone and combinations than the oldest-old (combinations were significant in both Groups 1 and 2, while antipsychotics alone were only significant in Group 1)

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction).

***Table 5.18**: Comparing anti-dementia medication prescribing status with residents' age for different classes of psychotropic medications, among residents on psychotropic medications (n=5123)*

			Classes of Psychotropic medications					p-value (different psychotropics and antidementia medications in Youngest-old)
	Anti-dementia status		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.448
Youngest-old	Group 1	Count	262	92	37	253	644	
		% within Group 1 in Youngest	40.70%	14.30%	5.70%	39.30%	100%	
		Adjusted Residual	-1.2	-0.5	0.7	1.3		
	Group 2	Count	712	247	82	594	1635	
		% within Group 2 in Youngest	43.50%	15.10%	5.00%	36.30%	100%	
		Adjusted Residual	1.2	0.5	-0.7	-1.3		
		Adj. p-value*	0.92	1	1	0.7		

			Classes of Psychotropic medications					p-value (different psychotropics and anti-dementia medications in Oldest-old)
	Anti-dementia status		AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	0.003
Oldest-old	Group 1	Count	381	70	65	209	725	
		% within Group 1 in Oldest	52.60%	9.70%	9.00%	28.80%	100%	
		Adjusted Residual	-0.5	-3.1	1.7	1.9		
	Group 2	Count	1138	299	148	534	2119	
		% within Group 2 in Oldest	53.70%	14.10%	7.00%	25.20%	100%	
		Adjusted Residual	0.5	3.1	-1.7	-1.9		
		Adj.p-value*	1	<0.01	0.3	0.22		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: There was a significant association between classes of psychotropic medications and anti-dementia medication prescribing status only in the oldest-old group. Residents in Group 1 were prescribed more anxiolytics alone, and in combination than Group 2, in both age groups but this was not significant. Oldest-old residents in Group 2 were prescribed significantly more antipsychotics than Group 2.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage in Group 1 than Group 2 but not statistically significant data.

*adjusted p-value (Bonferroni correction).

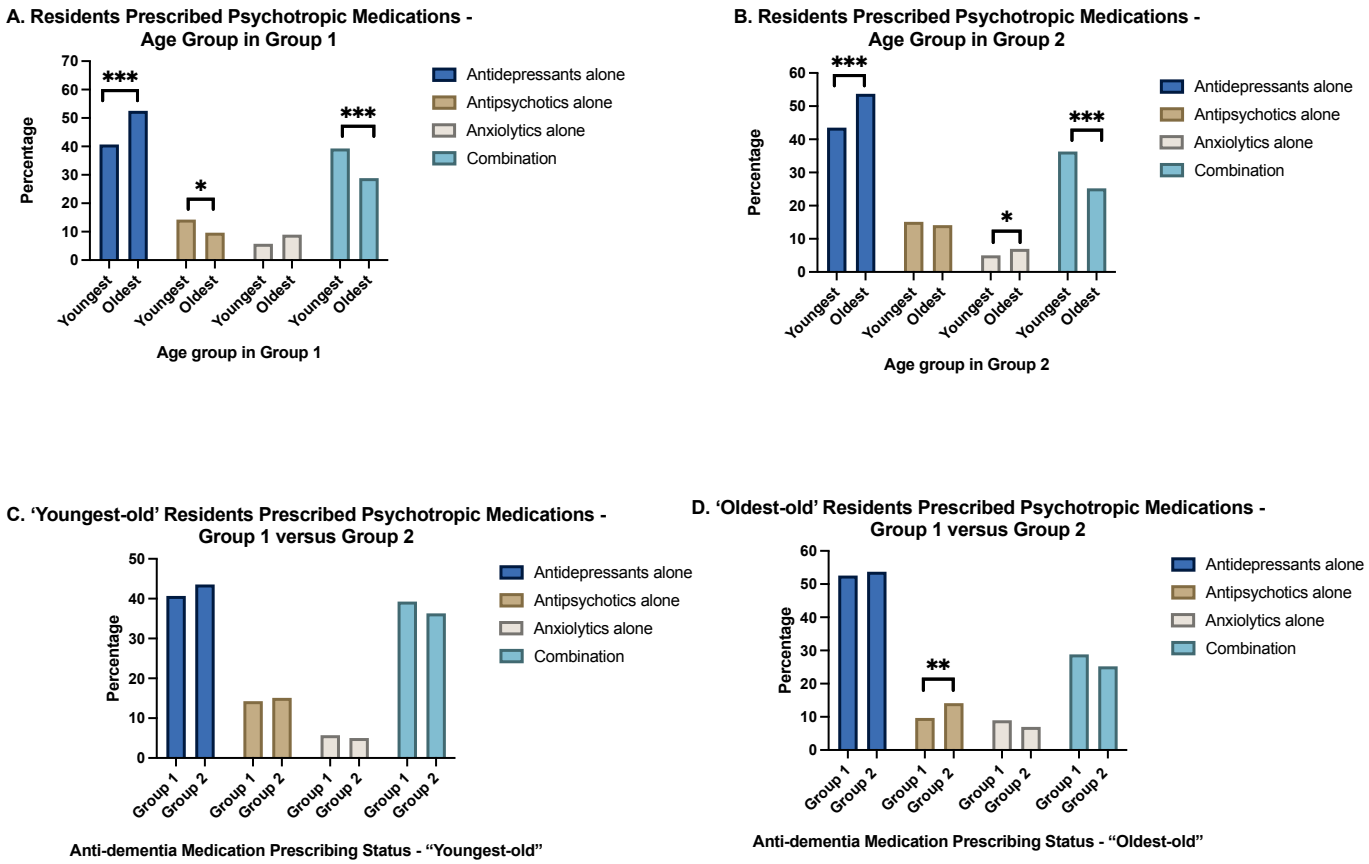


Figure 5.8: *Residents' age and different classes of psychotropic medications in Group 1 and 2, among residents on psychotropic medications (n=5123). (A) Different age groups with different psychotropic medications in Group 1: the oldest-old were prescribed significantly more antidepressants, while the youngest-old were prescribed significantly more antipsychotics and combinations. (B) Different age groups with psychotropic medication in Group 2: the oldest-old were prescribed significantly more antidepressants and anxiolytics, while the youngest-old were prescribed significantly more combinations. (C) Comparing antidementia medication prescribing status in 'youngest-old' residents: those in Group 1 were prescribed more anxiolytics and combinations, but the difference was not significant. (D) Comparing antidementia medication prescribing status in 'oldest-old' residents: those in Group 1 were prescribed more anxiolytics and combinations, but the difference was not significant. However, those in Group 2 were prescribed significantly more antipsychotics. *adj. p-value <0.05, **adj. p-value <0.01, ***adj. p-value <0.001.*

Across all residents (n = 9,060), age was significantly associated with the prescribing of different classes of psychotropic medications in both Group 1 and Group 2 (**Chi-square test, overall p < 0.001 for both groups**) **(Table 5.19**). In both Groups 1 and 2, youngest-old residents were significantly more likely to be prescribed antipsychotics alone and in combination than oldest-old residents (Group 1: antipsychotics 10.3% vs 5.9%, combinations 28.4% vs 17.6%, Group 2: antipsychotics 9.8% vs 6.7%, combinations 23.6% vs 12%). Conversely, oldest-old residents were significantly more likely to not be prescribed psychotropic medications **(Table 5.19).**

When comparing age groups for all residents between Group 1 and Group 2, residents in Group 2 (whether youngest-old or oldest-old) were significantly more likely to not be prescribed any psychotropic medications than those in Group 1 (youngest-old: 35.1% vs 27.8%, oldest-old:52.5% vs 39.1%). However, residents in Group 1 (whether youngest-old or oldest-old) were significantly more likely to be prescribed combinations than those in Group 2 (Youngest-old: 28.4% vs 23.6%, oldest-old: 17.6% vs 12%). Also, oldest-old residents in Group 1 were significantly more likely to be prescribed antidepressants alone (32%) and anxiolytics alone (5.5%) than their counterparts in Group 2 (25.5%, 3.3%, respectively) **(Table 5.20).**

***Table 5.19**: Residents' age and different classes of psychotropic medication in Group 1 and Group 2, across all residents (n=9060)*

			Classes of Psychotropic medications						p-value (different psychotropics and age in Group 1)
	Age		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Group 1	Youngest - old	Count	248	262	92	37	253	892	
		% within youngest in group 1	27.80%	29.40%	10.30%	4.10%	28.40%	100%	
		Adjusted Residual	-5.4	-1.3	3.7	-1.4	5.9		
	Oldest-old	Count	465	381	70	65	209	1190	
		% within oldest in group 1	39.10%	32.00%	5.90%	5.50%	17.60%	100%	
		Adjusted Residual	5.4	1.3	-3.7	1.4	-5.9		
		Adj. p-v*	<0.001	0.96	<0.01	0.8	<0.001		

			Classes of Psychotropic medications						p-value (different psychotropics and age in Group 2)
	Age		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Group 2	Youngest-old	Count	885	712	247	82	594	2520	
		% within youngest group 2	35.10%	28.30%	9.80%	3.30%	23.60%	100%	
		Adjusted Residual	-14	2.5	4.6	-0.1	12.6		
	Oldest-old	Count	2339	1138	299	148	534	4458	
		% within oldest group 2	52.50%	25.50%	6.70%	3.30%	12.00%	100%	
		Adjusted Residual	14	-2.5	-4.6	0.1	-12.6		
		Adj. p-v*	<0.001	0.06	<0.001	1	<0.001		

[1]AntiDep = antidepressants alone, [2]AntiPsy = antipsychotics alone, [3]Anxio = anxiolytics alone

Note: Considering all residents, there was a significant association between age and the different classes of psychotropic medications prescribed in both Groups 1 and 2. Oldest-old residents were significantly more likely than youngest-old to not be prescribed psychotropic medications. However, youngest-old residents were significantly more likely than oldest-old residents to be prescribed antipsychotics alone, and combinations of psychotropic medications.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction).

***Table 5.20**: Comparing anti-dementia medication prescribing status with residents' age for different classes of psychotropic medication, across all residents (n=9060)*

			Classes of Psychotropic medications						p-value (different psychotropics & anti-dementia medications in Youngest-old)
	Anti-dementia status		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Youngest -old	Group 1	Count	248	262	92	37	253	892	
		% within Group 1 Youngest	27.80%	29.40%	10.30%	4.10%	28.40%	100%	
		Adjusted Residual	-4	0.6	0.4	1.3	2.8		
	Group 2	Count	885	712	247	82	594	2520	
		% within Group 2 youngest	35.10%	28.30%	9.80%	3.30%	23.60%	100%	
		Adjusted Residual	4	-0.6	-0.4	-1.3	-2.8		
		Adj. p-v*	<0.001	1	1	0.96	<0.05		

			Classes of Psychotropic medications						p-value (different psychotropics & anti-dementia medications in Oldest-old)
	Anti-dementia status		No Psychotropics	AntiDep[1]	AntiPsy[2]	Anxio[3]	Combination	Total	<0.001
Oldest-old	Group 1	Count	465	381	70	65	209	1190	
		% within Group 1 Oldest	39.10%	32.00%	5.90%	5.50%	17.60%	100%	
		Adjusted Residual	-8.2	4.5	-1	3.4	5.1		
	Group 2	Count	2339	1138	299	148	534	4458	
		% within Group 2 Oldest	52.50%	25.50%	6.70%	3.30%	12.00%	100%	
		Adjusted Residual	8.2	-4.5	1	-3.4	-5.1		
		Adj. p-v*	<0.001	<0.001	1	<0.01	<0.001		

Note: Among all residents, there was a significant association between the classes of psychotropic medications prescribed and anti-dementia medication prescribing status in both youngest-old and oldest-old. Residents in Group 2 (both youngest and oldest-old) were significantly more likely to not be prescribed psychotropic medications compared to those in Group 1. Conversely, residents in Group 1 were significantly more likely to be prescribed combinations than those in Group 2 (for both age groups). Also, oldest-old residents in Group 1 were significantly more likely to be prescribed antidepressants alone and anxiolytics alone than their counterparts in Group 2.
Orange shading is a higher percentage and statistically significant data compared to the other group.
Green shading is a higher percentage but not statistically significant data.
*adjusted p-value (Bonferroni correction).

5.3.3.4 Number of psychotropic medications and individual drugs prescribed

This section focuses on the number of psychotropic medications and individual drugs prescribed, regardless of whether they were prescribed alone or in combination. As previously noted in **Table 5.1**, the total number of psychotropic medications prescribed was 7,870, with 2,114 (27%) in Group 1 (anti-dementia medications prescribed) and 5,756 (73%) in Group 2 (no anti-dementia medications prescribed). From a descriptive perspective, antidepressants were the most frequently prescribed class of psychotropic medications, followed by antipsychotics, and then anxiolytics in both Groups 1 and 2 (**Table 5.21; Figure 5.9**). A similar pattern was observed across all medications prescribed **(Table 5.22).**

Overall, there was a significant association between prescribed anti-dementia medication status, and the classes of psychotropic medications prescribed, whether considering only psychotropic medications or all medications (chi-square test, $p < 0.001$).

Among psychotropic medications, antipsychotics were significantly more likely to be prescribed in Group 2 than 1 (27.3% vs 23.4), while anxiolytics were significantly more likely to be prescribed in Group 1 than 2 (19.2% vs 16.1%) **(Table 5.21; Figure 5.9).**

Among all medications, antidepressants and anxiolytics were significantly more likely to be prescribed in Group 1, whereas the absence of psychotropic medication prescribing was significantly greater in Group 2 **(Table 5.22)**

Table 5.21: *Number of classes of psychotropic medications prescribed in Groups 1 and 2, among psychotropic medications prescribed*

		Classes of psychotropic medications				Overall p-value
Anti-dementia medication prescribing status		Antidepressants	Antipsychotics	Anxiolytics	Total	<0.001
Group 1: Residents prescribed anti-dementia medications (Yes)	Count	1213	495	406	2114	
	% within Group 1	57.40%	23.40%	19.20%	100%	
	Adjusted Residual	0.6	-3.5	3.3		
Group 2: Residents not prescribed anti-dementia medications (No)	Count	3261	1571	924	5756	
	% within Group 2	56.70%	27.30%	16.10%	100%	
	Adjusted Residual	-0.6	3.5	-3.3		
	adj. p-value*	1	<0.01	<0.01		

Note: regardless of whether residents were prescribed combinations or specific types of medications alone, there was a significant association between prescribed anti-dementia medication status and different classes of psychotropic medications. Among psychotropic medications prescribed, anxiolytics were prescribed significantly more in Group 1 than Group 2, while antipsychotics were prescribed significantly more in Group 2 than in Group 1.

Orange shading is a higher percentage and statistically significant data compared to the other group.

Green shading is a higher percentage but not statistically significant data.

*adjusted p-value (Bonferroni correction).

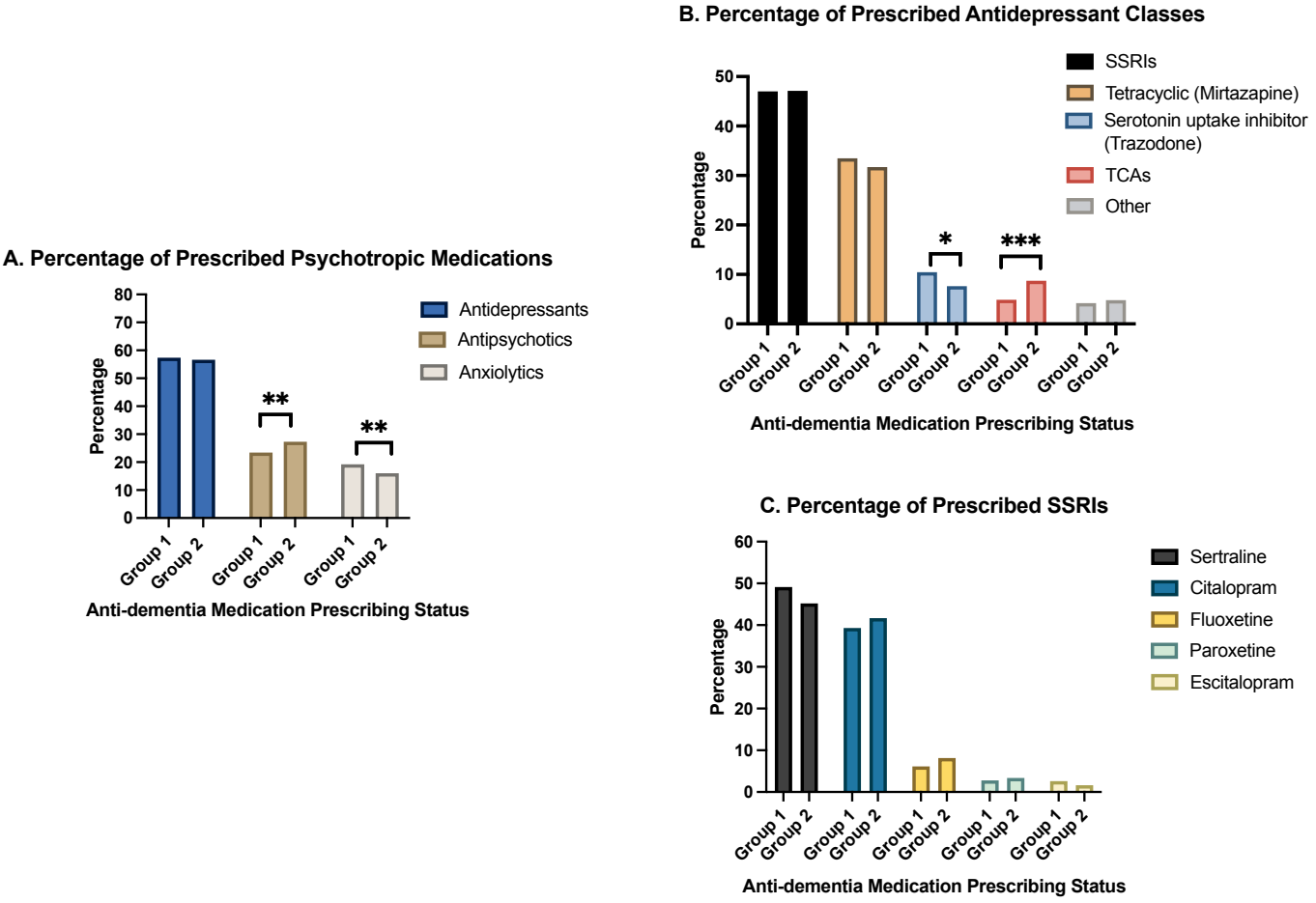


Figure 5.9: *Percentage of classes of psychotropic medication prescribed. (A) Comparison of psychotropic medication classes between Groups 1 and 2: antipsychotics were prescribed significantly more in Group 2, while anxiolytics were prescribed significantly more in Group 1. (B) Comparison of antidepressant classes between Groups 1 and 2: SSRIs and mirtazapine were the most frequently prescribed antidepressants with no significant difference between Groups 1 and 2. However, trazodone was significantly higher in Group 1, while TCAs were significantly higher in Group 2. (C) Comparison of individual drugs within the SSRI class between Groups 1 and 2: sertraline and citalopram were the most frequently prescribed SSRIs, with no significant difference between groups.*

**adj. p-value <0.05, **adj. p-value <0.01, ***adj. p-value <0.001.*

***Table 5.22**: Number of classes of psychotropic medications prescribed in Groups 1 and 2, among all medications prescribed*

		Classes of psychotropic medications					Overall p-value
Anti-dementia status		No psychotropics	Antidepressants	Antipsychotics	Anxiolytics	Total	<0.001
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	18959	1213	495	406	21073	
	% within Group 1	90.00%	5.80%	2.30%	1.90%	100%	
	Adjusted Residual	-9.8	7.7	1.7	7.1		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	67055	3261	1571	924	72811	
	% within Group 2	92.10%	4.50%	2.20%	1.30%	100%	
	Adjusted Residual	9.8	-7.7	-1.7	-7.1		
	adj. p-value*	<0.001	<0.001	0.3	<0.001		

Note: regardless of whether residents were prescribed combinations or specific types of psychotropic medications alone, there was a significant association between prescribed anti-dementia medication status and different classes of psychotropic medications. Among all medications prescribed, antidepressants and anxiolytics were prescribed significantly more in Group 1 than in Group 2, while no psychotropic medications were prescribed significantly more in Group 2 than in Group 1.
Orange shading is a higher percentage and statistically significant data compared to the other group.
*adjusted p-value (Bonferroni correction).

Since antidepressants represented the highest percentage of psychotropic medications prescribed, a further step was taken by disaggregating the antidepressant class. There was a significant association between prescribed anti-dementia medication status and prescribed types of antidepressants (**chi-square, p <0.001, Cramer's V = 0.078**) (**Table 5.23**). The prescribing of trazodone was significantly higher in Group 1 (10.5%) than in Group 2 (7.6%), whereas tricyclic antidepressants (TCAs) was significantly higher in Group 2 (8.7%) than in Group 1 (4.9%) (**Table 5.23**, **Figure 5.9.B**). As some drugs (duloxetine, venlafaxine, tranylcypromine and agomelatine) were prescribed in low numbers, they were combined with each other under the classification "Other".

***Table 5.23**: Antidepressant Classes Prescribed in Groups 1 and 2*

		Antidepressant Classes						Overall p-value
Anti-dementia medication prescribing status		SSRIs	Mirtazapine	Trazodone	TCAs	Other**	Total	<0.001
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	570	406	127	59	51	1213	
	% within Group 1	47.00%	33.50%	10.50%	4.90%	4.20%	100%	
	Adjusted Residual	-0.1	1.1	3	-4.3	-0.9		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	1536	1034	249	285	157	3261	
	% within Group 2	47.10%	31.70%	7.60%	8.70%	4.80%	100%	
	Adjusted Residual	0.1	-1.1	-3	4.3	0.9		
	Adj. p-value*	4.6	1.3	<0.05	<0.001	1.8		

Note: There was a significant association between anti-dementia medication prescribing status and different classes of antidepressants. Trazodone was prescribed significantly more in Group 1 than Group 2, whereas tricyclic antidepressants (TCA) were prescribed significantly more in Group 2 than Group 1.
Orange shading is a higher percentage and statistically significant data compared to the other group.
*Adjusted p-value (Bonferroni correction)
** other includes: duloxetine, venlafaxine, tranylcypromine and agomelatine.

In addition, the SSRIs class was disaggregated because it represented the highest percentage among the antidepressant classes and contained more individual drugs. There was no significant association between prescribed anti-dementia medication status and different SSRI medications (**chi-square test, p = 0.148**) (**Table 5.24**, **Figure 5.9.C**). Sertraline and citalopram were most frequently prescribed among SSRI medicines in both Groups 1 and 2.

***Table 5.24**: Selective Serotonin Reuptake Inhibitors (SSRIs) Prescribed in Groups 1 and 2*

		SSRI drugs					Total	Overall p-value
Anti-dementia medication prescribing status		Sertraline	Citalopram	Fluoxetine	Paroxetine	Escitalopram		0.148
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	280	224	35	16	15	570	
	% within Group 1	49.10%	39.30%	6.10%	2.80%	2.60%	100%	
	Adjusted Residual	1.6	-1	-1.5	-0.7	1.5		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	694	640	125	52	25	1536	
	% within Group 2	45.20%	41.70%	8.10%	3.40%	1.60%	100%	
	Adjusted Residual	-1.6	1	1.5	0.7	-1.5		

Note: There was no significant association between anti-dementia medication prescribing status and different SSRI drugs. Green shading is a higher percentage in Group 1, but not statistically significant data.

TCA prescribing was significantly higher in Group 2 than in Group 1 (**Table 5.23**, **Figure 5.9.B**); however, when the TCA class was disaggregated, there was no association between prescribed anti-dementia medication status and TCA medications (**chi-square test, p = 0.19**) (**Table 5.25**). Amitriptyline was the most frequently prescribed among TCAs in both Group 1 and Group 2 (**Table 5.25**). As some drugs (clomipramine, dosulepine, doxepin, imipramine, lofepamine, nortriptyline) were prescribed in low numbers, they were combined with each other under the classification "Other".

***Table 5.25**: Tricyclic Antidepressant Drugs Prescribed in Groups 1 and 2*

		TCA drugs			Overall p-value
Anti-dementia medication prescribing status		Amitriptyline	Other**	Total	0.190
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	47	12	59	
	% within Group 1	79.70%	20.30%	100.00%	
	Adjusted Residual	-1.3	1.3		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	246	39	285	
	% within Group 2	86.30%	13.70%	100.00%	
	Adjusted Residual	1.3	-1.3		

Note: there was no association between prescribed anti-dementia medication status and TCA prescriptions.
Green shading is a higher percentage in Group 1 but not statistically significant data.
**Other includes: clomipramine, dosulepine, doxepin, imipramine, lofepamine, nortriptyline.

After disaggregating the antipsychotic class, there was an association between prescribed anti-dementia medication status and antipsychotic drugs (**chi-square test, p <0.001**) (**Table 5.26**). Risperidone was significantly more likely to be prescribed in Group 1 (50.9%) than in Group 2 (27.2%), whereas levomepromazine, haloperidol, olanzapine, and other antipsychotics were prescribed significantly more in Group 2 (**Table 5.26**, **Figure 5.10.A**). Some drugs (promazine, zuclopenthixol, clozapine, chlorpromazine, amisulpiride, trifluoperazine, pericyazine, sulpiride, flupentixol, benperidol) were prescribed in low numbers and were therefore combined under the classification "Other".

***Table 5.26**: Antipsychotic Drugs Prescribed in Groups 1 and 2*

		Antipsychotic Drugs							Total	Overall p-value
Anti-dementia medication prescribing status		Risperidone	Quetiapine	Levomepromazine	Haloperidol	Olanzapine	Aripiprazole	Other**		<0.001
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	252	70	53	24	48	27	21	495	
	% within Group 1	50.90%	14.10%	10.70%	4.80%	9.70%	5.50%	4.20%	100%	
	Adjusted Residual	9.8	0.8	-4.9	-4	-2.7	-0.3	-3.2		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	427	199	321	172	226	91	135	1571	
	% within Group 2	27.20%	12.70%	20.40%	10.90%	14.40%	5.80%	8.60%	100%	
	Adjusted Residual	-9.8	-0.8	4.9	4	2.7	0.3	3.2		
Significance	Adj. p-value*	<0.001	2.96	<0.001	<0.001	<0.05	5.3	<0.01		

Note: There was a significant association between antipsychotic types and prescribed anti-dementia medications status. Risperidone was significantly more prescribed in Group 1 than Group 2, whereas levomepromazine, haloperidol, olanzapine, and other were prescribed significantly more in Group 2.
Orange shading is a higher percentage and statistically significant data compared to the other group.
Green shading is a higher percentage in Group 1, but not statistically significant data.
*adjusted p-value (Bonferroni correction)
**Other includes: Promazine, Zuclopenthixol, Clozapine, Chlorpromazine, Amisulpiride, Trifluoperazine, Pericyazine, Sulpiride, Flupentixol, Benperidol.

After disaggregating the classes of anxiolytics, there was an association between prescribed anti-dementia medication status and anxiolytic drugs (**chi-square test, p < 0.001**) (**Table 5.27**). Lorazepam and diazepam were the most frequently prescribed among anxiolytics. However, lorazepam was prescribed significantly more in Group 1 (78.1%) than in Group 2 (67.2%), while diazepam and other anxiolytics were prescribed significantly more in Group 2. (**Table 5.27**, **Figure 5.10.B**). As some drugs (oxazepam, buspirone) were prescribed in low numbers, they were combined with each other under the classification "Other".

***Table 5.27**: Anxiolytic Drugs Prescribed in Groups 1 and 2*

		Anxiolytic drugs			Total	Overall p-value
Anti-dementia medication status		Lorazepam	Diazepam	Other**		<0.001
Group 1 Residents prescribed anti-dementia medications (Yes)	Count	317	87	2	406	
	% within Group 1	78.10%	21.40%	0.50%	100.00%	
	Adjusted Residual	4	-3.3	-2.6		
Group 2 Residents not prescribed anti-dementia medications (No)	Count	621	279	24	924	
	% within Group 2	67.20%	30.20%	2.60%	100.00%	
	Adjusted Residual	-4	3.3	2.6		
	Adj. p-value*	<0.001	<0.01	<0.05		

Note: there was an association between prescribed anti-dementia medication status and anxiolytic drugs. Lorazepam was prescribed significantly more in Group 1 than Group 2, while diazepam and other anxiolytics were prescribed significantly more in Group 2.
Orange shading is a higher percentage and statistically significant data compared to the other group.
*adjusted p-value (Bonferroni correction)
**Other includes: oxazepam, buspirone.

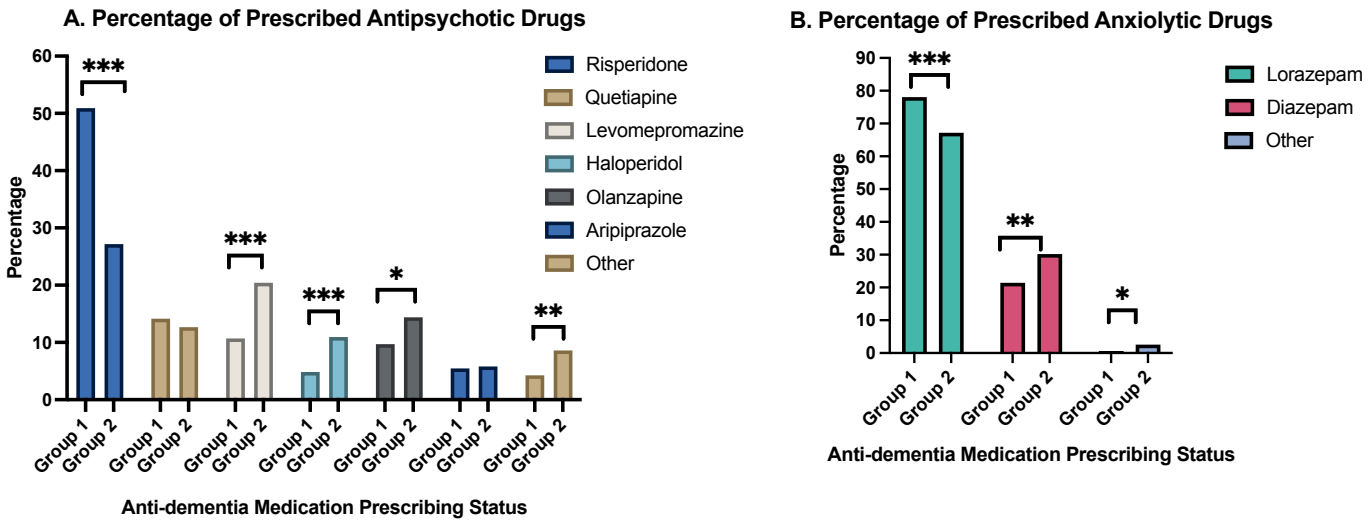


Figure 5.10: *Percentage of antipsychotics and anxiolytics prescribed in Groups 1 and 2. (A) Comparison of antipsychotic drugs in Groups 1 and 2: Risperidone was prescribed significantly more in Group 1, while Levomepromazine, Haloperidol, Olanzapine, and other antipsychotics were prescribed significantly more in Group 2. (B) Comparison of anxiolytic drugs in Groups 1 and 2: Lorazepam was prescribed significantly more in Group 1, while Diazepam and other anxiolytics were prescribed significantly more in Group 2. *adj. p-value <0.05, **adj. p-value <0.01, ***adj. p-value <0.001.*

5.4 Discussion

This study aimed to investigate the prescribing of psychotropic medications among residents prescribed and those not prescribed anti-dementia medications. This study shows that there are significant associations between prescribing anti-dementia and psychotropic medications. Residents prescribed anti-dementia medications were more likely to be prescribed psychotropic medications compared to residents who were not prescribed anti-dementia medications. This pattern was consistent across different age groups and genders, when comparing those prescribed anti-dementia medications with their counterparts who were not.

Among both groups, those prescribed and those not prescribed anti-dementia medications, antidepressants were the most commonly prescribed psychotropic medications. Residents prescribed anti-dementia medications were more likely to be prescribed antidepressants alone, anxiolytics alone, and combinations of psychotropic medications across all residents. This may indicate that individuals prescribed anti-dementia medications have a greater number or severity of symptoms that are more difficult to manage.

Regardless of anti-dementia prescribing status, age and gender may influence psychotropic medication prescribing. In this study, males and those belonging to the youngest-old group were more likely to be prescribed psychotropic medications than females and those in the oldest-old group.

5.4.1 Residents with Dementia

Dementia is among the leading causes of death in care homes (Eley 2023) and it is a major contributing factor to care home admissions, often driven by the challenges of managing BPSD and increased stress in informal carers (Cooper et al. 2007; Wetzels et al. 2010; Toot et al. 2017). Nevertheless, prescribing anti-dementia medications has been shown to delay care home admission, improve cognitive outcomes, and reduce mortality (Howard et al. 2012; Donegan et al. 2017; Havreng-Théry et al. 2024).

People with dementia represent over two-thirds (70%) of those living in care homes in the UK (Alzheimer's Society 2025b). In the absence of clinical diagnostic data in this current study, residents prescribed anti-dementia medications (donepezil, galantamine, rivastigmine, or memantine) were considered likely to have dementia, particularly AD, as these medications are primarily indicated for AD, the most common type of dementia (Alzheimer's Disease International 2020b). Therefore, the prescribing of anti-dementia medications served as a proxy to identify potential residents with dementia, particularly AD; this cohort of residents was categorised as Group 1. Group 2 residents were those individuals that were not prescribed any anti-dementia medications. Whilst this group may include individuals with dementia (either undiagnosed or with no pharmacological intervention), the use of anti-dementia medications to discriminate between the two groups still provides a practical basis for comparison, as the study aimed to investigate whether the prescribing of anti-dementia drugs drives the prescribing of psychotropics (rather than a diagnosis of dementia per se). Given the focus on medication prescribing and the lack of diagnostic data, this approach enables a meaningful comparison between residents more likely to have dementia (Group 1) and those without such prescriptions (Group 2). This method is especially useful in studies where clinical diagnoses are unavailable and can help identify important patterns in prescribing practices. Nonetheless, the findings should be interpreted with caution, especially when compared with studies based on diagnoses.

Residents prescribed anti-dementia medications represented 23% of all residents in the current study. This may be explained by the characteristics of the study population, which was skewed by significant numbers of oldest-old (85 – 105 years) and female residents, who were prescribed fewer active medications compared to youngest-old (65 – 84 years) and male residents (as discussed in **Chapter 4, section 4.4.1**). This prescribing pattern may reflect age-related pharmacokinetic changes, such as altered drug metabolism and increased sensitivity to side effects, along with the prioritization of palliative care in care home settings, particularly toward the end of life, or influenced by family caregiver preferences (Howard et al. 2012; Donegan et al. 2017; Havreng-

Théry et al. 2024). Also, the average life expectancy in care homes is approximately 1–2 years, and individuals expected to die within 12 months are typically considered to be approaching the end of life (British Geriatrics Society 2020; National Health Service [NHS] 2022b). Consequently, care homes often serve as appropriate environments for end-of-life care (Wowchuk et al. 2006). Palliative care not only include the management of physical symptoms such as pain and sleep disturbances but also emotional, social, and spiritual support (Berg 2020; National Health Service [NHS] 2022b). Therefore, the oldest-old, who constituted the majority of the residents might not be treated with anti-dementia medications and may instead have treatment focusing on palliative care. These factors may partly explain the lower prescription rates of anti-dementia medications observed in this study.

The proportion of individuals in care homes with dementia does vary internationally and it is therefore difficult to ascertain whether the population in this current study is representative. For example, Shin and colleagues found that residents on anti-dementia medications represented only 4.5% out of 6,468 residents across 40 care homes (mean age 83.8 SD=7.3, 72% females) in Australia (Shin et al. 2016). Whilst a study in Norway (mean age 84.4 SD = 7.8, 73% females) found that anti-dementia medications were prescribed to 11.3% out of 1165 residents (Helvik et al. 2017). In France, a study that included only residents with dementia in nursing homes (mean age 85.9 SD=4.6, 80% female) found that 59% out of 4,500 were prescribed anti-dementia medications (Jacquin-Piques et al. 2016). Also, in a UK community-based study, 55% of people with an AD diagnosis were prescribed anti-dementia medications (Donegan et al. 2017). These international differences may reflect variation in prescribing guidelines, disease stage, and differences in care home practices across settings.

5.4.2 Patterns and Prevalence of Psychotropic Medication Prescribing

In the current study, residents prescribed anti-dementia medications (65.8%) were more likely to be prescribed psychotropic medications than those not prescribed anti-dementia medications (53.8%) (Adjusted OR =1.6, 95% CI 1.44 – 1.77) (**Table 5.2**, **Figure 5.1.B**).

It has been observed in various countries, including Australia, the Netherlands, and Ireland, that the prescribing of psychotropic medications for residents in care homes is higher than for older people living in the community (Koopmans et al. 2003; Maguire et al. 2013; Harrison et al. 2020b). The rate of prescribing psychotropic medications increased significantly once individuals moved into care homes compared to when they were living in the community (Harrison et al. 2020b). Around 60.8% (95% CI 60.6 – 60.9) of residents were prescribed at least one psychotropic medication in the first three months following care home admission (Harrison et al. 2020b). For example, the prevalence of antidepressant and antipsychotic use was 27% and 6%, respectively, in the 12 months before entering a care home, but increased to 38% and 21%, respectively, in the first 3 months after care home admission (Harrison et al. 2020b). However, in the current study, it was not possible to determine the time of care home admission. The higher rate of prescribing after care home admission might be explained by the new environment and lifestyle for residents, who might feel distressed and uncomfortable compared to when they lived in the community (Bradshaw et al. 2012; Harrison et al. 2020b). Also, a study in the USA found that 84% of people with dementia in care homes (CI 76.2% -89.5%) were prescribed psychotropic medications, including antidepressants, antipsychotics, sedative-hypnotics, and mood stabilizers (the latter representing a small proportion), compared to 28.6% of those living in the community (CI 20.9% - 37.8%) (Maust et al. 2017). Living in care homes or nursing homes is thus associated with increased use of psychotropic medication (Maust et al. 2017; Thapaliya et al. 2022), so psychotropic medication use can be driven by living in care homes. Furthermore, this may be related to the prescribing culture in care homes, which mainly depends on medication rather than non-pharmacological approaches, possibly due to high workloads, low number of staff and lack of time (Sawan et al. 2016). These factors may help explain the high prescribing of psychotropic medications in care homes, particularly in those residents prescribed anti-dementia medications in the current study.

In contrast, another study comparing people with dementia in care homes to the community, found that the proportion of people in the community prescribed at least

one psychotropic (67.4% out of 16,908) was higher than in care homes (52% out of 4,500) (Jacquin-Piques et al. 2016). This study was conducted in France in 2012, and might thus be outdated, and it only included people aged 75 years old and above, missing a huge number of people (65 – 74) in the youngest-old age group who were found to be prescribed a many psychotropic medications in this current study.

Furthermore, in Japan (Hamada et al. 2021), the rate of use of psychotropic medications among residents with dementia was not significantly different at admission (44%) and two months after admission to the care home (43%). Moreover, anxiolytic use was significantly lower two months after admission. This might reflect different practical guidelines, staff knowledge, social activities, and access to non-pharmacological approaches in each country, which might affect the prescribing of psychotropic medications. In Japan, older people are valued as part of the culture (Karasawa et al. 2011; Kikuzawa et al. 2019), and there might be a focus on and easily accessible non-pharmacological approaches (Toba et al. 2014; Ozaki et al. 2017; Maki et al. 2018). This might explain why psychotropic medication use did not increase after admission to care homes. Also, the rate of psychotropic medication use in Japan was relatively low compared to other countries (Okumura et al. 2015; Ozaki et al. 2017)

5.4.2.1 Residents with and without Dementia

As mentioned above, deteriorating BPSD in the community might be difficult to manage, leading to care home admission (Wetzels et al. 2010; Toot et al. 2017). BPSD affect up to 90% of residents in care homes and might lead to higher rates of prescribing psychotropic medications (Selbaek et al. 2007a; Wetzels et al. 2010; Selbæk et al. 2013; Almutairi et al. 2021).

In Norway it was found that use of psychotropic medications was higher in care homes, with around 73% of all residents being prescribed psychotropic medications, of whom 74.5% had dementia whereas 66.5% did not, and this difference was significant (Helvik et al. 2017). Furthermore, in community settings in Finland, the use of psychotropic

medication (including antidepressants, antipsychotics and benzodiazepines) is higher in people with AD (53%) compared to those without AD (33%) (Taipale et al. 2014).

In two Australian studies, more than half of care home residents were prescribed at least one psychotropic medication (Westbury et al. 2019; Almutairi et al. 2021). For instance, Westbury et al. (2019) reported that antidepressants were prescribed to 41.4% (4,701 out of 11,368) of residents. However, these studies did not specifically include residents with dementia. Given the high prevalence of dementia in care homes (Alzheimer's Society 2025b), this may partly explain the Australian findings.

A similar pattern was observed in other countries focused on people with dementia, where more than half of residents with dementia in care homes were prescribed at least one psychotropic medication (Selbaek et al. 2007b; van der Spek et al. 2016; Smeets et al. 2018; La Frenais et al. 2021). For example, psychotropic medications were prescribed to 57.7% of residents with dementia, with antidepressants being the most commonly prescribed (40.6%, 578 out of 1,425) (La Frenais et al. 2021).

In the present study, psychotropic medications were prescribed to more than half of the residents in both groups: 65.8% among those prescribed anti-dementia medications and 53.8% among those not prescribed anti-dementia medications. Furthermore, antidepressants were the most commonly prescribed psychotropic medications in both groups (30.9% and 26.5%, respectively). The lower proportion of antidepressants in the present study compared to other findings is attributed to the focus on residents prescribed antidepressants alone. Generally, the findings reflect the high overall rate of psychotropic prescribing in care homes, particularly among residents prescribed anti-dementia medications.

In both the La Frenais et al. (2021) study (based on dementia diagnoses) and the Shin et al. (2016) study (based on anti-dementia medication), risperidone was the most commonly prescribed antipsychotic, aligning with the findings of the current study, despite the different methods used to identify residents with dementia. Harrison et al. (2020b) also identified dementia using either medication data or medical records and

found that individuals with dementia were more likely to be prescribed psychotropic medications, including antidepressants and antipsychotics, than those without dementia. These findings may suggest that people with dementia, whether identified through diagnosis or the use of anti-dementia medications, tend to be prescribed more psychotropic medications.

The literature does suggest that, once dementia is diagnosed and anti-dementia medicines are initiated, the prescribing of psychotropic medications (including antidepressants and antipsychotics) for individuals tends to increase, and continues for years (Joling et al. 2021; Loftus et al. 2023) (Blaszczyk et al. 2018; Thapaliya et al. 2022). Antipsychotics for example were prescribed to 5% of residents in the year before dementia diagnosis, rising to 19% after the diagnosis, while antidepressant and benzodiazepine prescriptions were slightly higher after dementia had been diagnosed; however, this study was specific to women (Thapaliya et al. 2022).

This increase is believed to be a consequence of individuals exhibiting BPSD. This may be particularly prevalent in care homes where 'disruptive' behaviours can have negative impacts on other care homes residents. As such, care home staff may view antipsychotics as beneficial for managing BPSD and continue to promote their long-term use, despite this being considered inappropriate (Smeets et al. 2014; Almutairi et al. 2018a; Walsh et al. 2018). Among residents with dementia in care homes, a positive association has been found between verbal agitation and the prescribing of all types of psychotropic medications (antidepressants, antipsychotics, and anxiolytics), while clinically significant agitation and physically non-aggressive symptoms (e.g. aimless wandering and inappropriate undressing) had a positive association with antipsychotic and anxiolytic medications (La Frenais et al. 2021). This may explain the higher rates of psychotropic medication prescribing observed among residents prescribed anti-dementia medications compared to those who were not in the present study. Thus, BPSD associated with dementia may be driving the prescribing of psychotropic medications.

In the UK, non-pharmacological interventions are recommended as the first-line treatment for BPSD (National Institute for Health and Care Excellence [NICE] 2018; Alzheimer's Association 2024). Despite this, psychotropic medications are often used off-label to manage BPSD, even though they offer modest efficacy and increase risk of severe side effects (Ruths et al. 2013; Kalisch Ellett and Lim 2020; La Frenais et al. 2021; Alzheimer's Association 2024). The high rate of prescribing of psychotropic medication may be due to off-label use, which could then indicate inappropriate prescribing. It was found that only 10% of psychotropic medication prescriptions for residents with dementia were appropriate, according to the Appropriate Psychotropic drug use in Dementia (APID) index (van der Spek et al. 2016). Therapy duration, indication and evaluation were the most inappropriate domains (van der Spek et al. 2016). Prescribing of antidepressants was found to be inappropriate mainly in indication and evaluation, whereas prescribing of antipsychotics and anxiolytics was more inappropriate in duration, indication and evaluation (van der Spek et al. 2016).

As a result, the increased prescribing of psychotropic medications in residents prescribed anti-dementia medications, mainly used for AD, in this study may reflect a general increase in the use of these medications in care homes, where a higher proportion of residents have dementia associated with BPSD. However, it was not possible to distinguish between these reasons because there was no access to clinical records or residents' medical histories before they arrived in the care home in the present study.

5.4.3 Residents on different classes of psychotropic medication and most commonly prescribed medications:

There was a significant association between prescribing anti-dementia medications and different classes of psychotropic medication. In this study, the most common prescribing pattern across residents both prescribed and not prescribed anti-dementia medications was antidepressants alone, followed by combinations, then antipsychotics alone, and finally anxiolytics alone. This pattern was consistent across both residents prescribed only psychotropic medications and all residents, although with different

proportions. Notably, the proportion of residents who were not prescribed any psychotropic medications was highest in the group who were not prescribed anti-dementia medications **(Table 5.11).** It is important to note that comparisons between residents prescribed psychotropic medications only and the overall resident population (which includes those not prescribed any psychotropics) should be interpreted with caution. These groups differ in size, due to different denominators, and may also differ in clinical characteristics. As a result, different proportions were observed, but overall patterns were broadly similar.

When comparing the two groups, residents prescribed anti-dementia medications were significantly more likely to be prescribed antidepressants alone and anxiolytics alone than those not prescribed anti-dementia medications, based on overall prevalence across all residents. Conversely, among residents prescribed psychotropic medications only, those not prescribed anti-dementia medications were significantly more likely to be prescribed antipsychotics alone, showing specific prevalence trends within this subgroup.

The findings from several previous studies align with the findings of this study in that antidepressants were the most frequently prescribed psychotropic medications in residents with dementia, followed by antipsychotics and finally anxiolytics (Selbaek et al. 2007a; Helvik et al. 2017; Smeets et al. 2018). For example, in a longitudinal study across 26 nursing homes in Norway, including 932 residents with AD, 39% were taking antidepressants, 26% were taking antipsychotics, and finally, 24% were taking anxiolytics (Helvik et al. 2017). In the current study, focusing on each class of medication alone may explain the relatively low proportions. Among all residents prescribed anti-dementia medications, 30.9% were prescribed antidepressants alone, 7.8% were prescribed antipsychotics alone, and 4.9% were prescribed anxiolytics alone.

Some studies have combined anxiolytics and hypnotics together as benzodiazepines and related drugs, leading to higher figures (Harrison et al. 2020b; La Frenais et al. 2021). For example, in the La Frenais et al. (2021) study, residents with dementia were

prescribed antidepressants (40%), the most frequently prescribed psychotropic medication, followed by anxiolytics and hypnotics together (22%), and finally antipsychotics (17%).

In the current study, disaggregating combinations revealed that the most frequently prescribed combinations in both groups were “antidepressants + antipsychotics” followed by “ antidepressants + anxiolytics”. These combinations appear to be driven primarily by the high proportions of antidepressant prescribing. Furthermore, residents prescribed anti-dementia medications were significantly more likely to be prescribed combinations, particularly “antidepressants + anxiolytics”, in both the subgroup prescribed psychotropic medications and all residents. This pattern may reflect stronger associations with combinations in residents prescribed anti-dementia medications and difficulties of the management in this group. Also, the significance of the “antidepressants + anxiolytics” combination may relate to the limited efficacy of antidepressants in people with dementia. This is supported by previous studies reporting no statistically significant difference between antidepressants and placebo in treating depression among people with AD (Banerjee et al. 2013; Orgeta et al. 2017; Zuidersma et al. 2019). As a result, anxiolytics may have been prescribed as additive treatment. This might explain the higher number of anxiolytic prescriptions among residents prescribed anti-dementia medications compared to those who were not, both within the psychotropic medication sub-group and across all medications (**Tables 5.21 and 5.22**).

It has also been found in the literature that the use of anxiolytics/hypnotics is higher in ‘as required prescriptions (PRN)’, although most PRN indications were not documented (La Frenais et al. 2021). However, the majority of the recorded indications were for agitation, anxiety, or distress, which are components of BPSD (La Frenais et al. 2021), supporting their use as second-line agents when antidepressants alone fail to manage symptoms. Moreover, anxiolytics are used to treat agitation/aggression, which is common in people with dementia; however, this is an inappropriate indication (Rijksen et al. 2021). Another explanation for this concomitant use is that anxiolytics counteract

the side effects of SSRIs, observed in some individuals, including insomnia and anxiety (Ruths et al. 2013).

It has been found previously that prescribing antidepressants was associated with prescribing antipsychotics and anxiolytics (Nishtala et al. 2009; Bourgeois et al. 2012b; Westbury et al. 2019). An Australian study Almutairi et al. (2021), which was not specific to residents with dementia but was conducted in residential aged care facilities and classified residents on each class of drug alone, found that residents on antidepressants alone formed the largest group, followed by those on antipsychotics alone, and finally those on benzodiazepines alone. Additionally, the combination of "antidepressants + antipsychotics" was the most common among drug combinations (Almutairi et al. 2021), which is a similar pattern to the findings of this current study.

5.4.3.1 Antidepressants:

Several studies have reported frequent antidepressant prescribing in care homes among residents with and without dementia (Ruths et al. 2013; Helvik et al. 2017; Smeets et al. 2018; Harrison et al. 2020b). However, their effectiveness in people with dementia is uncertain (Banerjee et al. 2013; Orgeta et al. 2017; Zuidersma et al. 2019), as antidepressants may be less effective due to neuronal damage and loss (Wilkins and Forester 2016; Lozupone et al. 2018). In addition to concerns about their effectiveness, antidepressants tend to be given for long durations. In one study, 90% of those treated with antidepressants were still on this treatment after 12 months (Midlöv et al. 2014). In the UK, it is recommended to use a non-pharmacological approach to treat depression in people with dementia (National Institute for Health and Care Excellence [NICE] 2018).

High prescribing of antidepressants in care homes might be related to a number of factors. In care homes, observation is typically the responsibility of the nurses, who might not have the ability to differentiate between depression and generalised low mood. For example, if a nurse observes a resident crying, they might ask the doctor to prescribe antidepressants, believing it to be depression (Iden et al. 2011). Also, doctors often feel under pressure to prescribe antidepressants, because they rarely do

systematic diagnostic work (Hoek et al. 2003; Wood-Mitchell et al. 2008; Iden et al. 2011), possibly due to lack of time or because they are distant from the care home. Nurses also spend a lot of their time on nursing and personal care, including washing and feeding; they have limited time to apply non-pharmacological approaches, and there are also significant financial barriers to these methods, all of which might lead to antidepressants becoming an easy option to use (Iden et al. 2011).

Antidepressants are not only used for depression but also for other indications, such as insomnia, anxiety, agitation and neuropathic pain (Bourgeois et al. 2012b; Helvik et al. 2017; Brimelow et al. 2019). In Belgian nursing homes, only 66% of antidepressant use was found to be for depression, mainly using SSRIs (Bourgeois et al. 2012b). Also, citalopram is not only prescribed for depression but might also be effective in agitation too (Helvik et al. 2017; La Frenais et al. 2021; Hughes et al. 2024). Additionally, with increased severity of dementia, the use of antidepressants for different indications other than depression also increased (Bourgeois et al. 2012b). Despite this, depression could be under-recognised and under-treated in nursing homes (Hiltunen et al. 2016; Gerritsen et al. 2017). These factors may partly explain the high rate of antidepressant prescribing, particularly among residents prescribed anti-dementia medications in the present study, but they also raise concerns about the appropriateness of such prescribing in this group.

Moreover, restrictions on the use of antipsychotics might lead to the use of antidepressants instead, due to their more favourable safety profile, particularly SSRIs (Ruths et al. 2013; Riese 2015; Brimelow et al. 2019). However, while antidepressants are generally considered safer than antipsychotics, SSRIs are associated with adverse effects such as falls, bone loss and fractures (Bloch et al. 2011; Coupland et al. 2011; Ruths et al. 2013). These factors together may explain the higher prescribing of antidepressants in care homes.

In the literature, it has been found that there is no significant difference in prescribing of antidepressants between residents with and without dementia (Selbaek et al. 2007a; Van Asch et al. 2013; Midlöv et al. 2014; Hiltunen et al. 2016; Helvik et al. 2017). For

example, two studies conducted in Norwegian nursing homes found no significant differences between residents with and without dementia. In both studies, dementia was defined as a score of 1 or above on the Clinical Dementia Rating Scale (Selbaek et al. 2007a; Helvik et al. 2017).

On the other hand, two Australian studies reported that antidepressant prescribing was significantly higher among people with dementia (Brimelow et al. 2019; Harrison et al. 2020b). Harrison et al. (2020b) found that within the first three months after entering a care home, the prevalence of antidepressant use was slightly higher in residents with dementia (39%) compared to those without (37%) (Prevalence Ratio = 1.05; 95% CI: 1.04–1.07). In that study, dementia status was determined either from aged care records or based on whether the resident was prescribed anti-dementia medication. These findings are consistent with the current study which found that, across all residents, antidepressants were more commonly prescribed to those residents also prescribed anti-dementia medications (30.9%) compared to those not prescribed them (26.5%) ($p < 0.001$). Also, in the community, between 2005 and 2011 in Finland, people with dementia were three times more likely to use antidepressants than those without dementia (Taipale et al. 2014). The method used to identify dementia status may contribute to these differences in results across studies. Also, different settings, clinical guidelines, and countries might yield different results.

When antidepressant classes were disaggregated in this study, SSRIs (sertraline and citalopram) and tetracyclic antidepressant (mirtazapine) were the highest antidepressant medications prescribed among both residents prescribed and not prescribed anti-dementia medications, with no significant differences. Another class of antidepressants, trazodone, was the only one that was significantly higher in residents prescribed anti-dementia medications compared to those who were not (**Table 5.23**, **Figure 5.9.B**). This pattern may be due to the sedative properties of trazodone and mirtazapine, which are often used for insomnia or sleep disturbances at low doses (Saletu-Zyhlarz et al. 2002; Bourgeois et al. 2012b; Leong 2014). However, they have different anticholinergic effects (Bishara et al. 2017), which is important to consider when prescribing for people with dementia.

Drugs with anticholinergic effects are associated with falls, cognitive impairment, and dementia, and might lead to higher mortality in older adults (Bishara et al. 2017). Also, anticholinergic drugs and acetylcholinesterase inhibitors (anti-dementia medications) have opposing effects, which can diminish their clinical efficacy when used together (Sink et al. 2008; Bishara et al. 2017). The medication classification system utilised by the Anticholinergic effect on Cognition (AEC) tool is a "traffic light" system in which each substance is assigned a score of zero, one, two, or three (Bishara et al. 2017; Bishara et al. 2019). A medication that has no anticholinergic effect on cognition is given a score of zero, and a medication with the greatest effect is indicated by a score of three (Bishara et al. 2019). Drugs with strong anticholinergic effects should be reviewed, stopped or replaced with alternatives that have lower anticholinergic effects where possible, particularly in people with dementia (Bishara et al. 2017; Bishara et al. 2019). Trazodone has a score of zero, while sertraline, citalopram and mirtazapine each have a score of 1 (Bishara et al. 2017). So this might explain why trazodone prescribing was significantly higher among residents prescribed anti-dementia medications compared to those who were not.

While the current study cannot determine indications for psychotropic medications, it has been found in the literature that common reasons include depression, anxiety, sleep disturbances, agitation, and psychosis (Brimelow et al. 2019). In people with dementia, agitation and psychosis were the most frequent indications for prescribing psychotropic medications (Brimelow et al. 2019). SSRIs (particularly sertraline and citalopram) were found to be frequently used for care home residents with depression and agitation (Bourgeois et al. 2012b; Helvik et al. 2017; Hughes et al. 2024).

In the current study, TCAs were prescribed significantly more among residents not prescribed anti-dementia medications (8.7%) than among those prescribed anti-dementia medications (4.9%) within antidepressant classes. TCAs, such as amitriptyline, are generally not recommended for use in older adults because of their serious side effects, strong anticholinergic activity (e.g. amitriptyline has a score of 3 on the AEC scale), and narrow therapeutic index (Bishara et al. 2017; Khalid 2023). Their

use might indicate potential inappropriate prescribing for older patients, particularly those with dementia (Banerjee et al. 2013; Ruths et al. 2013; Fixen 2019). However, they are still prescribed because they might be used for different indications off-label such as for migraine, insomnia and pain (Wong et al. 2017; Hiance-Delahaye et al. 2018). In Belgian nursing homes it was found that TCAs were used for neuropathic pain at low doses (Bourgeois et al. 2012c). Also, these drugs might already have been prescribed before care home admission, so it would be difficult to stop them, especially if people were stable. Taken together, these factors likely explain the lower prescribing of TCAs among residents prescribed anti-dementia medications compared to those who were not. This finding might reflect more cautious prescribing in this population, although the indications were not known in the present study.

Other studies conducted in care homes, although not specifically on residents with dementia (despite the high prevalence of dementia in these settings), have found that SSRIs are the most frequently prescribed antidepressants (particularly sertraline and citalopram), followed by mirtazapine, and finally TCAs (particularly amitriptyline) (Nishtala et al. 2009; Westbury et al. 2019; Harrison et al. 2020b).

Similarly in a longitudinal study in England (La Frenais et al. 2021), residents with dementia in care home were more likely to be prescribed SSRIs (citalopram 15.2%, sertraline 5.7%), followed by mirtazapine (11.2%), then trazodone (4.4%), and finally TCAs (amitriptyline 2.3%). A similar pattern of antidepressant prescribing was observed in the present study among residents prescribed anti-dementia medications, where SSRIs (47%) were the most commonly prescribed, followed by mirtazapine (33.5%), trazodone (10%), and TCAs (4.9%), within the antidepressant classes. Although the percentages differ, the pattern of antidepressant prescribing in the present study aligns with the general trend observed in La Frenais et al. (2021). The higher proportions in the present study likely reflect the smaller and more specific sample, which included only residents who were prescribed psychotropic medications. Notably, in the present study among residents prescribed anti-dementia medications, sertraline (49%) was prescribed more frequently than citalopram (39%) within SSRIs, which is different from the findings of La Frenais et al. (2021) where citalopram was more common, this

difference might be due to the method of identifying people with dementia. In the present study, residents diagnosed with dementia but not prescribed anti-dementia medications, or who had discontinued such medications, would have been missed. Also, the present study covered 310 care homes across UK, while the La Frenais et al. study (La Frenais et al. 2021) identified residents with dementia through clinical diagnosis, not by medications, and covered only 86 care homes in England. These factors might explain the slight difference.

Sertraline, citalopram, mirtazapine and trazodone are widely prescribed for people with dementia who develop changes in mood and behaviour (Alzheimer's Society 2021d). Therefore, the findings from the present study are consistent with those found elsewhere, indicating that this is a common treatment pattern for people with dementia, even if it is not always considered best practice.

5.4.3.2 Antipsychotics:

Antipsychotics are mainly used to treat schizophrenia and bipolar disorder, but they may also be prescribed to manage persistent aggression in people with dementia (Szczepura et al. 2016; National Institute for Health and Care Excellence [NICE] 2018; Yunusa et al. 2019; Royal College of Psychiatrists 2022). However, their benefits in this context are modest, and they should therefore be prescribed only in limited circumstances. Specifically, antipsychotics should be used in people with dementia only when the individual is at risk of harm to themselves or others or is experiencing severe distress due to agitation or hallucinations. Additionally, these medications should be prescribed at the lowest effective dose and used for the shortest possible duration, due to limited efficacy. A review of the treatment should occur every 6 weeks (National Institute for Health and Care Excellence [NICE] 2018).

Risperidone and haloperidol are the only licensed drugs for treating non-cognitive symptoms of dementia in the UK (National Institute for Health and Care Excellence [NICE] 2024a). Risperidone is a second-generation antipsychotic and is associated with lower risk of extrapyramidal symptoms, so it is the first choice and can be used for up to

6 weeks (Bhattacharyya 2024; National Institute for Health and Care Excellence [NICE] 2024c). This might explain why risperidone was the most frequently prescribed antipsychotic in this present study (50.9% among antipsychotics in those prescribed anti-dementia medications).

In Australia and Canada, risperidone is the only antipsychotic licensed for use in BPSD (Canadian Institute for Health Information 2016; Australian Institute of Health and Welfare (AIHW) 2023). In the USA, the FDA recently approved Brexpiprazole for agitation associated with dementia (U.S. Food and Drug Administration (FDA) 2023). This drug is not marketed in the UK, so its use cannot be compared (All Wales Therapeutics and Toxicology Centre 2018).

In the current study, risperidone (50.9%) and quetiapine (14.1%) were the most frequently prescribed antipsychotics among residents prescribed anti-dementia medications. This has also been seen in other studies in the UK (La Frenais et al. 2021) and Australia (Shin et al. 2016). For example, risperidone was commonly used (67%) followed by quetiapine (11%) among residents prescribed anti-dementia medications (Shin et al. 2016). However, in a large-scale study including 31,619 residents across 616 care homes in England, quetiapine was the most commonly prescribed, followed by risperidone although the study was not specifically focused on people with dementia (Szczepura et al. 2016). These findings suggest that risperidone is prescribed more frequently in residents with dementia, reflecting adherence to guideline recommendations, whereas quetiapine may be more widely used in the general care home population.

Second-generation antipsychotics were more frequently prescribed in care homes than first-generation, but the difference was not significant (Szczepura et al. 2016). Haloperidol is a first-generation antipsychotic and has more severe extrapyramidal and hyperprolactinaemia effects. It also has numerous contraindications, so it tends to only be used in emergency situations (Bhattacharyya 2024; National Institute for Health and Care Excellence [NICE] 2024c). This might explain the lower percentage of haloperidol prescribing among residents prescribed anti-dementia medications (5% of 495)

compared to those not prescribed anti-dementia medications (11% of 1,571) within the antipsychotic class in the present study. In other studies, haloperidol was among the least frequently prescribed antipsychotics for residents with dementia in care homes (Shin et al. 2016; La Frenais et al. 2021). However, it was the highest among injectable 'as required PRN prescription' antipsychotics (Wang et al. 2023), suggesting that it is indeed only used in acute emergency situations.

Other antipsychotics might be used "off-label" depending on the balance of risk and benefits for specific individual situations (Brimelow et al. 2019; Bhattacharyya 2024). This might explain the use of antipsychotics other than licenced drugs such as quetiapine, levomepromazine, olanzapine, and aripiprazole in this study. It has also been found that around 40% of antipsychotics were prescribed as 'off-label' in care homes (Volicer 2012).

Since antipsychotics are associated with increased morbidity and mortality and have limited efficacy (Banerjee and Great Britain. Department of 2009; Donegan et al. 2017), NICE guidelines state that the duration of antipsychotic use in people with dementia should not exceed 6 weeks, while in Australia, guidelines stipulate that it should not exceed 12 weeks (Australian Institute of Health and Welfare (AIHW) 2023). In this study, it was not possible to determine the duration of antipsychotic use for all residents because of the limitations of the data set, specifically that prescribing start / stop dates were not routinely collected. Prolonged use of antipsychotics increases the risk of serious adverse effects, including stroke, pneumonia, heart failure, and fractures, particularly within the first 90 days after starting treatment in people with dementia (Mok et al. 2024). It has been found in the literature that the duration of antipsychotics prescribed for people with dementia is a common issue. In one study in Australia, more than 50% of residents receiving anti-dementia medications were also prescribed antipsychotics for more than six months across 40 care homes from 2008 to 2013 (Shin et al. 2016). Another study in UK found that 82% of antipsychotics were prescribed for longer than 6 weeks in care homes (Szczepura et al. 2016). Antipsychotic prescriptions in people with dementia mainly start after they move into care homes and commonly continue until they die (Harrison et al. 2020a; Kalisch Ellett and Lim 2020). Exceeding

the recommended duration of antipsychotic use might be related to the infrequent monitoring of residents' medications and the desire to decrease staff distress (Malone et al. 2007; Zuidema et al. 2011a; Szczepura et al. 2016). In Denmark, one study found that regardless of residents' diagnosis, behavioural issues might lead to the use of antipsychotics (Sørensen et al. 2001). Ultimately, these studies corroborate the inappropriate use of antipsychotics in people with dementia in care homes observed in this current study.

5.4.3.3 Anxiolytics:

Anxiolytics are generally recommended for the short-term management of severe anxiety and should not be used for more than four weeks, in order to avoid the risk of dependence and withdrawal symptoms (Bourgeois et al. 2012a; Rijksen et al. 2021; National Institute for Health and Care Excellence [NICE] 2024b). Their prolonged use may also have implications for the progression of dementia and cognitive decline (Rosenberg et al. 2012; Brimelow et al. 2019; He et al. 2019).

In older adults, benzodiazepines (including anxiolytics and hypnotics) should be avoided due to their potential to cause confusion and ataxia, which can increase the risk of falls and fractures (Bourgeois et al. 2012a; Rijksen et al. 2021; National Institute for Health and Care Excellence [NICE] 2024b). Using psychotropic medications such as anxiolytics to treat BPSD, e.g. anxiety, is generally against recommendations (Alzheimer's Society 2021d; La Frenais et al. 2021).

Despite these concerns, it has been found that anxiolytic prescribing in care homes frequently exceeds recommended durations. For instance, a Dutch study reported that the median duration of anxiolytic use in nursing homes was 321 days (range: 57–1,567 days), and the majority of prescriptions were for managing agitation and aggression, which were considered inappropriate prescribing based on duration and indication (Rijksen et al. 2021). Contextual factors within care homes might affect prescribing as it has been reported that large nursing homes were associated with the persistent use of anxiolytics compared to smaller homes, which might be due to a lower ratio of registered nurses to residents or staff distress (Kim and Whall 2006; Zuidema et al.

2011a; Helvik et al. 2017). However, such information was not available in the present study.

This section has focused on anxiolytics because **Chapter 4** found that anxiolytics (5% of nervous system medications) were prescribed more than hypnotics (3%), and similar findings have been reported in previous studies (Bourgeois et al. 2012a; Rijksen et al. 2021). For example, Rijksen et al. (2021) found that in residents with dementia prescriptions for anxiolytics (30%) were greater than those for hypnotics (17%) among both benzodiazepine and non-benzodiazepine classes.

In general, in this study, prescriptions for the anxiolytic class were significantly higher in residents prescribed anti-dementia medications compared to those who were not. When this class was disaggregated, lorazepam was the most frequently prescribed drug in both groups, those prescribed anti-dementia medications (78.1%) and not prescribed (67.2%), followed by diazepam (21.4% and 30.2%, respectively). Lorazepam prescribing was significantly higher in those prescribed anti-dementia medications compared to those who were not, whereas diazepam and other anxiolytics (including oxazepam and buspirone) were more frequently prescribed in those not prescribed anti-dementia medications.

Lorazepam has a lower anticholinergic effect score (AEC = 0) and a shorter half-life (t½ = 10–20 hours) compared to diazepam, which has an AEC of 1 and a considerably longer half-life (t½ = 20–100 hours). Also in previous studies, lorazepam was used to manage agitation and aggression in residents with dementia (La Frenais et al. 2021; Rijksen et al. 2021). These reasons may explain why lorazepam was prescribed significantly more in residents with anti-dementia medications who might have had more BPSD.

In a longitudinal UK study, researchers found that lorazepam (8.4%) was more frequently prescribed in residents with dementia than diazepam (3.2%), followed by oxazepam (0.4%) and buspirone (0.2%) (La Frenais et al. 2021). While this reflects a similar prescribing pattern to the present study, the percentages differ due to variations

in the denominator used for calculation. Similarly, a study conducted in Belgian nursing homes, which included around 48% of residents with dementia, found that lorazepam was the most commonly prescribed anxiolytic, whereas diazepam and oxazepam were among the least prescribed drugs in this class (Bourgeois et al. 2012a).

However, in Dutch care homes and residents with dementia, oxazepam was the most frequently prescribed anxiolytic, followed by lorazepam, following Dutch guidelines (Zuidema et al. 2018; Rijksen et al. 2021). Also, two studies conducted in Australia found that oxazepam prescribing was higher, but these studies were not specific to dementia, although they were conducted in care homes (Westbury et al. 2019; Harrison et al. 2020b). It has also been found that short-acting anxiolytics, such as lorazepam and oxazepam, are more frequently prescribed than long-acting anxiolytics, such as diazepam (Bishara et al. 2017; Halvorsen et al. 2017). Lorazepam and oxazepam have sedative properties and fewer anticholinergic effects (Bond and Lader 1988; Chew et al. 2008; Bishara et al. 2017). The differences might rise from different practices in each country, onset of action, potency, and price. Lorazepam has a quicker onset of action, is more potent, and is cheaper than oxazepam (Bond and Lader 1988; The Alliance for Benzodiazepine Best Practices 2023; Online Formulary 2024). However, short-acting benzodiazepines are also associated with severe adverse events, such as hip fractures (Bakken et al. 2014).

When comparing anxiolytics in studies examining people with and without dementia, conflicting results emerge. Anxiolytics or benzodiazepines have been found to be prescribed at similar levels between people with and without dementia at baseline and after 72 months in Norway and Australia (Helvik et al. 2017; Harrison et al. 2020b). Even in community settings, levels of anxiolytic use are similar between dementia and non-dementia patients (Taipale et al. 2014). However, in Brimelow et al. (2019) benzodiazepine use was lower in residents with dementia (OR 0.63 (0.44-0.91) $p = 0.013$). Different practices in each country and setting, including whether anxiolytics are classified under benzodiazepines or separately, as well as the number of people included, might be responsible for these conflicting results.

5.4.4 Gender and Age

There is a clear distinction between the terms sex and gender. Sex refers to biological and physiological characteristics, such as hormones and genital organs. For example, higher levels of testosterone in males can lead to physical differences such as greater muscle mass and bone density, which may contribute to more aggressive behaviour (Sell et al. 2012; Brook 2024; The Council of Europe 2024; World Health Organization 2024a). In contrast, gender refers to the socially constructed roles, behaviours, and expectations associated with being male or female, as well as an individual's internal sense of identity (Brook 2024; The Council of Europe 2024; World Health Organization 2024a).

From a social perspective, historical and cultural norms have shaped gender roles. For instance, boys are often encouraged to engage in physical play or aggression, whereas girls are more often for nurturing behaviours. This may help explain why toy guns are commonly associated with boys, while dolls are linked to girls (Furtuna 2014; Bracke et al. 2020; Kaufman et al. 2023; Brook 2024). Also, it has been found that 81% of the social care workforce is female (Skills for Care's Workforce Intelligence 2023), which may reflect how gender norms influence occupational preferences.

Moreover, gender differences might be related to learned behaviour, as social role theory has suggested (Eagly et al. 2000; Johnson et al. 2017). Depending on social circumstances and accepted cultural aspects, men and women can be culturally / socially taught to behave in particular ways. Traditionally, certain actions are anticipated from men compared to women. For instance, society has generally been more accepting of men showing aggression and violent behaviour than when women display the same actions (Eagly et al. 2000).

Regarding age, most of the care home population in the UK consists of the oldest-old. Among the care home population aged 65 years and over, 56.4% of residents were aged 85 years and over (Storey 2023b). Age-related changes influence pharmacokinetics and pharmacodynamics, making older adults in care homes particularly susceptible to

medication-related harm (Lindsey 2009; Corsonello et al. 2010; Maxwell 2024). The pharmacokinetic and pharmacodynamic properties of psychotropic medications are also influenced by comorbidities and polypharmacy, both of which are prevalent among a significant number of older adults. Consequently, older adults are at an elevated risk of adverse drug reactions and interactions (Zubenko and Sunderland 2000; Lindsey 2009). With age, the risk of geriatric syndromes including orthostatic hypotension, falls, and associated skeletal fractures increases. These conditions can result from a variety of factors, such as medication-related adverse effects, polypharmacy, and comorbid medical conditions (Bulat et al. 2008; Lindsey 2009).

Thus, it is critical to consider gender and age when discussing the prescribing of psychotropic medications among older adults, as information regarding how these factors influence prescribing in this demographic is scarce (Moga et al. 2017). The fact that older women frequently experience higher rates of diseases and disabilities than men may contribute to the fact that they tend to take more medications overall (Bierman et al. 2007; Moga et al. 2017).

5.4.4.1 Patterns of psychotropic medication prescribing by gender and age groups

In both groups (those prescribed and those not prescribed anti-dementia medications) in the present study, males were prescribed more psychotropic medications than females, with the difference being statistically significant only among those not prescribed anti-dementia medications. Moreover, the youngest-old group was prescribed more psychotropic medications than the oldest-old group, with the difference being significant in both groups prescribed and not prescribed anti-dementia medications (**Tables 5.4 and 5.6**). This may suggest that males and residents in youngest-old group exhibit more behavioural symptoms, regardless of anti-dementia medication prescribing status.

In terms of gender differences, this trend became more evident when psychotropic medications were disaggregated. Among residents prescribed psychotropic

medications, males were prescribed more antipsychotics alone, anxiolytics alone, and combinations than females. However, this was only statistically significant for antipsychotic prescriptions among residents not prescribed anti-dementia medications. In contrast, females were significantly more likely to be prescribed antidepressants alone than males in both groups (those prescribed and those not prescribed anti-dementia medications) (**Table 5.13**). Among all residents, including those not on psychotropic medications, a similar trend was observed in both groups. Males were more likely to be prescribed antipsychotics alone, anxiolytics alone, and combinations, with statistical significance only for antipsychotics among residents not prescribed anti-dementia medications (**Table 5.15**).

Regarding age differences, among residents on psychotropic medications, the youngest-old were significantly more likely to be prescribed antipsychotics alone (only significant among residents prescribed anti-dementia medications) and combinations than the oldest-old. Conversely, the oldest-old were significantly more likely to be prescribed antidepressants alone than the youngest-old in both Groups (prescribed and not prescribed anti-dementia medications) (**Table 5.17**). Across all residents, the youngest-old were significantly more likely than the oldest-old to be prescribed antipsychotics alone and combinations in both Groups (**Table 5.19**).

When comparing residents of the same gender and age group between those prescribed and not prescribed anti-dementia medications, those with anti-dementia drugs were prescribed significantly more psychotropic medications than those without anti-dementia medications (**Tables 5.5 and 5.7**). This suggests that the presence of anti-dementia drugs may be a primary factor driving the prescription of psychotropic medications, rather than gender or age. Also, when comparing residents of the same gender or age group between those prescribed and those not prescribed anti-dementia medications across all residents, a similar pattern was observed. Both males and females, as well as youngest-old and oldest-old individuals prescribed anti-dementia medications, were significantly more likely to be prescribed combinations than their counterparts not prescribed anti-dementia medications. Antidepressants alone and anxiolytics alone were also more commonly prescribed among those prescribed anti-

dementia medications than among those not prescribed these drugs, with statistical significance observed only among females and the oldest-old residents prescribed anti-dementia medications (**Tables 5.16 and 5.20**). These consistent trends suggest that the prescription of antidepressants, anxiolytics, and combinations may be more strongly associated with those prescribed anti-dementia medications rather than gender or age.

Gender and age differences in psychotropic medication use may arise from several factors. Firstly, care home staff may be more likely to notice and report behaviours in male residents, as these behaviours are often perceived as more threatening, distressing, or dangerous. In contrast, similar behaviours in females may be viewed as more acceptable (Isaksson et al. 2011; Denson et al. 2018; Resnick et al. 2021). This perception might imply that male residents are seen as stronger and express more violent behaviour, thereby leading to more frequent use of psychotropic medications in males than in females to manage such behaviours.

Moreover, BPSD show variations between gender and age groups. In term of gender, men are more likely to exhibit physical aggression, indifference, and regressive behaviours, including sexually inappropriate conduct, as measured by the Cohen-Mansfield Agitation Inventory (CMAI) (Lovheim et al. 2009; Zuidema et al. 2009; Resnick et al. 2021). These may explain the higher rate of antipsychotic use observed in males (Helvik, 2017; Szczepura, 2016; Lövheim, 2009; Ruths, 2013). A Norwegian study in nursing homes found that antipsychotics were prescribed more frequently in males (adjusted OR = 0.64, 95% CI: 0.44–0.93), although the study did not differentiate between residents with or without dementia (Helvik et al. 2017).
In contrast, women are more prone to experience depression, anxiety, and restlessness (Lovheim et al. 2009; Zuidema et al. 2009). It has been found that female residents are more likely to experience depression, anxiety, sadness, and physical complaints than males, which might explain the higher rates of antidepressant prescribing among females in care home (Ruths et al. 2013; Moga et al. 2017; La Frenais et al. 2021; Resnick et al. 2021). For instance, a UK study found that, among residents with

dementia, females were more likely to be prescribed antidepressants than males (OR=1.35, 95% CI: 1.14 – 1.59). (La Frenais et al. 2021).

Regarding anxiolytics, restricting antipsychotic prescriptions may compel staff to manage agitation and aggression, especially in males, with anxiolytics, which are frequently prescribed in care homes (Richter et al. 2012; La Frenais et al. 2021). This may explain the trend towards increased prescribing of anxiolytics alone and in combination in males compared to females in the present study, although these differences were not significant.

However, in community settings, females are more likely to be prescribed antidepressants and anxiolytics, while males tend to be prescribed antipsychotics (Loftus et al. 2023). Although trends suggest increasing antidepressant use among females (Helvik et al. 2017) and higher antipsychotic use among males (La Frenais et al. 2021), these findings were not statistically significant. Some studies also found no gender differences in psychotropic medication use (Hamada et al. 2021; Resnick et al. 2021). For example, Resnick et al. (2021) found no gender differences in the use of antidepressants, anxiolytics, or antipsychotics among U.S. residents; however, their study was limited to individuals with moderate to severe dementia. In contrast, the present study included residents prescribed anti-dementia medications, regardless of dementia severity. While no significant gender differences were observed across all residents for different classes of psychotropic medication, when focusing specifically on those prescribed psychotropic medications, females prescribed anti-dementia medications were significantly more likely to be prescribed antidepressants than males. Also, benzodiazepine use showed no gender differences in care homes in both Germany and Sweden (Lovheim et al. 2009; Jacob et al. 2017).

In terms of age groups, psychotropic medication prescribing generally decreases with increasing age (Langballe et al. 2011; Ruths et al. 2013; Grill et al. 2021; Hamada et al. 2021). Similarly, in the present study, the oldest-old were significantly less likely to be prescribed psychotropic medications compared to the youngest-old (Group 1: 60.9% vs. 72.2%; Group 2: 47.5% vs. 64.9%). As care homes are recognized as appropriate

settings for end-of-life care (Wowchuk et al. 2006; Berg 2020), this may be due to a shift towards palliative care approaches.

As noted in **Chapter 4**, the majority of male residents in this study (51%) were in the youngest-old category, while most female residents (68%) were oldest-old. Females generally live longer than males (Buxton 2024), and this was reflected in the significantly higher mean age of females (88 years, SD = 9.6) compared to males (82 years, SD = 10.6) in care homes (Buchanan et al. 2004; Resnick et al. 2021). Furthermore, younger residents in nursing homes (mean age = 84.4 years, SD = 7.9) tended to show more neuropsychiatric symptoms (Selbaek et al. 2007a). Thus, since the younger residents in this study were mostly males, this may partly explain the higher rate of psychotropic prescribing among the youngest-old, particularly antipsychotics alone and combinations.

For example, a UK study (not specifically limited to residents with dementia) found that care homes with high rates of antipsychotic prescribing were more likely to have younger (65–84) and male residents (Szczepura et al. 2016). Similarly, in Japan, residents aged 65–84 with dementia were prescribed significantly more antipsychotics, anxiolytics, and antidepressants compared to those aged ≥85 years(Hamada et al. 2021). Helvik et al. (2017) also found that younger residents (mean age = 84.4 years, SD = 7.8) were prescribed more antipsychotics, though the study did not define "younger-old" precisely. In a systematic review focusing on the community, younger patients (<75) were prescribed more antidepressants and antipsychotics, while older patients (>80) were prescribed more benzodiazepines. In this systematic review, people aged 75 to 80 were not mentioned, but this was due to each study's inclusion and exclusion criteria (Loftus et al. 2023).

Other factors, as well as gender and age, might affect prescribing. La Frenais et al. (2021) found that anxiolytics in the UK were prescribed more in nursing homes than in residential homes, whereas more persistent use of antipsychotics was found in institutions served by multiple GPs (4 or more GPs) and located in deprived areas (defined as neighbourhoods in the top 10% on the index of multiple deprivation scores

nationally (Szczepura et al. 2016; Ministry of Housing 2019). Longer stay residential institutions were associated with clinically significant neuropsychiatric symptoms, leading to more use of psychotropic medications (Selbaek et al. 2007b). Longer stays were also found to be associated with persistent use of antipsychotics (Helvik et al. 2017). Therefore, while age and gender are important factors to consider, they are not the only ones influencing prescribing practices. Other variables, such as length of stay and institutional characteristics, may also play a role and highlight the need for future research to explore these influences more thoroughly.

5.5 Strengths and Limitations:

Since the same database was used in Chapter 4, the strengths and limitations have already been discussed in Section 4.5. In this chapter, residents were divided into two groups based on their prescribing status for anti-dementia medications. It was assumed that residents in Group 1 who were prescribed anti-dementia drugs had AD, as these medications are primarily used for this condition (National Health Service [NHS] 2024). However, it is important to acknowledge that some residents in Group 2 may also have had AD or another type of dementia, either undiagnosed or not treated with pharmacological interventions. Consequently, the number of residents with dementia in this study may have been underestimated. As the focus of the study was to examine whether the prescribing of anti-dementia drugs drives the prescribing of psychotropic medications, rather than dementia diagnoses per se, the findings should be interpreted with caution, particularly when compared with studies based on clinical diagnoses.

Nevertheless, this approach remains valuable and is comparable to studies in which clinical diagnostic data are unavailable, as it enables the identification of important patterns in prescribing practices and highlights the challenges involved in this type of study.

5.6 Conclusion:

The findings from this chapter support previous research on the prescribing of psychotropic medications in care homes, showing that more than half of residents are prescribed these medications. Residents who were prescribed anti-dementia medications were more likely to also be prescribed psychotropic medications. Notably, this pattern was consistent across all groups studied (males, females, the youngest-old, and the oldest-old), when comparing those residents with and without anti-dementia medications. These results suggest that for care home residents being prescribing anti-dementia medications (primarily used for AD) is the driving force for significantly increasing the likelihood of being prescribed psychotropic medications.

In addition, being male or belonging to the youngest-old group was associated with higher prescribing of psychotropic medications, regardless of anti-dementia medication prescribing status. This finding indicates a higher prevalence or severity of symptoms in these groups. Residents with anti-dementia medications were also more likely to be prescribed multiple psychotropic drugs, possibly due to a wider range of symptoms and/or to the drugs being less effective.

As shown in this study, there is a high rate of psychotropic medication prescribing in care home residents, particularly among those prescribed anti-dementia medications. However, the reasons for this prescribing are unclear, especially given that such use is not recommended by guidelines for treating people with dementia. Therefore, Chapter 6 will explore how care home staff manage BPSD, including the use of psychotropic medications, and identify barriers to effective management by conducting interviews.

Chapter 6: Preliminary Investigation of Care Home Staff's Views on the Management of BPSD, particularly Depression, in Residents with Dementia: An Exploratory Qualitative Study

6.1 Introduction

Managing BPSD in patients with dementia in residential care homes is particularly challenging due to limited resources, a lack of clinical guidelines, and pressure from both family members and care home staff (Jennings et al. 2018a). A comprehensive assessment of the residents and the surrounding environment is necessary for the development of a care plan that includes monitoring of outcomes after implementation by trained staff (Sawan et al. 2017). BPSD often results in admission to care homes (Toot et al. 2017; Dhuny et al. 2021) and people with dementia may struggle to communicate their needs, leading to behaviours that disrupt others, which are often managed with psychotropic medications (Dhuny et al. 2021).

The use of psychotropic medications (e.g., antidepressants, antipsychotics, anxiolytics) in care homes is increasing (Ruths et al., 2013) as discussed in **Chapters 4** and **5**. Although these medications have only modest efficacy, they are associated with serious adverse events (Ruths et al., 2013). For example, the use of antipsychotics in people with dementia is associated with an increased incidence of stroke and mortality risk (Ballard et al. 2008; Richter et al. 2012). Care homes may inappropriately depend on psychotropic medications due to the difficulties of implementing non-medication strategies consistently, a lack of awareness about the associated risks, and viewing medication as an easier solution for managing BPSD (Almutairi et al. 2018b; Maust et al. 2018b; Yoon et al. 2022).

In **Chapters 4** and **5** issues were identified with the use of psychotropic medications in care homes, particularly for residents who were also taking anti-dementia medications, based on administration data. However, these data could not identify the reasons for prescribing psychotropic medications due to the lack of clinical rationale for prescription decisions in the eMAR database. Thus, there is a need to investigate this issue in more detail, exploring the reasons why and how these medications are used in care homes and how BPSD is managed from the perspective of care home staff.

Care home staff, such as registered nurses, manage conditions associated with aging, assess new residents, develop care plans, manage risks, and provide medical care, particularly for residents with complex needs, due to their qualifications and expertise (Berg 2023). Also, because they spend more time with residents, they are able to observe and record residents' behaviour (Sawan et al. 2017; Dhuny et al. 2021), so it is important to explore their views. In parallel, the Royal Pharmaceutical Society has promoted expanding pharmacists' roles in care homes, highlighting benefits such as medication reviews, harm reduction, error prevention, and minimising waste (National Institute for Health and Care Excellence [NICE] 2014; Baqir 2018; Royal Pharmaceutical Society 2024).

Therefore, interviewing care home staff and pharmacists will help to explore the use of psychotropic medications in detail from their perspective and gather information to improve the management of BPSD, particularly depression.

6.1.1 Aim and Objectives

The overall aim of this study is to understand and explore pharmacists' and care home staff's views on the management of BPSD, particularly depression and the use of psychotropic medications, in residents with dementia in care homes.

The objectives are to:

1. Explore how care home staff and pharmacists understand the treatment of BPSD, particularly depression, in residents with dementia in care homes.
2. Identify how effective nursing staff and pharmacists perceive the treatment of BPSD, particularly depression, to be in residents with dementia.
3. Identify facilitators and barriers to the effective treatment of BPSD in residents with dementia.
4. Assess the feasibility of conducting interviews with pharmacists and care home staff.

6.2 Methods

In **Chapter 2** (sections 2.6 and 2.8), the general methodology and an overview of qualitative research were discussed. Qualitative research focuses on recognising subjective reality and highlighting the importance of understanding people's experiences related to specific phenomena (Castellan 2010; Austin 2019). Interviews, observation, and open-ended surveys are examples of qualitative data collection (Gill et al. 2008).

6.2.1 Ethical Approval

Based on the Health Research Authority's definition of research, this project is considered a service evaluation rather than research (Health Research Authority [HRA] 2022). Usually, the purpose of research is to find generalisable or transferrable new knowledge, whereas a service evaluation defines or judges current services or care (Health Research Authority [HRA] 2022). Thus, the project did not require approval from the NHS Research Ethics Committee (REC), but only School Research Ethics Committee (SREC) approval (Pharmacy Research Ethics 2021). This method was submitted to the School Ethics Committee as a protocol and approval was granted by the SREC (SREC references and committee: 2324-01) (see Appendix 4).

6.2.2 Qualitative Interviews

Interviews are usually selected as a common data collection method in qualitative research due to their conversational quality and engagement in the social context between participants and the interviewer, leading to an exploration of ideas and thoughts (Austin and Sutton 2018). Usually, interviews are guided by a topic guide or interview schedule consisting of specific questions (Austin and Sutton 2018; Babbie 2020).

There are three main types of interview design: fully structured, semi-structured, and unstructured (in-depth) (Austin and Sutton 2018). The differences between these types are in the interview format, data collection, information, and skills and knowledge required (Ryan et al. 2009; Austin and Sutton 2018). Fully structured interviews use a

specified set of questions in a fixed order; participants might be asked to select an answer from a provided set of options (Austin and Sutton 2018). Unstructured interviews usually consist of talking points instead of particular questions and are used when researchers are not familiar with the topic of interest (Ryan et al. 2009; Austin and Sutton 2018).

A semi-structured interview design is most commonly used because it is more flexible than a structured interview, does not follow a set sequence of questions or wording, and allows interviewers to ask open-ended questions (Gill et al. 2008; Tod 2015). Also, interviewers are able to adapt the topic guide, explore emerging issues, and ask probing questions. Data in this type of interview can be analysed either quantitatively or qualitatively (e.g., thematic analysis) or by using a combination of both (Austin and Sutton 2018).

In this study, in order to explore participants' views on the management of BPSD, particularly depression, in residents with dementia, semi-structured interviews were used, as they were deemed the most appropriate method to address the study's aim. A semi-structured approach was chosen because the questions were flexible and could be adapted based on the participants' responses, allowing for the exploration of emerging themes or issues that might arise. Also, probing questions were asked to gain further clarification if required.

6.2.3 Individual Interviews, Focus Groups and Group Interviews

There are three main ways to conduct interviews: individual interviews, focus groups, and group interviews. An individual, 'one-to-one' interview is a discussion conducted with a single participant (Denscombe 2010). It usually gathers data about a single participant's perspective, knowledge, behaviour and beliefs on a topic of interest (Denscombe 2010). Focus groups and group interviews gather people together to collect their viewpoints about a particular topic (Denscombe 2010; Coe et al. 2021). The main difference is in the interaction within the group. In the focus group, data is collected through discussion among several participants, while in group interviews, the

discussion is generated between each participant in the group and the researcher (Denscombe 2010; Coe et al. 2021).

Moreover, individual interviews focus on individual perspectives in more depth and provide greater privacy for participants to speak freely. However, in focus groups, the depth of data might be limited by group dynamics, and individual perspectives may be influenced by the group (Denscombe 2010; Guest et al. 2017; Austin and Sutton 2018). Also, individual interviews are easier to arrange in terms of scheduling compared to the group format. Therefore, in this study, individual interviews were conducted because the researcher was interested in personal viewpoints, as each individual would have unique experiences and different backgrounds, and they would be available at different times.

6.2.4 Design and Development of the Topic Guide

The topic guide comprised broad, open-ended questions to motivate the interviewees to take the lead on the narrative and thus to reflect participants' viewpoints (Rowley 2012). Also, prompt questions were asked to initiate further discussion and ensure accurate understanding (Ryan et al. 2009; Holloway 2016). The topic guide is included in Appendix 4.

The questions were mainly based on the researcher's results from the analysis of the data from the eMAR database used in care homes described in **Chapters 4** and **5**. The results from these chapters highlighted the issue of psychotropic medication use, particularly among residents taking anti-dementia medications, based on prescription data. To understand and explore the reasons for using psychotropic medications and how BPSD is managed in care home residents, these findings were translated into the interview questions. When the ethics application and all the associated documents were originally approved, the intention was to focus on depression in particular in people with AD. However, several months later, following a more detailed analysis of the database results, the scope of the interviews was expanded to consider BPSD more broadly. During the interviews, participants also mentioned other symptoms of BPSD

(e.g., anxiety) as examples. Consequently, the findings reflect a wider perspective on BPSD, with depression remaining a particular focus.

The topic guide questions comprised three sections, addressing general information, psychotropic medications for the treatment of BPSD symptoms, and treatment of depression in dementia. The general section focused on how care home staff deal with residents at admission, and how medications are reviewed. The psychotropic medications section covered how staff handle residents exhibiting behavioural symptoms such as depression or agitation, and also explored factors like age and gender that might affect the use of these medications. Finally, depression management in residents with dementia was discussed, including what the first-line treatment would be (medication or non-medication approaches), and what barriers might exist to using non-medication approaches.

The topic guide started with general questions and then moved to sections gathering specific data to address the research question using a funnel technique (Ryan et al. 2009; Babbie 2020; Rosala 2022). Demographic information (including job title, workplace, length of experience, training, and experience working with residents with dementia) was also obtained at the beginning of the interviews as part of the conversation. This information is necessary to understand the participants' views and put them into the context of their knowledge and experience. The topic guide was created to guide the interviews and maintain a focus on the topic, and it was reviewed with the researcher's supervisors (Professor Emma Kidd [EK] and Dr Mathew Smith [MS]). Piloting the topic guide is important to enable testing, improve questions, and ensure that the questions covered the topic adequately (Tod 2015). In the present study, this was challenging because only two participants were ultimately recruited; however, the researcher tested the topic guide by asking the first interviewee if there were areas or questions that were not covered but needed to be included, and whether questions were clearly constructed.

6.2.5 Study Setting

Semi-structured individual interviews were conducted in this study. Creating a comfortable environment – a 'comfort zone' – is essential, so that participants feel free and encouraged to share their ideas and thoughts without judgment or fear (Austin and Sutton 2018). Interviews were therefore conducted in a quiet environment to avoid distraction and ensure participants' confidentiality (Doody and Noonan 2013).

The interviews were planned to be conducted online unless the participant preferred a different method, such as a face-to-face or telephone interview. Online interviews, using platforms such as Microsoft Teams or Zoom, were preferable because of better geographical spread and accessibility for participants. Entering a care home might require approval from the owner and increase the risk of infection for residents. In this study, recruitment and interviews took place during the winter months due to time limitations at the end of the PhD. Also, conducting the study during this period meant that heightened infection control measures were in place, which further affected access to care homes. If a participant preferred a face-to-face interview, they were asked if it was possible for the researcher to gain access to the care home and what procedure, if any, needed to be followed. If the researcher determined that access would be difficult, an online interview was organised.

For online interviews, the participants were asked to undertake the interviews in a quiet and secure place, such as the participant's office or a meeting room in the care home. The researcher was also in a quiet room, such as a meeting room in the School, while conducting interviews. The date and time were arranged based on the participants' preference, and for online interviewing, participants were given the option to turn the camera off or on. Interviews were originally intended to be conducted online; however, the participants recruited preferred face-to-face or telephone interviews.

6.2.6 Sampling and Selection

Due to the range of different backgrounds and qualifications of participants likely to be encountered and the exploratory nature of this study, a purposive sampling methodology was used (Etikan 2016; Creswell and Creswell 2018). Purposive sampling involves deliberately selecting specific participants with particular characteristics that will best address the research problem (Etikan 2016; Creswell and Creswell 2018). Also, recruiting a diverse sample ensures a comprehensive understanding of the topic in a short time, which can be achieved by using a purposive approach (Etikan 2016; Creswell and Creswell 2018).

Purposive sampling techniques primarily focus on achieving thematic saturation (i.e. data saturation), which occurs when collecting additional data no longer uncovers fresh insights or reveals new characteristics, indicating that the researcher has obtained a sufficient sample (Etikan 2016; Creswell and Creswell 2018; Hennink and Kaiser 2022). Thus, if no new themes or insights are identified during analysis, this suggests that data saturation has been reached, and further data collection may not be necessary.

Qualitative studies typically involve a relatively small number of participants (Fusch and Ness 2015; Creswell and Creswell 2018; Hennink and Kaiser 2022). Evidence indicates that six to seven interviews can be sufficient to capture most of the themes (approximately 80% saturation), while more interviews can lead to a higher level of saturation (Namey et al. 2016; Guest et al. 2020).

Given the exploratory nature of this study and discussions with supervisors, it was estimated that a sample size of approximately 10 to 15 participants, for each of the pharmacists and care home staff groups, from different sites in Wales would be sufficient to reach saturation. If saturation was not achieved and sufficient time remained, recruitment would continue. Conversely, if more than 15 participants responded and saturation had already been achieved, additional volunteers would be thanked but no further interviews would be conducted, following a ‘first come, first served’ approach.

6.2.7 Inclusion and Exclusion Criteria

This study initially focused on two groups: 1) Pharmacists and 2) Care home staff. For pharmacists, participants had to be involved in supporting pharmaceutical care and medicines management for care home residents, with a minimum of 2 years of experience (i.e., post-foundation training years). Only pharmacists who were involved with supporting the pharmaceutical care/medicines management of residents in care homes were included: typically, these would be pharmacists with clinical roles, such as pharmacists who are conducting polypharmacy reviews. Community pharmacies/pharmacists whose sole role was the provision/supply of medication to care homes were excluded.

For care home staff, participants included managers and/or nurses responsible for drug administration, with a minimum of 2 years of experience (i.e. post-training years). Both care home staff and pharmacists were required to have at least two years of experience (i.e. post-foundation years) to ensure that they had sufficient practical experience and could contribute meaningfully to addressing the research questions. The care home sites and the locations of the pharmacists were within Wales only, to reduce variation between health systems in different parts of the United Kingdom.

6.2.8 Recruitment

For care home staff (care home managers and/or nurses), no Research and Development (R&D) approval was required, because they were employed by private organisations and not by the NHS. A database of email addresses for care homes in England and Wales was purchased from OSCAR Research (https://www.oscar-research.co.uk/). OSCAR Research compiles databases of information based on publicly accessible data – in this case, for care homes in England and Wales. Specifically, all care homes in the UK are registered, inspected and listed by the relevant authority, namely the Care Quality Commission (CQC) in England and the Care Inspectorate Wales (CIW) in Wales. OSCAR Research compiles this information into an accessible and searchable database, which they provide to public sector bodies

(including the Office for National Statistics, universities, the Cabinet Office, the NHS, the Ministry of Defence, and local councils).

Care home staff were recruited using these email addresses. The School's license agreement with OSCAR Research allowed for the use of the database (including email addresses) for research purposes. Typically (but not always), it is the care home manager who monitors the care home email address. The email addresses for the care homes were used as the first point of contact and care home managers/owners were recruited as gatekeepers via these email addresses. Specifically, the gatekeeper email was addressed to the care home manager/owner. Therefore, there were multiple gatekeepers: one per care home. The gatekeeper's invitation letter, information sheet, and consent form (see Appendix 4) were sent to the gatekeeper to read, in order to clarify their role, and then to sign either electronically or by typing their initials.

After signing the consent form, the gatekeepers received an invitation email, a participant information sheet (PIS) and a consent form as attachments to forward via email to the potential participants (see Appendix 4). To increase convenience, consent forms could be signed electronically or by typing their initials. After signing, potential participants were asked to return the consent form to the researcher's email address (alotaibit1@cardiff.ac.uk). If the gatekeepers fitted the inclusion criteria, they were also eligible to act as potential participants.

Then, the researcher arranged interviews according to the participants' preferences at their preferred times. If there was no response after 10–14 days, a reminder email, based on the original email, was sent. If no reply was received within a further two weeks, the participant was marked as having not responded and no recruitment took place. This procedure was in line with the ethics application, ensuring that participants had adequate time to consider the invitation and respond.

For pharmacists, who were involved with supporting the pharmaceutical care/medicines management of residents in care homes, a gatekeeper (Consultant Pharmacist and National Lead for Wales: Community Healthcare) was needed to

facilitate recruitment of potential participants. As the pharmacists were likely to be working for health boards, Research and Development (R&D) approval was necessary. After speaking with the gatekeeper responsible for recruiting pharmacists, it was found that the number of pharmacy professionals working in care homes across Wales was low from a health board perspective, at only around three pharmacists. This limited number of care home pharmacists covered a vast number of care homes, with infrequent visits (once or twice a year). Consequently, their level of involvement was likely to be constrained and they might not be deeply engaged in clinical management. After discussing this issue with the research team, the decision was made to focus only on care home staff, and no further efforts were made to recruit pharmacists.

To protect confidentiality, all data (demographic information, consent forms, recordings, and pseudonymised transcripts) were stored in different files on Cardiff University's OneDrive, which could only be accessed by the research team (Talal Alotaibi (TA), EK and MS). Each participant was assigned a unique code to ensure pseudonymisation.

6.2.9 Data Analysis

Interviews were recorded and transcribed *verbatim*. The recording helped the researcher to listen actively during the interviews and revise transcripts when required (Doody and Noonan 2013). Interviews were recorded using a digital voice recorder device if they were conducted face-to-face or by telephone, while online interviews (which were not used in the present study, but a procedure needed to put in place in case participants preferred this approach) would be recorded automatically within the platform. For example, Microsoft Teams has recording and transcribing functions, and participants can turn the camera off or on. All recordings were uploaded and stored in Cardiff University's OneDrive platform and were locked to ensure that they could only be accessed by the research team (TA, EK and MS). All audio files were transcribed *verbatim* by the researcher (TA). The interviews were audio-recorded to enable the researcher to produce pseudonymised transcripts for analytical purposes. Any identifying information was redacted to ensure confidentiality. After generating the

pseudonymised transcripts, an accuracy check was then performed by listening to the recordings while simultaneously reading the transcripts to identify and correct any errors or omissions (Hagens et al. 2009).

As described in **Chapter 2**, two methods of reasoning – inductive and deductive – were employed during analysis. Transcripts were analysed thematically by the researcher using NVivo 12 software, which facilitated data organisation, coding, and retrieval. The thematic analysis followed Braun and Clarke's (2006) six-phase framework. These phases involve familiarising oneself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing a report (Braun and Clarke 2006).

After generating the transcript, it was read while simultaneously listening to the audio. This was followed by reading the transcript independently and making notes to become immersed in the data and achieve familiarisation. The transcript was then re-read alongside the notes to generate codes and label the data. Coding was conducted by the researcher (TA) to ensure consistency. Relevant codes were subsequently grouped together to form potential themes. These themes were reviewed to ensure that the codes accurately represented the data and, when appropriate, were combined with other themes. The themes were also reviewed with the research team. Finally, themes were written up narratively and supported with participant quotations as evidence. An inductive analysis was conducted first to allow new and unanticipated themes to be identified naturally from the data. This was followed by a deductive analysis, guided by the research objectives, to ensure that no data relevant to the study aim was overlooked.

6.2.10 Data Management

Personal data and consent forms were collected in accordance with the General Data Protection Regulations (GDPR). All the data was stored on Cardiff University's OneDrive, and was accessible only for the research team (TA, EK and MS). Since this OneDrive will be deleted after the researcher graduates from the university, Cardiff University's

Research Data Store will be contacted to store these data for longer-term accessibility. Also, a unique code for each participant was used to ensure pseudonymisation.

According to the Cardiff University Record Retention schedules, all data (demographic information, consent forms, recording and pseudonymised transcript) will be kept for fifteen years after the end of the project. Also, they may be accessed, where necessary, by members of the University's governance and audit teams or by regulatory authorities.

The results of this study have been used by the PhD student in his thesis and may be presented at conferences and published. It will not be possible to withdraw any pseudonymised data that has already been published or, in some cases, where identifiers are irreversibly removed during the course of a research project from the point at which it has been pseudonymised.

Participants received materials in advance, including a participant information sheet and a consent form, along with the researcher's contact information in case they had any questions. The participant information sheet provided an overview of the project, and a signed consent form was obtained before the project began. Participants were free to withdraw their consent to participate in the research project at any time, without giving a reason, even after signing the consent form. However, if the interview had been transcribed and become a pseudonymised transcript, it was not possible to withdraw their data. It took a month after the interview for a transcribed interview to become a pseudonymised transcript.

In the unlikely event of harm or neglect being identified in this study, the National Wales Safeguarding Procedures (guidance available at https://safeguarding.wales/en/) would be followed, and the relevant Regional Safeguarding Board would be contacted (https://safeguarding.wales/en/rsb-i/rsb-i-r1/r1-p1/). Also, it might be necessary to share specific data with a regulatory body, such as CSIW.

6.3 Results

The OSCAR Research care home database was received as an Excel sheet. There were 913 care homes listed. The database was cleaned by removing duplicates (using the 'unique' function in Excel), only including unique site numbers, resulting in 897 unique care homes. After that, the researcher focused on care homes that had available emails and catered for old age residents (113 care homes without emails were excluded), and excluded care homes associated with children, physical dependency, substance misuse, and alcohol dependency (13 homes). This left 771 unique care homes (897 - (113 + 13) = 771).

To achieve randomness while ensuring a sufficient sample for the planned target of 10–15 participants, every 10th row in the database was selected. In the first round, 77 care homes were contacted. Four rounds were completed, resulting in 308 of the 771 unique care homes being invited. Selecting every 10th home provided a reasonable selection of the database, ensuring a good spread of homes across Wales. Assuming that about 10% might reply, this would yield around 7–8 homes in the first round, which was about half of the planned sample size and closer to the 10–15 homes expected to give saturation. However, if every 20th row were selected, it would only give around 38 homes, resulting in 3–4 responses, requiring more requests to achieve the planned sample size and saturation. Conversely, selecting every 5th row would result in around 154 homes, which might exceed the 10 homes needed for saturation. Thus, every 10th row was selected.

Thus, 308 care homes across Wales were sent invitations. Seven care homes replied, giving a response rate of 2.2% (7/308 x 100): five declined to participate and only two respondents accepted the invitation. Both were managers in different care homes. These homes were associated with different health boards: one with Cardiff and Vale University Health Board and the other with Betsi Cadwaladr University Health Board. Acceptance of the interview invitation occurred after a reminder email was sent.

Interviews were conducted with two participants (one male and one female). The first interview was conducted in person on 25 January 2024. The second interview was initially scheduled to take place online; however, the participant later decided to have the interview over the telephone, which took place on 13 February 2024. On average, the interviews lasted 26 minutes (the first lasted 28 minutes and the second 24 minutes), indicating a moderate level of engagement because not all questions could be asked due to the respondents' busy schedules. The two care homes differed in size: one had fewer than 25 residents, while the other had more than 25. Regarding experience, there was a difference between the two participants. One had worked in the field for less than 5 years, while the other had over 10 years of experience.

Although thematic saturation was not reached, the information collected was valuable in expanding understanding of the data obtained from the care homes eMAR database in **Chapters 4** and **5** and was thus analysed. The analysis provided preliminary insights, leading to identifications of three preliminary or initial themes: effective management of BPSD, barriers to the provision of effective management, and the impact of effective collaboration between care home staff and professionals for the effective management of BPSD (**Table 6.1**). In addition, two sub-themes were identified for Theme 1: medication and non-medication, importance of adequate exploration to improve management approach.

***Table 6.1**: Preliminary Themes*

	Themes	Subthemes
1	Effective Management of BPSD.	a. Medication and non-medication b. Importance of adequate exploration to improve management approach.
2	Barriers to the provision of effective management of BPSD.	
3	Impact of effective collaboration between care home staff and professionals for effective management of BPSD.	

6.3.1 Theme 1: Effective Management of BPSD

Participants indicated that the management of the symptoms of BPSD was usually decided through discussions with GPs and mental health teams. These practitioners visited the care home site and discussed the symptoms with care home staff, such as nurses. The outcomes of the interviews fell into two subthemes for Theme 1.

a. Subtheme: Medication and non-medication approaches

Both participants agreed that it was important to start with a non-medication approach, such as talking therapy, and saw it as a valuable approach, but found that using both non-medication and medication approaches together was effective.

> *I think sometimes that there's a lot more value to talking therapies than to just starting on the course of heavy antidepressants; maybe a smaller dose alongside talking therapies would be more effective. (Manager 2. Experience > 10 years)*

However, there were different views about using medication. The first view supported the use of medications because they were helpful, especially in people with dementia, but emphasised that they required monitoring.

> *...using medication, it's quite appropriate because the medication tends to reduce a lot of the risks. Yes, there is a risk of obviously taking the medication, but on balance, I think*

the medication helps because imagine someone is, has got no ability to know what he's doing... That's when you have to consider the usage of medication. (Manager 1. Experience < 5 years)

However, the other respondent preferred not to use medication and minimised its usage as much as possible, arguing that it is worth trying different means which might be helpful before starting medication. The other reason given for not using medication was that once medication has been started, it might never be discontinued because of concerns about recurrence and relapse, even if the guidelines recommended reviewing and stopping. In this case, the risks might outweigh the benefits and, after a period of time, this might lead to polypharmacy issues.

...I don't go straight for medication. I will always try and see if there's environmental aspects that can be changed to reduce people's anxieties. And again, I, I'm very loath to use medication because there's so many other different techniques that can be utilised. (Manager 2. Experience > 10 years)

...I think sometimes GP and mental health professionals commence people on loads of medication and then they're very reluctant to take them off, even when the evidence suggests that they no longer need it. (Manager 2. Experience > 10 years)

b. Subtheme: Importance of adequate exploration to improve management approach.

The interviewees emphasised that it is very important to explore and understand residents' backgrounds, and that 'digging deeply' and discussion with residents might help to manage their behaviours. By understanding their background and addressing the underlying cause of their behaviour, it might be possible to avoid using medication.

...sometimes people are just too happy to pop pills rather than to look at the initial cause. (Manager 2. Experience > 10 years)

> *…there was a resident in a care home that used to get up at 4:00 every morning and was very challenging and very aggressive toward staff when they went to put him back to bed. When I went to do a review, I reminded the care home manager at that point that the gentleman used to be a milkman. And all he was doing – he'd gone back in time and [was] getting up and going to work. In his opinion, the carers were stopping him … so as soon as the approach was changed and they gave him a little milk truck too, it's helped. So understanding of somebody's context in their background is important. (Manager 2. Experience > 10 years)*

Due to challenges in communication with residents with dementia when talking about their issues, this approach will depend extensively on the staff's observations and how they report issues, because GPs and psychiatrists rely heavily on staff information. Otherwise, they will just prescribe medication without investigating the underlying cause.

> *… I think he's [a resident] depressed and then the doctor comes in and says, "Oh yes", but that depression is caused by the way we are treating that individual, so have we explored other means to find out? (Manager 1. Experience < 5 years)*

> *…Because the psychiatrist doesn't look after these people, he comes and relies on what the information you give. (Manager 1. Experience < 5 years)*

In addition, both participants focused on the importance of the holistic approach, involving input from all relevant people, and spending time assessing which approach will improve the resident's situation.

> *By taking a truly holistic approach and taking time to assess an individual thoroughly and contextually and involving the carers, involving people that have known these individuals for a lot longer than staff in care homes … maintaining and maximising the input that carers do have, because they do spend a lot of time with residents on a daily basis. (Manager 2. Experience > 10 years)*

6.3.2 Theme 2: Barriers to the Provision of Effective Treatment

The participants described two barriers to the provision of effective treatment. The first was the lack of training and its quality with respect to dealing with people with dementia and non-medication approaches. Particularly since the COVID-19 pandemic, most training occurs online, where the outcome tends to be poor and unhelpful. In online training, people can be easily distracted by their surroundings, or they can just sign into the session without fully focusing on the content. This was said to be different if the training is conducted in person.

> *The barrier is the training. Especially like after COVID, the training, it's been very poor because it's just online. This person might just put himself on to say he's on, but he's busy doing something. (Manager 1. Experience < 5 years)*

The second barrier identified was the lack of time to get an overall picture of the situation. Taking the time to understand and review residents' situation might help to improve their management, but this might not always be possible due to workload. These barriers might affect the provision of effective treatment, consequently leading to the prescription of medication as an easy solution.

> *People just seem to be wanting to get medication rather than spend time trying to understand what it is that's causing the individual's anxieties. (Manager 2. Experience > 10 years)*

> *... GPs haven't got time to necessarily dig a lot deeper. Sometimes it's so much easier just to give people a prescription of antidepressants. (Manager 2. Experience > 10 years)*

6.3.3 Theme 3: Impact of effective collaboration between care home staff and professionals for effective management of BPSD

The management of BPSD is heavily reliant on interventions from GPs and mental health teams, as they are clinicians and have the authority to make clinical interventions. Therefore, there needs to be effective collaboration because care home

staff have intimate knowledge of the residents that can be used to inform decision-making, and thus to improve the management of BPSD.

> *If we don't all work together, you know, it's too easy to hand out some medication and then let the care staff deal with it in the care home... (Manager 2. Experience > 10 years)*

> *...I've got a good relationship with the mental health team, so I can always get in touch with them directly ... and discuss any concern with them... (Manager 2. Experience > 10 years)*

6.4 Discussion

This study identified three preliminary themes: effective management of BPSD with two sub-themes, barriers to the provision of effective management, and the impact of effective collaboration between care home staff and professionals on the management of BPSD.

Managing BPSD is particularly challenging due to the lack of clinical guidelines, limited resources, and the pressure from both family members and care home staff (Jennings et al. 2018a). A thorough assessment of both the resident and their environment is essential to create a care plan that involves trained staff monitoring the outcomes (Sawan et al. 2017).

However, psychotropic medications are frequently prescribed in care homes, despite the fact that guidelines, such as those established by NICE, suggest that BPSD should be initially treated without medication (National Institute for Health and Care Excellence [NICE] 2018; Moth et al. 2021; Alzheimer's Association 2024). Due to the challenges of consistently implementing non-medication strategies, a lack of awareness regarding the associated risks, and the perception that medication is a simpler solution for managing BPSD, care homes may inappropriately rely on psychotropic medications (Almutairi et al. 2018b; Maust et al. 2018b; Yoon et al. 2022). As demonstrated in the results presented in **Chapters 4** and **5**, many residents were

prescribed psychotropic medications, with a notably higher prevalence among those who were also receiving anti-dementia medications. Residents who were taking anti-dementia medications were significantly more likely to be prescribed psychotropic medications (66%) compared to those who were not (54%).

Most studies in the literature do not focus only on care home staff views but include a combination of GPs and staff or focus on GPs only (Sawan et al. 2017; Dhuny et al. 2021), so the discussions include different professionals depending on the subject matter. In this study, the results were drawn from only two participants, both managers in care homes, so it is difficult to discuss them in relation to the literature about the views of different healthcare professionals and to draw definitive conclusions. However, in the literature, most studies to date focus on the difficulties and challenges of treating BPSD in care homes, so the results are discussed accordingly based on the preliminary themes identified in this study.

6.4.1 Views on the Management of BPSD

In research conducted in Ireland, although the majority of GPs recognised the significance of non-medication approaches in the management of BPSD, they emphasised the challenges associated with incorporating these approaches into real-world settings (Walsh et al. 2017; Dhuny et al. 2021). In the study conducted by Dhuney et al. (2021), all participating GPs agreed that psychotropic medications do not benefit people with BPSD and recommended using non-medication approaches. This view is similar to those expressed by the two managers in the present study. Both participants agreed on the importance of using non-medication approaches, such as talking therapy, as an initial step. These approaches help to understand the underlying causes of distress and behavioural changes in residents (Caspar et al. 2018; Alzheimer's Society 2021c). However, the participants held contrasting views on using medication: one supported its use, while the other preferred not to use it and sought to minimize its use.

Nevertheless, around 56% of GPs prescribed antipsychotics if people with BPSD were physically aggressive (Dhuny et al. 2021). This might imply that there is a discrepancy

between the clinical practice of GPs and their knowledge of the limited efficacy of antipsychotic medications, demonstrating the practice gap and challenges that GPs encounter (Dhuny et al. 2021).

In a study conducted in Australia, most GPs considered psychotropic medications as a "necessary evil", prescribed to manage the high workload in care homes resulting from lack of staff, especially at night, because a single disruption from one resident can cause a disturbance throughout the whole unit (Sawan et al. 2017). In the GPs' view, psychotropic medication is deemed necessary to maintain peace and calm among staff and residents (Sawan et al. 2017).

6.4.2 Factors influencing the Management of BPSD or Challenges of Treating BPSD

Research has revealed that GPs face huge pressure from care home staff to prescribe psychotropic medications due to factors such as understaffing, lack of time and resources, and lack of staff knowledge and skills, all of which influence GPs' decisions about prescribing these medications (Azermai et al. 2014; Cousins et al. 2017; Sawan et al. 2017; Dhuny et al. 2021; Moth et al. 2021). Due to recruitment challenges in the current study, these factors might not be directly related to my initial results. With more participants, additional themes might have been identified; however, this requires further exploration in future research.

Care homes frequently experience difficulties in recruiting and retaining sufficient skilled staff and are often understaffed (Jenkins et al. 2016; Yoon et al. 2022). Understaffing is associated with increased aggression (verbal and physical) by residents with dementia (Cassie 2012; Yoon et al. 2022), and is an obstacle to the consistent implementation of non-medication approaches, which then leads to dependence on psychotropic medications as an easy solution (Cassie 2012; Sawan et al. 2017; Yoon et al. 2022). Understaffing is also associated with higher prescribing of psychotropic medications to overcome high workload (Zuidema et al. 2011b; Smeets et al. 2014; Cousins et al. 2017; Sawan et al. 2017). In the Netherlands, Zuidema et al. (2011) found

that a low staff-to-resident ratio was associated with high antidepressant use (OR 0.13, 95% CI (0.04-0.47)), and staff distress was associated with high use of antipsychotics and anxiolytics. This distress might result from understaffing and high workload.

Lack of training was highlighted in the current study as a barrier to providing effective management of BPSD in care homes, which may be due to differences in staff knowledge and qualifications. Registered Nurses (RNs) have advanced training and skills, allowing them to provide holistic care and implement non-medication approaches, whereas Licensed Practical Nurses (LPNs) focus on essential tasks, such as medication administration (Cioltan et al. 2017; Vogelsmeier et al. 2017; Crystal et al. 2020; Yoon et al. 2022). LPNs are more common in the USA, where their role is often comparable to that of nursing assistants in the UK. It has been found that higher LPN staffing levels are associated with an increased use of antipsychotics (Cioltan et al. 2017; Yoon et al. 2022), and some nursing assistants feel overwhelmed and unqualified to deal with residents who have BPSD due to inadequate training (Sawan et al. 2017). This difference in knowledge and lack of training may impact the management of BPSD and contribute to the inappropriate use of psychotropic medications.

Moreover, lack of time was identified as one of the barriers to providing effective management of BPSD in the present study, and this may result from understaffing. This was evident during the recruitment stage, as although over 300 invitations were sent, only seven people responded (five declined, two accepted) after the reminder emails. The lack of participation, and the responses after receiving the reminder, might indicate lack of time. Also, studies have reported that understaffing leads to staff spending insufficient time with residents, which negatively impacts the job performance of RNs, consequently leading to reliance on psychotropic medications due to excessive workload (Smeets et al. 2014; Sawan et al. 2017; Yoon et al. 2022). Prior research has found that increased RN hours provided additional time to investigate the underlying causes of challenging behaviours and enabled the creation of comprehensive care plans to reduce the severity of behavioural symptoms, particularly in residents with dementia (Smeets et al. 2014; Sawan et al. 2017).

Not spending enough time with each resident makes it difficult to gain a holistic view of how to provide effective management of BPSD, which may be due to understaffing. Staffing can become a barrier to the use of non-medication approaches or a facilitator of inappropriate psychotropic medication use (Cousins et al. 2017; Sawan et al. 2017; Dhuny et al. 2021). Moreover, while care home staff lack the time to implement non-medication approaches, GPs also lack the time to perform medication reviews, which leads to challenges in discontinuing or changing psychotropic medications, particularly if they were initiated by others (Iden et al. 2011; Almutairi et al. 2018b; Moth et al. 2021).

From the perspective of GPs, studies have found that GPs' experience, registration of patients with new GPs, and visits by multiple GPs affect the management of BPSD in care homes (Szczepura et al. 2016; Cousins et al. 2017; Welberry et al. 2021). GPs with more confidence and experience in the management of BPSD have been found to be less likely to succumb to pressure from staff to prescribe psychotropic medications; however, those with less experience were reluctant to discontinue or reduce the dose of such medications (Smeets et al. 2014; Cousins et al. 2017; Jennings et al. 2018a; Moth et al. 2021). Cousins et al. (2017) found that GPs with 20–40 years of experience were significantly less likely to see pressure from staff to prescribe psychotropic medications as an obstacle to the use of non-medication approaches compared to those with less than 5 years' experience. This was similar to the findings of the present study, in which the care home manager with more experience (more than 10 years) strongly supported using non-medication approaches first. However, only two participants were involved so these findings would need to be confirmed by further research. This may suggest that experience influences management, although different professionals were involved (GPs versus care home managers).

In previous studies, GPs stated that in order to improve BPSD management, increasing the number of staff members at care homes, increasing GPs' access to old age psychiatrists and geriatricians, increasing funding to provide elderly care, and providing more training to improve the management of BPSD for staff and GPs will all help to reduce the use of psychotropic medications and increase the application of non-medication approaches (Dhuny et al. 2021; Moth et al. 2021).

Nonetheless, there is concern that discontinuing or deprescribing psychotropic medications could have an undesirable impact on residents' quality of life, resulting in the recurrence of challenging behaviours and distressing psychological symptoms (Smeets et al. 2014; Cousins et al. 2017; Simmons et al. 2018; Dhuny et al. 2021). This discontinuation may also increase the workload for staff (Sawan et al. 2017). Additionally, the perceived lack of effectiveness of non-medications approaches, or inadequate staff resources to implement them, might hinder discontinuation, according to staff views (Simmons et al. 2018).

Thus, studies have found that some GPs, staff, or relatives were resistant to discontinuing psychotropic medications due to concerns about worsening symptoms (Azermai et al. 2014; Smeets et al. 2014; Cousins et al. 2017; Simmons et al. 2018; Moth et al. 2021). Moth et al. (2021) stated that GPs and care home staff both have a strong belief in the effectiveness of antipsychotics for managing BPSD, even though there is evidence of associated adverse risks. This may indicate a lack of knowledge, experience, or training.

This behaviour could be explained according to Karl Weick's sensemaking theory, which involves forming and testing an understanding of a changing environment, and then adjusting it based on perceived credibility (Snook et al. 2012; Moth et al. 2021). In care homes, healthcare professionals and relatives are unlikely to consider deprescribing if they believe in the drug's benefits, underestimate its side effects, and perceive that discontinuing it will lead to an increased workload (Jennings et al. 2018b; Moth et al. 2021). However, acknowledging side effects and observing no worsening of symptoms can make discontinuing inappropriate psychotropic medications seem reasonable (Moth et al. 2021). This highlights the importance of enhancing knowledge about these medications, especially their side effects, in order to ensure evidence-based practice.

A Cochrane review found that long-term use (≥ 3 months) of antipsychotics could be successfully discontinued without worsening BPSD (Van Leeuwen et al. 2018; Neville et al. 2020). Additionally, discontinuation has been associated with improvements in

quality of life, cognition, and activities of daily living, a reduction in falls and higher family satisfaction (Simmons et al. 2018; Van Leeuwen et al. 2018; Neville et al. 2020). Moreover, medication reviews that utilised collegial mentoring and systematic clinical evaluation successfully reduced psychotropic medications (commonly antidepressants and sedatives) for residents without worsening behavioural issues and improved physical function (Gedde et al. 2021). Conversely, the use of an increased number of psychotropic medications (particularly antipsychotics and benzodiazepines) was associated with a lower quality of life (Harrison et al. 2018).

6.4.3 Constructive Collaboration

Care home staff deliver one-to-one care for people with BPSD (Dhuny et al. 2021). These staff are ideally placed to observe and document residents' mood and behaviour, as they spend the most time with residents (Dhuny et al. 2021). GPs and staff collaborate to evaluate potential triggers of BPSD, and then GPs can provide guidance on non-medication approaches and prescribe medication if necessary (Dhuny et al. 2021). This highlights the importance of constructive and effective collaboration between GPs and staff. Trustful relationships and effective communication are helpful to reduce inappropriate use of psychotropic medications (Sawan et al. 2017; Walsh et al. 2017; Jennings et al. 2018a).

Recognising the comprehensive knowledge that care home staff have about their residents, and willingness by GPs to listen to their insights, can help in initiating medication reviews or discontinuing psychotropic medications (Sawan et al. 2017; Walsh et al. 2018). For example, a nurse assistant observed that a resident displayed different behaviours after being prescribed risperidone (Sawan et al. 2017, p. 519). She spoke with the doctor about stopping the medication, and the doctor listened to her. As a result of this effective communication, the medication was discontinued. The process of deprescribing or reviewing these medications is significantly influenced by the collaboration and communication among healthcare professionals, as well as the acknowledged contributions of these professionals (Sawan et al. 2017; Walsh et al. 2017; Moth et al. 2021).

This is consistent with the perspective of the care home managers in the present study, who emphasised the importance of effective collaboration between staff and healthcare professionals in managing BPSD. Constructive collaboration helps to share observations and discuss concerns in a meaningful way, leading to improved management of BPSD and shaping of the best decisions. As a result, GPs depend significantly on the information provided by staff, meaning that nurses play a significant role in shaping GPs' decisions regarding the initiation, reduction, or cessation of psychotropic medications (Iden et al. 2011; Dhuny et al. 2021).

However, it has been reported that some GPs expressed a lack of confidence in care home staff and ignored pharmacists' recommendations because they were frustrated at 'being told how to do their job,' which potentially affects the provision of effective management (Sawan et al. 2017; Walsh et al. 2018; Moth et al. 2021). Also, some staff reported that certain GPs maintained a hierarchical and traditional approach, expecting nurses to follow their instructions without question and not to participate in the decision-making process (Sawan et al. 2017). Thus, lack of trust and refusal to take feedback from other health professionals might negatively affect the management of BPSD.

6.5 Limitations including Researcher's Experience and Challenges of Conducting Research with Care Home Staff

The very low recruitment rates were not anticipated when this study was originally conceived. Once it became clear that so few participants were going to be recruited, the focus of the study shifted towards assessing the feasibility of conducting interviews with care home staff for a larger future study. Therefore, there is a mismatch between some of the original documentation which had to be used (e.g. the participant information sheet) as it had ethical approval and the results obtained. This limitation could be overcome in future work by improving recruitment and by submitting minor amendments to the documents for ethical approval to ensure consistency between the stated aims and study results. I did not submit minor amendments at the time as I was

nearing the end of my PhD and did not have enough time to wait for the amendments to be approved before I could start recruiting participants.

Securing ethical approval to conduct this study took a long time, so invitations were sent later than planned in the year. As they were sent during the winter period, it is possible that care home managers declined to participate due to the higher sickness burden at this time of year among both staff and residents. However, using a purchased care home database and the fact that some responses were received reflect that invitations were likely to have been sent to the correct email addresses.

After sending 308 invitations, only two participants agreed to participate, even after sending reminders. This indicates that there are significant barriers to conducting research in care homes and that care home managers or staff are reluctant to participate. In addition, due to the low response rate, the themes that were identified were preliminary, and would need to be refined or explored further, potentially through engaging more participants and employing additional recruitment strategies.

Conducting research in care homes is essential to building an evidence base specific to this area and enhancing the overall quality of care (Jenkins et al. 2016). Engaging in research can elevate care standards, improve residents' quality of life, and support the professional growth of staff (Jenkins et al. 2016). From 2022 to 2023, the number of care home residents increased significantly, by 3.1% (Barrett 2023a), and this growing number means that understanding residents' health needs and evaluating the quality of care provided in these settings has become crucial for global health (Tzouvara et al. 2016). However, despite the necessity to enhance care quality, researchers have encountered difficulties and challenges in recruiting staff in care homes (Davies et al. 2014; Tzouvara et al. 2016). The challenges of recruiting care home staff seen in this study support these findings.

In care homes, low response rates and participation in research could be attributed to several barriers or factors. Lack of time and a high workload were found to be major barriers to recruiting care home staff (Jenkins et al. 2016; Tzouvara et al. 2016; Law and

Ashworth 2022). In the study by Tzouvara et al. (2016) in the UK, seven eligible care homes were contacted by posting letters and making follow-up calls to ensure that managers had received the invitations. Four of them were too busy to respond, and three care home receptionists refused to direct calls to their managers. Although two care home managers agreed to participate in the present study, not all questions could be asked due to participants' upcoming meetings and tasks limiting the time available for the interview. This supports the findings from the earlier studies of a lack of time, busy schedules and high workload pressure in care homes.

Workload and understaffing were found to lead to high staff turnover, which could be another reason for the reluctance to participate in research (Davies et al. 2014; Jenkins et al. 2016; Tzouvara et al. 2016). This high rate of staff turnover is because care homes are not preferred workplaces because of a lack of defined career pathways, high workload, clinical complexity, and differences in training quality (Owen 2006; Cousins et al. 2016). With understaffing, allowing staff to participate in research would affect the care provided to residents by putting more pressure on other staff (Jenkins et al. 2016). Furthermore, managers and staff were reluctant to disrupt their regular schedules to participate (Shin 2013; Jenkins et al. 2016). Although building respectful relationships with care homes might be helpful in recruitment, changing management structures and high turnover can be disruptive and impact on the development of such relationships (Davies et al. 2014; Jenkins et al. 2016).

Furthermore, staff may demonstrate a lack of enthusiasm for research, have insufficient knowledge about their involvement in such studies, or perceive there to be little benefit for themselves and their residents (Goodman et al. 2011; Davies et al. 2014; Jenkins et al. 2016; Law and Ashworth 2022). In this study, the researcher provided a Participant Information Sheet (PIS) to give more details about what participation would entail. However, there was still little response, possibly reflecting that the PIS was not read, or if the PIS was read, there was a lack of confidence in the researcher's intentions. Moreover, staff members might have suspected that the goal of the research was to expose poor practices rather than to enhance care (Hanson et al.

2010; Garcia et al. 2013; Jenkins et al. 2016). Therefore, mistrust and fear might hamper recruitment (Tzouvara et al. 2016).

Poor communication between managers and administrative staff was suggested by previous studies (Garcia et al. 2013; Tzouvara et al. 2016) as another barrier to recruitment. In the present study, gatekeepers, typically care home managers, were utilised in the recruitment process by using a database that included managers' contact details, such as email addresses. This enabled direct communication with managers, reducing reliance on administrative staff. However, despite this approach, the response rate remained very low, so poor communication is less likely to explain the limited recruitment.

The topic guide used in this study contained a range of questions and prompts designed to be covered within the 60 minutes allocated. This length might have placed an additional burden on participants and contributed to the low recruitment rate, particularly given the busy schedules of care home staff. If this study were to be repeated, the interview length would be reduced to approximately 30 minutes, accompanied by a shorter and prioritised topic guide. This would reduce the perceived burden, allow for a more focused discussion, and potentially improve recruitment and participation rates.

The interview topic guide was designed based on the findings from the previous chapters (**Chapters 4** and **5**), which themselves were informed by a systematic review (**Chapter 3**). This ensured that the questions were grounded in evidence generated in earlier stages of the research and allowed for more detailed exploration among people who worked in care homes. While the topic guide was not directly informed by previous similar qualitative studies, it is likely to have been indirectly influenced by the literature incorporated into the systematic review. The topic guide also underwent extensive review by the ethics committee and was refined based on their feedback. In future work, the topic guide will be informed by similar studies in the literature in addition to the results from the database to ensure that it addresses the desired aim.

According to the literature, in order to increase the likelihood of successful recruitment, several strategies need to be considered, and I would explore and test these to improve recruitment in my future work. Firstly, engaging individuals who have already established relationships with care home providers can facilitate contact and recruitment (Tzouvara et al. 2016; Law and Ashworth 2022). This strategy would require investigation for my future work as identifying individuals might not be easy. Secondly, building a trustful and respectful relationship with managers and staff might be achieved by visiting care homes before the study (Jenkins et al. 2016; Tzouvara et al. 2016). These visits would increase familiarisation with the project and show appreciation for participants' time and contribution, which had a significant impact on improving practice (Tzouvara et al. 2016). This strategy would definitely be feasible for my future work as there are many care homes easily accessible from Cardiff. Thirdly, appreciation for participants' time might be reflected through incentives (Tzouvara et al. 2016; Smith et al. 2019). Incentives do not only mean money, but might include providing a certificate of participation or offering drinks and snacks (Tzouvara et al. 2016). Again, this strategy would be easy to implement in my future work. In addition, conducting the study during the spring and summer when infection risk is lower could improve recruitment. All these strategies would hopefully result in improved recruitment. I would also aim to improve participation rates by using a shorter interview duration and a more concise topic guide.

6.6 Conclusion and Future Work

Although it is not possible to draw definitive conclusions from this study because of the recruitment challenges and the small number of participants, three preliminary themes were identified: effective management of BPSD, barriers to providing effective management, and the impact of collaboration between care home staff and professionals on the effective management of BPSD.

These themes were clearly related to previous findings in the literature, lending some support and validity to these preliminary findings and confirming the appropriateness of

the overall focus of the topic guide. However, there is a clear need to engage more participants by using multiple recruitment strategies to refine existing themes and identify new themes. Even with the additional recruitment strategies outlined above, it might still be challenging to conduct interviews with care home staff. Conducting a survey which participants could complete in their own time might result in a higher response rate: the two interviews described here provide a basis for the questions that could be used in such a survey.

It is clear even from these preliminary findings that improving our understanding of care home staff's views will generate information to support the improvement of the management of BPSD in care homes.

Chapter 7: General Discussion

7.1 Introduction

Dementia has a significant impact on people's lives and is considered a leading cause of death in care homes (Eley 2023; Alzheimer's Society 2025b). It is prevalent in care homes, with 70% of care home residents in the UK having dementia (Alzheimer's Society 2025b). AD is the most prevalent type of dementia, accounting for an estimated 70% of dementia cases (National Institute for Health and Care Excellence [NICE] 2018). Up to 90% of people with dementia show BPSD, such as depression, anxiety, and aggression (Selbæk et al. 2013; Cankurtaran 2014; Almutairi et al. 2021; Dhuny et al. 2021). BPSD often leads to care home admission, due to the difficulty in managing the condition in the home environment (Toot et al. 2017; Dhuny et al. 2021).

NICE guidelines recommend that BPSD should initially be treated using a non-pharmacological approach; however, psychotropic medications are often prescribed in care homes (National Institute for Health and Care Excellence [NICE] 2018; Moth et al. 2021; Alzheimer's Association 2024). Around two-thirds of care home residents are prescribed psychotropic medications, and the use of these medications has increased over time (Ruths et al. 2013; Grill et al. 2021; Hughes et al. 2024). Residents with dementia in care homes are prescribed more psychotropic medications than those without dementia, and this might be due to BPSD (Selbaek et al. 2007a; Helvik et al. 2017; Maust et al. 2018a). Antidepressants are the most frequently prescribed drug class (Ruths et al. 2013; Almutairi et al. 2021; Grill et al. 2021). However, there is major concern about the efficacy of antidepressants in people with dementia: the effects might not be significantly different from those of a placebo (Banerjee et al. 2013; An et al. 2017; Dudas et al. 2018; Zuidersma et al. 2019). Consequently, care homes might depend on psychotropic medications inappropriately due to the challenges of applying non-pharmacological interventions, the high prevalence of dementia in care homes and the difficulties of managing BPSD combined with the scale of prescribing of psychotropic medications, particularly antidepressants.

Hence, the overarching research question for this thesis is as follows: How are psychotropic medications prescribed in residential care homes in the UK? To address this question, the aim of this thesis is to investigate the prevalence and patterns of prescribing psychotropic medications (particularly antidepressants, antipsychotics, and anxiolytics) among older adults living in UK care homes, including their use in the management of BPSD. A comprehensive understanding of the literature was developed through a systematic review presented in **Chapter 3**. The results from **Chapter 3** informed the subsequent chapters. In this chapter, the main findings are discussed together across the empirical **Chapters (4,5 and 6**) and in relation to the existing literature with regard to the overall aim of the thesis. This discussion will cover the most commonly prescribed medications in care homes, the management of BPSD with a focus on psychotropic medications, and the residents' demographics, including age and gender. After discussing the thesis results, the strengths and limitations will be addressed, followed by suggestions for future work. Finally, the conclusions will be presented.

7.2 Medications Most Frequently Prescribed in Care Homes

Results from **Chapter 4** showed that the medications most frequently prescribed in care homes were those that affected the nervous system, which accounted for 28% of all medications prescribed. Analgesics (44%), which included non-opioids (66.5%) and opioids (33.5%), were the most frequently prescribed nervous system medications, with paracetamol being the highest (92%) among non-opioid analgesics. Also, 95% of residents (8,629 out of 9,060) were on nervous system medications, and of these, 88% (7,563 out of 8,629) were on analgesics.

This pattern is consistent with findings from Danish care home populations, where analgesics (59%) were also widely prescribed, with paracetamol being the most frequently used (Albertsen et al. 2022). Furthermore, the use of analgesics, particularly paracetamol, has increased over time in care homes. In Norway, in 2000, 35% of prescriptions were for analgesics, and 23% were for paracetamol. By 2011, these

numbers had risen significantly, with analgesic prescriptions at 58% and paracetamol use at 48% (Sandvik et al. 2016).

The high use of analgesics, particularly paracetamol, in care homes may be attributed to the prevalence of pain among residents, with approximately 80% of people in care homes possibly experiencing pain (Schofield 2018). Pain prevalence tends to increase with age, and it is often expected as part of the aging process (Sandvik et al. 2016; Schofield 2018). Additionally, it has been observed not only that analgesic use increases with age but that women tend to be prescribed more analgesics than men (Sandvik et al. 2016), possibly due to pain-related diagnoses such as osteoporosis, arthritis, and fractures, which demonstrate a biological sex bias (Sandvik et al. 2014; Sandvik et al. 2016). The results in this thesis were influenced by the presence of more women and oldest-old residents than men and youngest-old residents, respectively, in the care homes, which may partially explain the higher rate of prescribing analgesics.

Anti-dementia medications are primarily indicated for AD, the most common type of dementia (Alzheimer's Disease International 2020a), and their use may be considered a proxy to identify potential residents with AD in the absence of diagnostic data. In **Chapters 4** and **5**, it was found that 23% of residents were prescribed anti-dementia medications (representing 9% of all nervous system medications). In Australia, 4.5% of residents across 40 care homes were prescribed anti-dementia medications (Shin et al. 2016). However, in both studies, diagnosis and clinical information were not available, meaning that prescribing rates were calculated across the total resident population rather than only those with a confirmed AD diagnosis. This might have contributed to the relatively low figures reported. In contrast, more than 50% of residents with dementia in French care homes were reported to be prescribed these medications (Jacquin-Piques et al. 2016).

Given that the prevalence of dementia in UK care homes is estimated at 70% of residents, and AD is the most prevalent type of dementia (Alzheimer's Society 2025b), higher prescribing rates might have been expected. NICE guidelines recommend offering anti-dementia medications regardless of the severity of dementia symptoms

(National Institute for Health and Care Excellence [NICE] 2018), and evidence suggests that these drugs can slow disease progression, improve cognitive outcomes, reduce mortality, and delay care home admission (Howard et al. 2012; Donegan et al. 2017; Alzheimer's Society 2024b; Havreng-Théry et al. 2024). In the UK, approximately 55% of people diagnosed with AD are prescribed anti-dementia drugs, although this figure is not specific to care home residents as many people with AD live at home (Donegan et al. 2017).

One possible explanation for the lower prescribing rates in the current study lies in sample characteristics. As noted in **Chapters 4** and **5**, the study population contained a large proportion of the oldest-old and female residents, who are prescribed fewer medications. This may reflect age-related pharmacokinetic changes, greater susceptibility to side effects, end-of-life care approaches, or family preferences (Howard et al. 2012; Donegan et al. 2017; Havreng-Théry et al. 2024). This could partly explain the lower prescribing of anti-dementia medications in this study's sample.

7.3 Management of BPSD - Psychotropic Medications

According to NICE guidelines, the management of BPSD should begin with non-pharmacological interventions, such as psychosocial or environmental strategies (National Institute for Health and Care Excellence [NICE] 2018). This approach was acknowledged and recognised by the care home managers interviewed in **Chapter 6**, who believed in the importance of starting with these strategies. However, the results from **Chapters 4** and **5** revealed that more than half (56.5%) of residents were prescribed at least one psychotropic medication (69% of these residents were on one type, and 31% were on combinations). Furthermore, an association was observed between the prescription of anti-dementia medications and psychotropic medications among residents. There thus appears to be a discrepancy between the managers' views and the actual practices in care home settings, although only two care home managers were interviewed so they may not be representative.

Similarly, this issue, and the contradictory data, were also observed among general practitioners (GPs) in Australia (Dhuny et al. 2021). A non-medication approach was recommended by a majority of GPs, as they believed that individuals with BPSD did not benefit from psychotropic medication. Nevertheless, the majority of them also indicated that they would prescribe antipsychotics for individuals with dementia who were physically aggressive, and nearly half of them would prescribe antipsychotics for individuals with dementia who were agitated or unsettled (Dhuny et al. 2021). Although they were aware of the management of BPSD, this might indicate extremely challenging conditions in care homes and difficulties in applying a non-pharmacological approach, which might eventually lead to a reliance on psychotropic medications, particularly in residents with AD. In Australia, GPs viewed psychotropic medication as a "necessary evil" to manage the high workload resulting from the shortage of staff and to maintain peace and prevent disruption among residents and staff, particularly at night (Sawan et al. 2017). It has also been found that the use of psychotropic medications is associated with night-time behaviour, suggesting that "controlling" this behaviour to avoid disturbing other residents overnight may be the aim of such treatment (Nijk et al. 2009).

In the literature, multiple studies from different countries found that more than half of residents in care homes had been prescribed psychotropic medications, which is in line with the findings of this study. In the Netherlands, 63% of residents in care homes were prescribed psychotropic medications (Nijk et al. 2009), while in Norway this figure was 73% (Helvik et al. 2017) and in Australia it was 84% (Almutairi et al. 2021). In the UK, Grill et al. (2021) found that 63.5% of care home residents were prescribed at least one psychotropic medication, and 27% were prescribed two or more. Similarly, in Norway, 33% of residents were prescribed two or more psychotropic medications (Ruths et al. 2013).

In the present study, an association was observed between anti-dementia medication and psychotropic medication prescribing, with a significantly higher proportion of residents being prescribed psychotropic medications among those prescribed anti-dementia drugs (66%) compared with those not prescribed them (54%). In the literature, psychotropic medication use has been shown to be higher among residents with

dementia in care homes (Selbaek et al. 2007b; van der Spek et al. 2016; Helvik et al. 2017; Smeets et al. 2018; Ballard and Corbett 2020; La Frenais et al. 2021). For example, in Norway, 74% of residents with dementia were prescribed psychotropic medications, compared with 66% of those without dementia, where dementia was defined by a Clinical Dementia Rating (CDR) score of ≥1 (Helvik et al. 2017). In the UK, 58% of care home residents with dementia were prescribed psychotropic medications (La Frenais et al. 2021) , while in the Netherlands the figure was 56% (Smeets et al. 2018). Also, in the USA, the use of anti-dementia medications in long-term care facilities has been associated with greater prescribing of antipsychotics (Blaszczyk et al. 2018). In community settings, the initiation of anti-dementia medications was followed by increased prescribing of psychotropic medications (Martinez et al. 2013). Collectively, these findings suggest that in this study dementia is likely to be driving the prescribing of psychotropic medications in those prescribed anti-dementia medication.

One reason for the higher prescribing of psychotropic medications may be their off-label use to manage BPSD, despite their modest efficacy and potential risk of adverse effects (Ruths et al. 2013; Kalisch Ellett and Lim 2020; La Frenais et al. 2021; Alzheimer's Association 2024). For instance, in the UK, the only antipsychotics licensed for use in people with dementia are risperidone and haloperidol (National Institute for Health and Care Excellence [NICE] 2024a). However, as shown in **Chapter 5**, medications other than licensed antipsychotics – for example, quetiapine – were also prescribed for people with anti-dementia medications. Similar findings have been reported in other studies, where people with dementia were prescribed antipsychotics that were not licensed for that purpose, including studies conducted in the UK (La Frenais et al. 2021) and Australia (Shin et al. 2016; Brimelow et al. 2019).

In the present study, the clinical indications for prescribing were not available so it is not possible to be sure about the reasons for the increased prescribing of psychotropic medications in the anti-dementia medication group. Nevertheless, agitation and psychosis are reported as the most frequent reasons for psychotropic prescribing among residents with dementia in Australian care homes (Brimelow et al. 2019). Also, in UK care homes, the prescribing of psychotropic medications (antidepressants,

antipsychotics, and anxiolytics) was positively associated with verbal agitation, whereas clinically significant agitation and physically non-aggressive behaviours (such as inappropriate undressing and aimless wandering) have been associated with higher prescribing rates of antipsychotics and anxiolytic medications (La Frenais et al. 2021).

Although GPs are responsible for prescribing medication, care home staff might influence GPs' decisions regarding the initiation, reduction, or discontinuation of psychotropic medications because they spend a significant amount of time with residents (Iden et al. 2011; Dhuny et al. 2021). Consequently, the issue of understaffing in care homes may result in less time being spent with residents, making it difficult to take a holistic view and consider their background, which can lead to a reliance on psychotropic medications as an easy solution (Cousins et al. 2017; Sawan et al. 2017; Vogelsmeier et al. 2017; Yoon et al. 2022). It has been noted that understaffing in care homes is associated with increased prescribing of psychotropic medications (Zuidema et al. 2011b; Smeets et al. 2014; Cousins et al. 2017; Sawan et al. 2017). Therefore, care home staff may also contribute to the high prescribing of psychotropic medications.

Reliance on psychotropic medications may therefore primarily address staffing issues rather than the needs of residents. Despite these drugs being associated with only modest effects, they carry significant side effects, including stroke, falls, fractures, and mortality (Ruths et al. 2013; Defrancesco et al. 2015; Jennum et al. 2015; Donegan et al. 2017; Kalisch Ellett and Lim 2020; Rijksen et al. 2021). Recruiting more skilled nurses into care homes, such as registered nurses, might solve this issue. Moreover, recruiting more pharmacists might be beneficial, particularly in medication reviews. In Wales, this study revealed that the number of pharmacists working in care homes is very low. In a study conducted in Australia, over half of GPs were confident that pharmacists conducting medication management reviews were beneficial in managing BPSD (Cousins et al. 2017). This issue needs further investigation.

The high prescribing of psychotropic medications in care homes raises concerns about their appropriateness, particularly for residents with dementia. Evidence indicates that only 10% of psychotropic prescriptions in care home residents with dementia were fully

appropriate, with the main issues being relating to indication, evaluation, and duration of therapy (van der Spek et al. 2016). Also, prescribing may contribute to an increased anticholinergic burden, with around 48% of residents reported to be prescribed anticholinergic drugs (Grill et al. 2021). This issue requires further exploration, especially in residents with dementia.

As regards the duration of use of psychotropic medications, it was not possible to obtain information about the duration of use of these medications from the care home database used in this thesis (eMAR), although only active prescriptions were included. However, various studies have noted that use of psychotropic medications in care homes often exceeds the recommended duration and may continue until the resident's death (Midlöv et al. 2014; Shin et al. 2016; Szczepura et al. 2016; van der Spek et al. 2016; Kalisch Ellett and Lim 2020; Rijksen et al. 2021). Indeed, around 90% of care home residents who were prescribed antidepressants continued to receive them 12 months after initiation (Midlöv et al. 2014). Generally, the guidelines in the UK, which are not specific for people with dementia, state that the effects of antidepressants are seen within 4 weeks and that treatment might continue for up to 6 months, with regular reviews (National Institute for Health and Care Excellence [NICE] 2022c). However, in people with dementia, there is concern about the efficacy of antidepressants, and, as mentioned previously, the effect might not differ significantly from that of a placebo (Banerjee et al. 2013; An et al. 2017; Dudas et al. 2018; Zuidersma et al. 2019).

Regarding antipsychotics, NICE guidelines recommend a duration of 6 weeks for people with dementia. However, research shows that 82% of prescriptions in UK care homes exceeded this duration (Szczepura et al. 2016). Another study, conducted in Australia, found that more than 50% of residents in care homes on anti-dementia medication were prescribed antipsychotics for more than 6 months (Shin et al. 2016).

For anxiolytics, both NICE guidelines and Dutch guidelines generally recommend short-term use (4 weeks) due to the risk of dependence, tolerance, and side effects like falls and fractures (Zuidema et al. 2018; Rijksen et al. 2021; National Institute for Health and Care Excellence [NICE] 2024b). However, in a study conducted in the Netherlands,

prescriptions for anxiolytics often exceeded the recommended duration (>4 weeks), with a median duration of use of 321 days (range 57 – 1,567 days) in care homes (Rijksen et al. 2021). Similarly, a UK study found that the median duration for anxiolytics and antipsychotics in care homes was 1 year (La Frenais et al. 2021).

The exceeding of recommended durations and prolonged use of psychotropic medications may be explained by the lack of regular medication reviews, time pressures on staff due to understaffing, and beliefs among some GPs, staff, and relatives that discontinuation could worsen residents' symptoms (Azermai et al. 2014; Smeets et al. 2014; Cousins et al. 2017; Simmons et al. 2018; Dhuny et al. 2021; Moth et al. 2021). These beliefs often relate to concerns that deprescribing could trigger the recurrence of challenging behaviours and lead to deterioration in residents' quality of life (Azermai et al. 2014; Cousins et al. 2017; Simmons et al. 2018; Moth et al. 2021). Consequently, deprescribing is recognised as a significant challenge. However, evidence also shows that psychotropics can often be successfully discontinued without worsening BPSD, and in some cases discontinuation may even improve residents' quality of life (Simmons et al. 2018; Van Leeuwen et al. 2018; Neville et al. 2020; Gedde et al. 2021).

Preliminary qualitative findings from **Chapter 6** also highlight this complexity. One care home manager emphasised that once psychotropics are initiated, they can be difficult to discontinue, which may lead to the addition of more medications over time. Results from **Chapter 4** demonstrated that combinations of psychotropic medications (31.1% of those on psychotropics; 17.55% of all residents) represented the second most common category, after antidepressants alone. Furthermore, findings in **Chapter 5** showed that combinations of psychotropics were significantly more common among residents prescribed anti-dementia drugs (34% of those on psychotropics; 22.2% of all residents) compared with those not prescribed anti-dementia drugs (30% and 16.2%, respectively; $p < 0.05$). The findings agree with a study conducted in Australia where 45% of residents who were prescribed psychotropic medications in residential aged care facilities were taking a combination of these medications, although this was not reported specifically for people with dementia (Almutairi et al. 2021). This pattern may

reflect a lack of regular medication reviews and highlights the challenge of discontinuing psychotropic medications once initiated. The issue becomes more complex among residents who are prescribed anti-dementia medications, possibly due to the presence of more numerous or severe BPSD symptoms in this group, and/or because they are more challenging to manage, leading to the addition of further medications.

7.4 Different Types of Psychotropic Medications

In **Chapter 4**, psychotropic medications, including antidepressants (17%), antipsychotics (8%), and anxiolytics (5%), accounted for 30% of nervous system medications prescribed in this study, making them the second most common class after analgesics. Overall, 56.5% of residents were prescribed at least one psychotropic medication.

Among psychotropic medications, antidepressants were the most commonly prescribed class (57%). Among these, SSRIs (particularly sertraline and citalopram) and mirtazapine, a tetracyclic antidepressant, were the most frequently prescribed. Antidepressants remained the most prescribed psychotropic medications even when residents were categorised by anti-dementia medication prescribing status in **Chapter 5**, suggesting extensive use and possible inappropriate prescribing in care homes. The same trend was observed for residents prescribed antidepressants alone, regardless of anti-dementia status. Among individual antidepressants, trazodone was prescribed significantly more often in residents with anti-dementia medications (10.5%) compared with those without (7.6%), possibly due to its sedative properties (Bourgeois et al. 2012b; Leong 2014).

In **Chapter 4**, antipsychotics (26%) were the second most commonly prescribed psychotropic class. This remained consistent in **Chapter 5** for both residents prescribed and not prescribed anti-dementia medications, and the same pattern applied to those who were prescribed antipsychotics alone. Further disaggregation showed that the prescribing of risperidone was significantly higher among residents

prescribed anti-dementia medications (51%) compared with those not prescribed (27%), probably reflecting adherence to guidelines, as risperidone is licensed for use in people with dementia. However, other non-licensed antipsychotics were also prescribed in this group. Agreeing with the high prevalence of residents prescribed antidepressants alone, followed by antipsychotics alone, the most common psychotropic medication combination among residents was antidepressants plus antipsychotics, as shown in **Chapters 4** and **5.**

Anxiolytics were the least prescribed psychotropic class (17%), and this remained consistent after classification by anti-dementia medication prescribing status. Further disaggregation showed that lorazepam was prescribed significantly more often in residents with anti-dementia medications (78.1%) compared to those without (67.2%). The sedative properties of anxiolytics (Ruths et al. 2013) could explain why they might be added to other psychotropic medications. This theory is supported by results from residents who were prescribed a combination of medications; residents prescribed anti-dementia medications were prescribed significantly more combinations than those not prescribed anti-dementia medications, particularly combinations of antidepressants plus anxiolytics. In **Chapter 4**, it was also found that antidepressants alone were prescribed more frequently to females, while antipsychotics alone were more often prescribed to males. The same gender pattern was observed for combinations of medications: antidepressants plus anxiolytics were prescribed more often to females, whereas antipsychotics plus anxiolytics were prescribed more often to males. Thus, anxiolytics prescribing is often associated with another psychotropic medication and, for gender, is driven by the primary psychotropic class.

Many other studies in care homes report a similar pattern of psychotropic drug use: antidepressants are usually the most frequently prescribed, followed by antipsychotics and finally anxiolytics, and the most frequently prescribed combination is antidepressants plus antipsychotics (Ruths et al. 2013; Helvik et al. 2017; Smeets et al. 2018; Brimelow et al. 2019; Almutairi et al. 2021). These results are aligned with the findings of this study. However, some studies report a different order. This might be due to the age of these studies which might have been conducted before the establishment

of more recent prescribing policies and could also be explained by their small sample size. The study by Nijk et al. (2009) involved 1,322 residents, while the study by McMaster et al. (2017) only included 446 residents. In both studies, antipsychotic use was the highest among psychotropic drugs, which raises a major concern because antipsychotic use is associated with stroke and mortality (Ballard et al. 2008; Corbett et al. 2012; Richter et al. 2012).

In Australia, a study showed that antidepressant use in residential aged care facilities had substantially increased from 46% in 2006 to 58.5% in 2019, with sertraline, citalopram, and mirtazapine being the most commonly used antidepressants (Hughes et al. 2024); this is in agreement with the findings of this study. However, since trazodone is not licensed in Australia (Hughes et al. 2024), it is not possible to compare all the results.

In the current study, when comparing residents prescribed anti-dementia medications with those not prescribed them, the prescribing of antidepressants alone was significantly higher among those prescribed anti-dementia medications (30.9% vs. 26.5%, $p < 0.001$ across all residents). However, among residents who were prescribed only psychotropic medications, there was no significant difference in the prescribing of antidepressants alone between those who were prescribed anti-dementia medications and those who were not (47% vs. 49.3%, respectively). It is important to note that comparisons between residents who were prescribed psychotropic medications only and the overall resident population (which includes those not prescribed any psychotropics) should be interpreted with caution. These groups differ in size due to different denominators and may also vary in clinical characteristics. As a result, some differences in proportions were observed; however, the overall patterns were quite similar in both groups.

In the literature, two Australian studies reported that antidepressant prescribing was significantly higher among residents with dementia (Brimelow et al. 2019; Harrison et al. 2020b). For example, Brimelow et al. (2019) studied 779 residents and found that antidepressant use was significantly higher in those with dementia (34.5%) compared

with those without (27.2%) ($p < 0.05$). However, other studies have reported no significant differences in antidepressant prescribing between residents with and without dementia (Selbaek et al. 2007a; Van Asch et al. 2013; Midlöv et al. 2014; Hiltunen et al. 2016; Helvik et al. 2017). For instance, a Dutch study of 1,885 nursing home residents found no significant differences between those with dementia (58.8%) and those without (57.3%) (Van Asch et al. 2013). These inconsistent findings may be explained by differences in prescribing practices across countries as well as variations in sample sizes. Further research is needed to understand the prescribing of antidepressants in the care homes in this study.

7.5 Age and Gender

The results from this study indicated that most residents in the care homes studied were female (71%), and in the oldest-old age group (62%), as discussed in **Chapter 4**. These findings are consistent with the 2021 census data; thus, the population of this study is likely to be representative of the country as a whole. Most female residents were oldest-old (68%), while most male residents were youngest-old (51%). This was similar to information from the 2021 census, which found that there were more females in care homes than males, with 23 female residents for every 10 male residents for those aged 65 and over (Storey 2023b). Also, male residents were younger than female residents: 59% of males were below 85 years of age, whereas 63% of females were aged 85 and over (Storey 2023b).

7.5.1 Effects of Age and Gender on Psychotropic Medication Prescribing

Age and gender might affect prescribing, particularly of psychotropic medications. In **Chapter 4**, the number of all medications was significantly higher for male residents and youngest-old residents (irrespective of gender), compared to female and oldest-old residents, respectively. This pattern was similar to the findings for the number of psychotropic medications. In **Chapter 5**, after categorising residents by anti-dementia medication prescribing status, males continued to be prescribed psychotropic medications more frequently than females (although this difference was significant only in residents not prescribed anti-dementia medications). The youngest-old residents

(irrespective of gender) were prescribed these drugs significantly more frequently than the oldest-old in residents, both among those prescribed and those not prescribed anti-dementia medications.

Furthermore, age and gender may drive the class of psychotropic medication prescribed. In **Chapter 4**, residents who were prescribed antidepressants alone tended to be female or to belong to the oldest-old age group. In contrast, residents who were prescribed antipsychotics alone and combinations of psychotropics tended to be male or to belong to the youngest-old age group. Residents who were prescribed anxiolytics alone tended to be male or to belong to the oldest-old age group. These patterns were observed across all residents and in those who were prescribed psychotropic medications only but were not always significant. These findings were also seen in **Chapter 5** among residents both prescribed and not prescribed anti-dementia medications. Again, these patterns were observed across all residents and in those prescribed psychotropic medications only but were not always significant.

These findings suggest that males and the youngest-old exhibit more symptoms and/or more severe symptoms, leading to greater challenges in care homes, where staff may find them more difficult to manage, resulting in higher prescribing of psychotropic medications. This assumption is supported by the finding that the prescribing of psychotropic combinations was significantly higher in the youngest-old compared with the oldest-old residents, in both those prescribed and those not prescribed anti-dementia medications, with a non-significant but increasing trend observed in males compared with females. These patterns were evident both across all residents and within those prescribed psychotropic medications only, suggesting that this was a very strong association between psychotropic medication prescribing and being male or a youngest-old resident.

In the literature, increasing age in care homes has been associated with a decrease in psychotropic prescribing (Langballe et al. 2011; Ruths et al. 2013; Grill et al. 2021; Hamada et al. 2021). Similarly, in the present study, the oldest-old and female residents were less likely to be prescribed psychotropic medications. This may suggest that, for

the oldest-old, the focus of prescribing practices shifts towards palliative care (e.g., pain management). This interpretation is supported by the finding that analgesics were the most commonly prescribed nervous system medications (44%), while the oldest-old group also represented 62% of the study population. Furthermore, analgesic prescribing has been shown to be significantly associated with advanced age in care homes (Sandvik et al. 2016). It should also be noted that different age classifications and cut-offs may give different results. Therefore more work is needed to understand the nuances of prescribing in different age groups.

Regarding different classes of psychotropic medications, the literature indicates that being youngest-old and male are factors associated with higher antipsychotic prescribing in care homes (Lovheim et al. 2009; Nijk et al. 2009; Szczepura et al. 2016; Helvik et al. 2017). Conversely, the oldest-old and female residents in care homes are more likely to be prescribed antidepressants (Lovheim et al. 2009; Nijk et al. 2009; La Frenais et al. 2021; Hughes et al. 2024). These findings may be explained by evidence showing that youngest-old residents (mean age = 84.4, SD = 7.9) are more likely to present with neuropsychiatric symptoms (Selbaek et al. 2007a). Also, males are more likely to exhibit physical aggression, indifference, and regressive behaviours, including sexually inappropriate conduct (Lovheim et al. 2009; Zuidema et al. 2009; Resnick et al. 2021). The greater physical strength and perceived threat of the youngest-old and male residents may also contribute to higher prescribing rates of psychotropic medications, particularly antipsychotics, compared with the oldest-old and female residents (Kamble et al. 2008; Helvik et al. 2017). This study agrees with these previous findings indicating that the results are likely to be generalisable to care homes in the UK beyond the 310 considered in this project.

When comparing residents prescribed anti-dementia medications with their age- and gender-matched counterparts who were not prescribed such medications, it was found that those prescribed anti-dementia medications were more likely to be prescribed psychotropic medications regardless of age or gender. This was evident across psychotropic medication classes: antidepressants alone, anxiolytics alone, and psychotropic combinations were all more commonly prescribed among residents

prescribed anti-dementia medications, irrespective of age or gender. As suggested earlier in Section 7.3, these findings support the theory that the presence of anti-dementia medication is a key driver of psychotropic prescribing. This finding warrants further investigation.

7.6 Strengths and Limitations

As outlined in **Chapter 3** (Limitations Section 3.5), the majority of the review process was conducted by a single researcher, although 10% of the identified articles were screened at the full-text stage by a second reviewer to enhance rigour.
Chapters 4 and **5** examined data from the eMAR of 9,060 residents across multiple care homes (310) in the UK. However, data from care homes not using this particular eMAR provider, or those without eMAR, were not included. In total, there are approximately 16,726 care homes in the UK, with around 441,479 residents (Berg 2025). Although the sample in this thesis represents only about 2% of care home residents, it is likely to be broadly representative of the UK population, as the demographic information on care home residents reported in the 2021 census (Storey 2023b) aligns with the findings of this study. In addition, inferential statistical tests were used and the large sample size helped to account for heterogeneity. While the sampling used a non-probability approach and did not achieve randomisation, all care homes using eMAR from this single provider were included. Furthermore, the findings agreed with other studies in the literature from both the UK and other countries showing that the sample is indeed likely to be representative of the UK population.

The number of medications prescribed, and the number of residents with prescriptions, were calculated to identify residents who were using either one type of psychotropic medication alone or a combination, thereby avoiding duplication. The order of the proportions of different types of psychotropic drugs (antidepressants, followed by antipsychotics, and finally anxiolytics) in **Chapter 4** were the same in **Chapter 5**, suggesting that the SQL queries and subsequent data extraction were performed correctly. Also, the main researcher performed quality assurance checks after executing the queries and results were discussed with supervisors (sections 4.2.3.2 and

5.2.2.2). In **Chapter 6**, despite challenges in recruiting participants for interviews, the preliminary results were quite similar to those found in the literature. To some extent, this also supports the findings from **Chapters 4** and **5** and indicates that using the data from **Chapters 4** and **5** to produce the topic guide was a valid decision.

In **Chapters 4** and **5**, which were based on secondary data, the analysis was limited by the availability of information (Sections 4.2.2 and 4.5, Table 4.1). The most significant limitation was that diagnoses and clinical notes were not accessible, meaning that it was impossible to determine the precise indications for prescribing or the duration of treatment.

Consequently, in **Chapter 5**, the study population was divided into two groups based on anti-dementia medication prescribing status, under the assumption that residents prescribed anti-dementia drugs in Group 1 had AD, as these medications are mainly used for this condition (National Health Service [NHS] 2024). However, importantly, it is acknowledged that some residents in Group 2 might have had AD or other types of dementia (either undiagnosed or with no pharmacological interventions). Therefore, the number of residents with dementia in this study may have been underestimated. The focus of interest was whether the prescribing of anti-dementia drugs drives the prescribing of psychotropics, rather than dementia diagnosis per se. Findings in **Chapter 5** have therefore been interpreted with caution, especially when compared with studies based on clinical diagnoses. This proxy method might be comparable with studies where clinical diagnoses are unavailable, as it enables the identification of important patterns in prescribing practices and highlights the challenges involved in this type of study.

Due to data quality issues in the database, for example, missing information about residents' discharge or death dates, and inaccuracies in the exact start and stop dates of prescriptions, it was important to rely on the medication status. Therefore, only active medications were included, while those that had been stopped or were inactive were excluded. This was to ensure that the prescribing was active, and residents were still living in care homes when the sample was taken. Consequently, any resident with active medications were included (**Figure 4.1**).

The focus of the study was on the prescription of active medications, regardless of whether they were regular or used prn (as-needed), as distinguishing between them was outside the scope of the study objectives. Scheduled doses typically follow consistent times (e.g., 09:00 or 18:00), whereas prn medications are administered as needed and do not follow a fixed time. However, due to data quality issues related to date and time, it was difficult to reliably differentiate between prn and regular medication use. Moreover, in care home settings, prn medications may not always depend on residents' needs (Griffiths et al. 2019). Instead, their administration can be influenced by staff knowledge, staffing levels, care home size, and unclear prescribing instructions (Stokes et al. 2004; Jessop et al. 2017; Griffiths et al. 2019). These factors might result in prn medications being administered regularly inappropriately. Furthermore, the proportion of regular medications in care homes is generally higher than that of prn medications (La Frenais et al. 2021). For example, in care homes, regular psychotropic medications (including antidepressants, antipsychotics, and anxiolytics) accounted for 46% of all prescriptions, whereas prn represented only 4.5% (La Frenais et al. 2021). It was decided that separating prn from regular medications was not possible as it would lead to inconsistent data. Therefore, the focus remained on the prescription of active medications regardless of whether they were regular or prn. This represents a limitation, as potential differences between regular and prn medications could not be explored.

The lack of information available about the type of care home (nursing or residential) and the ethnicity of the residents is a limitation as having such details would have provided more granular results. However, from a safeguarding perspective, and as specified in the data-sharing agreement, information on the identity and geographical location of the care homes, whether they were privately operated and the characteristics of the residents was not provided. Thus, the study focused on the residents themselves rather than the characteristics of their care homes. The study also assumed that the prescription data for the medicines had been captured correctly, although staff might have made mistakes.

Regarding the classification of age groups, it is commonly found that in late adulthood, individuals are classified as youngest-old (65-84 years), oldest-old (85-99 years), and centenarians (100+) (Lally 2019). In this study, 85 years of age was used as the cut-off, so those below 85 years were considered “youngest-old”, and those aged 85 and over were classified as “oldest-old”. The centenarian group (100–105 years) was combined with the oldest-old due to the low number of centenarians (around 213), aiming to maintain approximately a 20-year age range in each group, for the purposes of comparison. Other narrower age bands were also considered but were rejected as the smaller sample sizes in each band could have led to the study being under-powered. Gender was classified according to the residents' titles (e.g., "Mr." was assumed to indicate a male resident). However, while residents' titles may not have always reflected biological sex, it was decided that, given the age of the residents, it was very unlikely that a significant number of the study population were transgender. Also, the data were skewed by the large number of oldest-old residents and females in **Chapters 4** and **5**.

Furthermore, the BNF was used to classify medications because the research was conducted in the UK, ensuring that all licensed medicines were included, which is a strength of this study. Also, if there were medications in different classes, the doses were checked. However, the BNF is primarily intended as a prescribing guide within the UK and therefore may limit comparability with studies conducted in other countries that may use the World Health Organization’s Anatomical Therapeutic Chemical (ATC) classification system. The use of scientific (generic) names partly mitigates this limitation across countries.

In **Chapter 6**, difficulties with recruiting participants presented a major limitation, as discussed in detail in the chapter (section 6.5) so are not repeated here, which restricted the conclusions that could be drawn.

7.7 Future Work

1. Given the high rate of psychotropic medication prescribing in care homes, it is essential to explore the indications for these medications in residents with dementia, particularly AD and assess how symptom severity influences prescribing. Also, further research into inappropriate prescribing practices (particularly regarding the duration of prescribing) and the anticholinergic burden in residents with AD is needed to better understand the impact of these issues. Conducting studies with access to both prescribing and diagnostic data would provide more such results
2. Moreover, future work should aim to educate prescribers and care home staff to reduce inappropriate prescribing and to support regular medication reviews. It is also important to evaluate the impact of training programmes. These could help promote evidence-based psychotropic medication prescribing in care homes and inform policy development.
3. Due to the challenges encountered in recruiting participants for interviews in **Chapter 6**, it is necessary to explore alternative recruitment strategies or utilise surveys to better capture staff views on psychotropic medication use and BPSD management in care homes, as well as to identify ways to facilitate the implementation of non-pharmacological interventions. This should involve not only care home staff but also GPs and other members of the multidisciplinary team, which may help to identify more effective management strategies, highlight existing challenges, and improve practice in these settings.
4. There is a scarcity of studies focusing on the influence of age and gender on psychotropic medication prescribing, indicating a need for further research to confirm the observed trends. Notably, similar trends in age and gender among residents with anti-dementia medications, compared to those without, showed a higher prescribing of antidepressants alone, anxiolytics alone and combinations of psychotropic medications. This requires further investigation.
5. The eMAR in care homes requires further development to accurately record all relevant information (e.g., indication, duration, next review, and flags for

inappropriate prescribing). This would aid in the effective review and optimisation of medication management. Utilising technology, such as artificial intelligence (AI), might help to address time constraints and facilitate non-pharmacological interventions, though further research is needed in this area.

6. It is likely that psychotropic medication prescribing is already high in community settings and may increase upon admission to care homes. Investigating this issue within the community could help to address the problem before residents transition to care homes.
7. Upon returning to Saudi Arabia, it would be valuable to examine prescribing of psychotropic medications in people with and without dementia, considering the different country and healthcare systems.

7.8 Conclusions

In conclusion, the findings of this thesis demonstrate that psychotropic medications are extensively prescribed in UK care homes, with prescribing increasing notably among residents who were prescribed anti-dementia medications (assumed to indicate the presence of AD). However, the reasons for this prescribing remain unclear. These findings suggest that anti-dementia medication prescribing is a strong driver of psychotropic medication prescribing, despite concerns about their efficacy and side effects.

In addition, the prescribing of a combination of psychotropic medications was significantly higher among residents prescribed anti-dementia medication compared with those not prescribed such medication. This may suggest more symptoms in the anti-dementia group, or a lack of regular medication reviews, leading to inappropriate prescribing. Interviews with two care home managers revealed awareness that non-pharmacological interventions should be initiated first in the management of BPSD, as recommended by clinical guidelines; however, this might be difficult and challenging in practice, due to lack of time, staff and resources.

Importantly, prescribing patterns were found to be significantly affected by age and gender, with males and the youngest-old prescribed more psychotropic medications than females and the oldest-old, respectively. Therefore, prescribers need to carefully consider age and gender before prescribing psychotropic medications to care home residents.

Overall, the results presented here have highlighted the importance of prescribers considering a range of factors and adhering to guidelines when using psychotropic medications to treat care home residents, particularly those who are also prescribed anti-dementia medications.

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Appendices

Appendix 1 Chapter – 3: A) PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2 for each meta-analysis.)	

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	

Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

B) The full search strategy for each database

Database(s): **Ovid MEDLINE(R) ALL** 1946 to Feb 25, 2021

#	Search	Results
1	Alzheimer Disease/	97430
2	Alzheimer Disease.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	104023
3	alzheimer*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	168668
4	1 or 2 or 3	168668
5	Depression/	124997
6	Depressive Disorder/	73650
7	Depressive Disorder, Major/	31341
8	Depressive Disorder, Treatment-Resistant/	1456
9	depress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	564558

10	low mood.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	855
11	depressive symptom*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	55773
12	depressive disorder.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	115857
13	major depress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	50127
14	Resistant depress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	3499
15	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	564849
16	Residential Facilities/	5562
17	Homes for the Aged/	14225
18	exp Nursing Homes/	40344
19	Geriatric Nursing/	13650
20	nursing home*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	47918
21	care home*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4476
22	residential home*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1013
23	Long-term care facilit*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	5912
24	home for the aged.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	867
24	residential facilit*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6343
25	long-term care cent?r.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	22
26	geriatric nursing.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	13940
27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	76992

28	4 and 15 and 27	315
29	exp Antidepressive Agents/	150712
30	exp Antidepressive Agents, Second-Generation/	67342
31	exp Antidepressive Agents, Tricyclic/	31220
32	Therapeutics/	8505
33	antidepress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	93643
34	treat*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6211403
35	manag*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1590906
36	therapy.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	5283569
37	selective serotonin reuptake inhibitors.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	8336
38	Citalopram.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	7179
39	Escitalopram.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2655
40	Fluoxetine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	14433
41	Fluvoxamine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	3018
42	Paroxetine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	6450
43	Sertraline.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	5387
44	Duloxetine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2819
45	Venlafaxine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4552
46	Amitriptyline.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	9458

47	Doxepin.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1476
48	Imipramine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	13317
49	Nortriptyline.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	3155
50	Clomipramine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4025
51	Dosulepin.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	66
52	Lofepramine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	166
53	Trimipramine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	535
54	Tetracyclic Antidepress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	331
55	tricyclic antidepress*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	9919
56	Mianserin.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	3443
57	Mirtazapine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2404
58	exp Serotonin Uptake Inhibitors/	42891
59	serotonin uptake inhibitors.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	19953
60	Trazodone.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2131
61	exp "Serotonin and Noradrenaline Reuptake Inhibitors"/	4876
62	(Serotonin and Noradrenaline Reuptake Inhibitors).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	711
63	exp Monoamine Oxidase Inhibitors/	21834
64	Monoamine Oxidase Inhibitors.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	11152

65	Phenelzine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1660
66	Isocarboxazid.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	412
67	Tranylcypromine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2265
68	Moclobemide.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	1026
69	Vortioxetine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	476
70	Tryptophan.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	61532
71	Melatonin receptor agonist*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	305
72	Agomelatine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	774
73	Noradrenaline Reuptake Inhibitors.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	734
74	Reboxetine.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	922
75	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74	9524711
76	28 and 75	197
77	limit 76 to english language	180
78	Dementia/	52966
79	dementia.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	133660
80	4 or 78 or 79	251961
81	76 and 80	197
82	limit 81 to english language	180

Appendix 1: Chapter 3

Database(s): **EMBASE** 1947- 27 February 2021

#	Searches	Results
1	Alzheimer Disease/	209668
2	Alzheimer Disease.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	214158
3	alzheimer*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	257110
4	1 or 2 or 3	257110
5	Depression/	391293
6	Depressive Disorder/	103835
7	Depressive Disorder, Major/	14594
8	Depressive Disorder, Treatment-Resistant/	1356
9	depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	869148
10	low mood.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1489
11	depressive symptom*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	74624
12	depressive disorder.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	46017
13	major depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	90699
14	Resistant depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	6303
15	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	869720
16	Residential Facilities/	7432
17	Homes for the Aged/	12479
18	exp Nursing Homes/	56921
19	Geriatric Nursing/	13002
20	nursing home*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	69600
21	residential home*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	8486
22	Long-term care facilit*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	7796

23	home for the aged.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	13933
24	residential facilit*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1499
25	long-term care cent?r.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	32
26	geriatric nursing.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	13356
27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	98678
28	4 and 15 and 27	603
29	exp Antidepressive Agents/	473441
30	exp Antidepressive Agents, Second-Generation/	473441
31	exp Antidepressive Agents, Tricyclic/	117346
32	Therapeutics/	1363973
33	antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	169487
34	treat*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	9204052
35	manag*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	2946788
36	therapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	8585424
37	selective serotonin reuptake inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	11770
38	Citalopram.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	23693
39	Escitalopram.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	12830
40	Fluoxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	48905
41	Fluvoxamine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	14306
42	Paroxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	28571
43	Sertraline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	27104
44	Duloxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	11712
45	Venlafaxine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	22151

46	Amitriptyline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	41373
47	Doxepin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	9840
48	Imipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	38012
49	Nortriptyline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	15504
50	Clomipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	18180
51	Dosulepin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	2473
52	Lofepramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1109
53	Trimipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	3832
54	Tetracyclic Antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1084
55	tricyclic antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	39571
56	Mianserin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	8074
57	Mirtazapine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	13204
58	exp Serotonin Uptake Inhibitors/	283914
59	serotonin uptake inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	573
60	Trazodone.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	12556
61	exp "Serotonin and Noradrenaline Reuptake Inhibitors"/	197214
62	(Serotonin and Noradrenaline Reuptake Inhibitors).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	504
63	exp Monoamine Oxidase Inhibitors/	52077
64	Monoamine Oxidase Inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	3246
65	Phenelzine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	5980
66	Isocarboxazid.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1591

67	Tranylcypromine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	6646
68	Moclobemide.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	4687
69	Vortioxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	1187
70	Tryptophan.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	85600
71	Melatonin receptor agonist*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	614
72	Agomelatine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	2453
73	Noradrenaline Reuptake Inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	533
74	Reboxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	3472
75	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74	14758228
76	28 and 75	433
77	limit 76 to english language	413
78	dementia/	124743
79	dementia.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]	215345
80	4 or 78 or 79	388049
81	76 and 80	433
82	limit 81 to english language	413

Database(s): **APA PsycInfo** 1806 to March Week 1 2021

#	Searches	Results
1	Alzheimer Disease/	48297
2	Alzheimer Disease.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	32037
3	alzheimer*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	67667
4	1 or 2 or 3	67667

5	Depression/	25909
6	Depressive Disorder/	0
7	Depressive Disorder, Major/	0
8	Depressive Disorder, Treatment-Resistant/	0
9	depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	381303
10	low mood.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	748
11	depressive symptom*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	52991
12	depressive disorder.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	64163
13	major depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	140963
14	Resistant depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	3670
15	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	381514
16	Residential Facilities/	0
17	Homes for the Aged/	0
18	exp Nursing Homes/	9064
19	Geriatric Nursing/	0
20	nursing home*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	14596
21	residential home*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	585
22	Long-term care facilit*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1780
23	home for the aged.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	579
24	residential facilit*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	3033
25	long-term care cent?r.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	17
26	geriatric nursing.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1293
27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	19854
28	4 and 15 and 27	358
29	exp Antidepressive Agents/	0
30	exp Antidepressive Agents, Second-Generation/	0
31	exp Antidepressive Agents, Tricyclic/	0
32	Therapeutics/	0
33	antidepress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	50028
34	treat*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	823873
35	manag*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	356716
36	therapy.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	408011
37	selective serotonin reuptake inhibitors.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	5344
38	Citalopram.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	3576
39	Escitalopram.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1688

40	Fluoxetine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	7495
41	Fluvoxamine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1780
42	Paroxetine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	3635
43	Sertraline.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	3229
44	Duloxetine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1093
45	Venlafaxine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2558
46	Amitriptyline.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2865
47	Doxepin.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	455
48	Imipramine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	4830
49	Nortriptyline.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1230
50	Clomipramine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2136
51	Dosulepin.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	25
52	Lofepramine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	111
53	Trimipramine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	157
54	Tetracyclic Antidepress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	123
55	tricyclic antidepress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	4693
56	Mianserin.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1305
57	Mirtazapine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	1322
58	exp Serotonin Uptake Inhibitors/	0
59	serotonin uptake inhibitors.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	7982
60	Trazodone.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	995
61	exp "Serotonin and Noradrenaline Reuptake Inhibitors"/	0
62	(Serotonin and Noradrenaline Reuptake Inhibitors).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	187
63	exp Monoamine Oxidase Inhibitors/	2258
64	Monoamine Oxidase Inhibitors.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2787
65	Phenelzine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	693
66	Isocarboxazid.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	109
67	Tranylcypromine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	587
68	Moclobemide.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	545
69	Vortioxetine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	231
70	Tryptophan.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	4195
71	Melatonin receptor agonist*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	93
72	Agomelatine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	443
73	Noradrenaline Reuptake Inhibitors.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	197
74	Reboxetine.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	552

75	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74	1249395
76	28 and 75	181
77	limit 76 to english language	170
78	"depression (emotion)"/	25909
79	Major Depression/	128348
80	Atypical Depression/	205
81	Late Life Depression/	747
82	Recurrent Depression/	883
83	5 or 9 or 10 or 11 or 12 or 13 or 14 or 78 or 79 or 80 or 81 or 82	381514
84	late life depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2128
85	atypical depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	793
86	recurrent depress*.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	2077
87	83 or 84 or 85 or 86	381514
88	Residential Care Institutions/	10779
89	Treatment Facilities/	1865
90	Elder Care/	4881
91	18 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 88 or 89 or 90	33398
92	Long Term Care/	5363
93	91 or 92	36305
94	exp Antidepressant Drugs/	39371
95	Drug Therapy/	138999
96	Treatment Resistant Depression/	2499
97	Treatment/	76265
98	exp Serotonin Reuptake Inhibitors/	12548
99	exp Serotonin Norepinephrine Reuptake Inhibitors/	1715
100	33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 59 or 60 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 94 or 95 or 96 or 97 or 98 or 99	1250585
101	drug therapy.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	141405
102	100 or 101	1250780
103	4 and 87 and 93 and 102	208
104	limit 103 to english language	195
105	Dementia/	36116
106	dementia.mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]	76250
107	4 or 105 or 106	110855

108	103 and 107	208
109	limit 108 to english language	195

Database(s): **Ovid Emcare** 1995 to 2021 Week 06

#	Searches	Results
1	Alzheimer Disease/	53430
2	Alzheimer Disease.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	54490
3	alzheimer*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	63175
4	1 or 2 or 3	63175
5	Depression/	104970
6	Depressive Disorder/	20864
7	Depressive Disorder, Major/	8568
8	Depressive Disorder, Treatment-Resistant/	758
9	depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	228346
10	low mood.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	494
11	depressive symptom*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	33558
12	depressive disorder.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	11590
13	major depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	26271
14	Resistant depress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	1311
15	5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	228548
16	Residential Facilities/	3422
17	Homes for the Aged/	2328
18	exp Nursing Homes/	24641
19	Geriatric Nursing/	2163
20	nursing home*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	30338
21	residential home*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3529
22	Long-term care facilit*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3922
23	home for the aged.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	2660
24	residential facilit*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	874
25	long-term care cent?r.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	18
26	geriatric nursing.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	2241

27	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26	39086
28	4 and 15 and 27	346
29	exp Antidepressive Agents/	107014
30	exp Antidepressive Agents, Second-Generation/	107014
31	exp Antidepressive Agents, Tricyclic/	22278
32	Therapeutics/	134374
33	antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	40140
34	treat*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	1668154
35	manag*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	757484
36	therapy.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	911470
37	selective serotonin reuptake inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	2812
38	Citalopram.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	6271
39	Escitalopram.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3694
40	Fluoxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	11762
41	Fluvoxamine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3308
42	Paroxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	8053
43	Sertraline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	8309
44	Duloxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3723
45	Venlafaxine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	6743
46	Amitriptyline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	8867
47	Doxepin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	2013
48	Imipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	4135
49	Nortriptyline.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3678
50	Clomipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	2806
51	Dosulepin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	476
52	Lofepramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	238
53	Trimipramine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	493
54	Tetracyclic Antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	278
55	tricyclic antidepress*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	10416
56	Mianserin.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	773
57	Mirtazapine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3923
58	exp Serotonin Uptake Inhibitors/	69594
59	serotonin uptake inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	97
60	Trazodone.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	3502
61	exp "Serotonin and Noradrenaline Reuptake Inhibitors"/	47769

62	(Serotonin and Noradrenaline Reuptake Inhibitors).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	98
63	exp Monoamine Oxidase Inhibitors/	6775
64	Monoamine Oxidase Inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	301
65	Phenelzine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	920
66	Isocarboxazid.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	189
67	Tranylcypromine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	677
68	Moclobemide.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	970
69	Vortioxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	236
70	Tryptophan.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	5431
71	Melatonin receptor agonist*.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	117
72	Agomelatine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	373
73	Noradrenaline Reuptake Inhibitors.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	102
74	Reboxetine.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	650
75	29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74	2515661
76	28 and 75	225
77	limit 76 to english language	214
78	dementia/	52113
79	dementia.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword]	73362
80	4 or 78 or 79	108603
81	76 and 80	225
82	limit 81 to english language	214

Scopus database on 02/03/2021

Scopus search	1. TITLE-ABS-KEY (alzheimer* OR "Alzheimer disease" OR dementia) 2. TITLE-ABS-KEY (depression OR "DEPRESSIVE DISORDER" OR "DEPRESSIVE DISORDER, MAJOR" OR "DEPRESSIVE DISORDER, TREATMENT-RESISTANT" OR depress* OR "low mood" OR "depressive symptom*" OR "depressive disorder" OR "resistant depress*" OR "major depress*") 3. TITLE-ABS-KEY ("Nursing home*" OR "Residential home*" OR "Long-term care facilit*" OR "home for the aged" OR "residential facilit*" OR "long-term care cent?r" OR "Geriatric nursing") 4. TITLE-ABS-KEY ("Antidepressive agents" OR "Antidepressive agents, second generation" OR "Antidepressive agents, tricyclic" OR "Serotonin uptake inhibitors" OR "Serotonin and noradrenaline reuptake inhibitors" OR "Monoamine oxidase inhibitors" OR "Therapeutics" OR therapy OR treat* OR manag* OR antidepress* OR citalopram OR escitalopram OR fluoxetine OR fluvoxamine OR paroxetine OR sertraline OR duloxetine OR venlafaxine OR amitriptyline OR doxepin OR imipramine OR nortriptyline OR clomipramine OR dosulepin OR lofepramine OR trimipramine OR mianserin OR mirtazapine OR trazodone OR phenelzine OR isocarboxazid OR tranylcypromine OR moclobemide OR vortioxetine OR tryptophan OR agomelatine OR reboxetine)
	(TITLE-ABS-KEY (alzheimer* OR "Alzheimer disease" OR dementia)) AND (TITLE-ABS-KEY (depression OR "DEPRESSIVE DISORDER" OR "DEPRESSIVE DISORDER, MAJOR" OR "DEPRESSIVE DISORDER, TREATMENT-RESISTANT" OR depress* OR "low mood" OR "depressive symptom*" OR "depressive disorder" OR "resistant depress*" OR "major depress*")) AND (TITLE-ABS-KEY ("Nursing home*" OR "Residential home*" OR "Long-term care facilit*" OR "home for the aged" OR "residential facilit*" OR "long-term care cent?r" OR "Geriatric nursing")) AND (TITLE-ABS-KEY ("Antidepressive agents" OR "Antidepressive agents, second generation" OR "Antidepressive agents, tricyclic" OR "Serotonin uptake inhibitors" OR "Serotonin and noradrenaline reuptake inhibitors" OR "Monoamine oxidase inhibitors" OR "Therapeutics" OR therapy OR treat* OR manag* OR antidepress* OR citalopram OR escitalopram OR fluoxetine OR fluvoxamine OR paroxetine OR sertraline OR duloxetine OR venlafaxine OR amitriptyline OR doxepin OR imipramine OR nortriptyline OR clomipramine OR dosulepin OR lofepramine OR trimipramine OR mianserin OR mirtazapine OR trazodone OR phenelzine OR isocarboxazid OR tranylcypromine OR moclobemide OR vortioxetine OR tryptophan OR agomelatine OR reboxetine)) AND (EXCLUDE (SUBJAREA , "ARTS") OR EXCLUDE (SUBJAREA , "AGRI")) AND (LIMIT-TO (LANGUAGE , "English")) AND (EXCLUDE (SUBJAREA , "ENVI") OR EXCLUDE (SUBJAREA , "BUSI") OR EXCLUDE (SUBJAREA , "CENG") OR EXCLUDE (SUBJAREA , "IMMU")) >>>>>>1,128 results 2. (TITLE-ABS-KEY (alzheimer* OR "Alzheimer disease" OR dementia)) AND (TITLE-ABS-KEY (depression OR "DEPRESSIVE DISORDER" OR "DEPRESSIVE DISORDER, MAJOR" OR "DEPRESSIVE DISORDER, TREATMENT-RESISTANT" OR depress* OR "low mood" OR "depressive symptom*" OR "depressive disorder" OR "resistant depress*" OR "major depress*")) AND (TITLE-ABS-KEY ("Nursing home*" OR "Residential home*" OR "Long-term care facilit*" OR "home for the aged" OR "residential facilit*" OR "long-term care cent?r" OR "Geriatric nursing")) AND (TITLE-ABS-KEY ("Antidepressive agents" OR "Antidepressive agents, second generation" OR "Antidepressive agents, tricyclic" OR "Serotonin uptake inhibitors" OR "Serotonin and noradrenaline reuptake inhibitors" OR "Monoamine oxidase inhibitors" OR "Therapeutics" OR therapy OR treat* OR manag* OR antidepress* OR citalopram OR escitalopram OR fluoxetine OR fluvoxamine OR paroxetine OR sertraline OR duloxetine OR venlafaxine OR amitriptyline OR doxepin OR imipramine OR nortriptyline OR clomipramine OR dosulepin OR lofepramine OR trimipramine OR mianserin OR mirtazapine OR trazodone OR phenelzine OR isocarboxazid OR tranylcypromine OR moclobemide OR vortioxetine OR tryptophan OR agomelatine OR reboxetine)) AND (EXCLUDE (SUBJAREA , "ARTS") OR EXCLUDE (SUBJAREA , "AGRI")) AND (LIMIT-TO (LANGUAGE , "English")) AND (EXCLUDE (SUBJAREA , "ENVI") OR EXCLUDE (SUBJAREA , "BUSI") OR EXCLUDE (SUBJAREA , "CENG") OR EXCLUDE (SUBJAREA , "IMMU")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "ch") OR LIMIT-TO (DOCTYPE , "bk")) >>>>>>>>>>1,030 results

Web of Science on 03/03/2021

Web of Science	1. TS= Alzheimer* OR TS= "Alzheimer disease" OR TS= dementia 2. TS= depression OR TS= "DEPRESSIVE DISORDER" OR TS= "DEPRESSIVE DISORDER, MAJOR" OR TS= "DEPRESSIVE DISORDER, TREATMENT-RESISTANT" OR TS= depress* OR TS= "low mood" OR TS= "depressive symptom*" OR TS= "depressive disorder" OR TS= "resistant depress*" OR TS= "major depress*" 3. TS= "Nursing home*" OR TS= "Residential home*" OR TS= "Long-term care facilit*" OR TS= "home for the aged" OR TS= "residential facilit*" OR TS= "long-term care cent?r" OR TS= "Geriatric nursing" 4. TS= "Antidepressive agents" OR TS= "Antidepressive agents, second-generation" OR TS= "Antidepressive agents, tricyclic" OR TS= "Serotonin uptake inhibitors" OR TS= "Serotonin and noradrenaline reuptake inhibitors" OR TS= "Monoamine oxidase inhibitors" OR TS= "Therapeutics" OR TS= therapy OR TS= treat* OR TS= manag* OR TS= antidepress* OR TS= citalopram OR TS= escitalopram OR TS= fluoxetine OR TS= fluvoxamine OR TS= paroxetine OR TS= sertraline OR TS= duloxetine OR TS= venlafaxine OR TS= amitriptyline OR TS= doxepin OR TS= imipramine OR TS= nortriptyline OR TS= clomipramine OR TS= dosulepin OR TS= lofepramine OR TS= trimipramine OR TS= mianserin OR TS= mirtazapine OR TS= trazodone OR TS= phenelzine OR TS= isocarboxazid OR TS= tranylcypromine OR TS= moclobemide OR TS= vortioxetine OR TS= tryptophan OR TS= agomelatine OR TS= reboxetine
	#4 AND #3 AND #2 AND #1 **Refined by: LANGUAGES:** (ENGLISH) AND **DOCUMENT TYPES:** (ARTICLE OR BOOK REVIEW OR REVIEW) >>>982 ARTICLES

C) Joanna Briggs Institute Checklist for quality assessment

1. JBI Critical Appraisal Checklist for studies reporting prevalence data

Reviewer_____Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Was the sample frame appropriate to address the target population?	☐	☐	☐	☐
2. Were study participants sampled in an appropriate way?	☐	☐	☐	☐
3. Was the sample size adequate?	☐	☐	☐	☐
4. Were the study subjects and the setting described in detail?	☐	☐	☐	☐
5. Was the data analysis conducted with sufficient coverage of the identified sample?	☐	☐	☐	☐
6. Were valid methods used for the identification of the condition?	☐	☐	☐	☐
7. Was the condition measured in a standard, reliable way for all participants?	☐	☐	☐	☐
8. Was there appropriate statistical analysis?	☐	☐	☐	☐
9. Was the response rate adequate, and if not, was the low response rate managed appropriately?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

2. JBI Critical Appraisal Checklist for cohort studies

Reviewer_____Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Were the two groups similar and recruited from the same population?	☐	☐	☐	☐
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	☐	☐	☐	☐
3. Was the exposure measured in a valid and reliable way?	☐	☐	☐	☐
4. Were confounding factors identified?	☐	☐	☐	☐
5. Were strategies to deal with confounding factors stated?	☐	☐	☐	☐
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	☐	☐	☐	☐
7. Were the outcomes measured in a valid and reliable way?	☐	☐	☐	☐
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	☐	☐	☐	☐
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	☐	☐	☐	☐
10. Were strategies to address incomplete follow up utilized?	☐	☐	☐	☐
11. Was appropriate statistical analysis used?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

3. JBI Critical Appraisal Checklist for randomized Controlled trials

Reviewer_____

Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	NA
1. Was true randomization used for assignment of participants to treatment groups?	☐	☐	☐	☐
2. Was allocation to treatment groups concealed?	☐	☐	☐	☐
3. Were treatment groups similar at the baseline?	☐	☐	☐	☐
4. Were participants blind to treatment assignment?	☐	☐	☐	☐
5. Were those delivering treatment blind to treatment assignment?	☐	☐	☐	☐
6. Were outcomes assessors blind to treatment assignment?	☐	☐	☐	☐
7. Were treatment groups treated identically other than the intervention of interest?	☐	☐	☐	☐
8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	☐	☐	☐	☐
9. Were participants analyzed in the groups to which they were randomized?	☐	☐	☐	☐
10. Were outcomes measured in the same way for treatment groups?	☐	☐	☐	☐
11. Were outcomes measured in a reliable way?	☐	☐	☐	☐
12. Was appropriate statistical analysis used?	☐	☐	☐	☐
13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

_____

_____

_____

Appendix 2: Chapter – 4

1. Dataset (all):

```
CREATE TABLE All_TA_updated ( PID integer, CID integer, PMID integer, Age integer,
Gender varchar(5),
                St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
                 Med_StartDate Datetime, Med_StopDate Datetime, Med_Status
varchar(50));

INSERT INTO dbo.All_TA_updated ( PID, CID, PMID, Age, Gender, St_Date,
GenericName, BNF_Class,
                  Med_StartDate, Med_StopDate, Med_Status)
 SELECT F.PID, F.CID, F.PMID, F.Age, F.Gender, P.StartDate, P.GenericProductName,
P.BNFName,
       P.MedicationStartDate, P.MedicationStopDate, P.MedicationStatus

  FROM dbo.FH_Filtered AS F
  JOIN dbo.PatientMedication AS P
          ON F.PID = P.PatientId
    WHERE F.Gender IN ( 'M', 'F') AND P.MedicationStatus = 'ACTIVE';
```

2. Extract (psychotropic medications):

```
SELECT COUNT (DISTINCT PID) FROM dbo.All_TA_updated
WHERE BNF_Class IN ( 'Antidepressant drugs',
 'Anxiolytics','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs',
'Antipsychotic drugs',);
```

3. For number of total psychotropic mediation

```
SELECT DISTINCT PID, BNF_Class, GenericName, COUNT (DISTINCT
GenericName) AS GEN_NO from dbo.All_TA_updated
WHERE BNF_Class IN ( 'Antidepressant drugs',
 'Anxiolytics','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs',
'Antipsychotic drugs')
group by PID, BNF_Class, GenericName order by BNF_Class;
```

4. Create antidepressants table:

```
CREATE TABLE Depression_updated ( PID integer, CID integer, PMID integer, Age
integer, Gender varchar(5),
                St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
                 Med_StartDate Datetime, Med_StopDate Datetime, Med_Status
varchar(50));
```

```
INSERT INTO dbo.Depression_updated ( PID, CID, PMID, Age, Gender, St_Date,
GenericName, BNF_Class,
                Med_StartDate, Med_StopDate, Med_Status)
 SELECT F.PID, F.CID, F.PMID, F.Age, F.Gender, P.StartDate, P.GenericProductName,
P.BNFName,
       P.MedicationStartDate, P.MedicationStopDate, P.MedicationStatus

  FROM dbo.FH_Filtered AS F
  JOIN dbo.PatientMedication AS P
         ON F.PID = P.PatientId
    WHERE F.Gender IN ( 'M', 'F') AND P.MedicationStatus = 'ACTIVE'
    AND BNFName IN ( 'Antidepressant drugs','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs');
```

5. Extract each psychotropic alone (e.g antidepressants alone):

```
SELECT DISTINCT PID FROM dbo.Depression_updated
      WHERE PID NOT IN ( SELECT DISTINCT PID FROM dbo.Psychotic_updated)
      AND PID NOT IN (SELECT DISTINCT PID FROM dbo.Anexity_updated);
```

6. Number of med with each BNF class, then extracted to Excel to combine together by using filter:

```
SELECT DISTINCT PID, BNF_Class, COUNT (DISTINCT GenericName) AS GEN_NO
from dbo.All_TA
WHERE Med_Status = 'Active' group by PID, BNF_Class order by BNF_Class;
```

7. Number of resident on active nervous system medication

```
SELECT COUNT (DISTINCT PID) FROM dbo.All_TA WHERE Gender IN ( 'M', 'F') AND
med_status = 'ACTIVE' AND BNF_Class IN ( 'Antidepressant drugs', 'Antimanic
drugs','Antimigraine drugs','Antimuscarinic drugs used in parkinsonism','Antipsychotic
drugs','Anxiolytics','Barbiturates','Bromocriptine and other dopaminergic drugs',
'CNS stimulatns and drugs used for ADHD','Control of epilepsy','Dopaminergic drugs
used in parkinsonism','Drugs for dementia',
'Drugs used in essential termor, chorea, tics and related disorders','Drugs used in
nausea and vertigo','Drugs used in status epilepticus',
'Drugs used in substance dependence','Hypnotics','Monoamine-oxidase inhibitors','Non-
opioid analgesics','Opioid analgesics',
'Other antidepressant drugs','Sedative and analgesic perioperative drugs','Selective
serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs');
```

Appendix 3: Chapter – 5

1. Create table with focus on residents with anti-dementia medications:

```
CREATE TABLE Dementia_updated ( PID integer, CID integer, PMID integer, Age integer,
Gender varchar(5),
            St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
            Med_StartDate Datetime, Med_StopDate Datetime, Med_Status varchar(50));

INSERT INTO dbo.Dementia_updated ( PID, CID, PMID, Age, Gender, St_Date,
GenericName, BNF_Class,
              Med_StartDate, Med_StopDate, Med_Status)
 SELECT A.PID, A.CID, A.PMID, A.Age, A.Gender, A.St_Date, A.GenericName,
A.BNF_Class,
      A.Med_StartDate, A.Med_StopDate, A.Med_Status
  FROM dbo.All_TA_updated As A
    WHERE (A.GenericName like'%Donepezil%'
        OR A.GenericName like '%Galantamine%' OR A.GenericName like
'%Rivastigmine%'
        OR A.GenericName like'%Memantine%' OR BNF_Class like '%dementia%');
```

2. Table for residents without anti-dementia medications:

```
CREATE TABLE No_Dementia_updated ( PID integer, CID integer, PMID integer, Age
integer, Gender varchar(5),
            St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
            Med_StartDate Datetime, Med_StopDate Datetime, Med_Status varchar(50));

INSERT INTO dbo.No_Dementia_updated ( PID, CID, PMID, Age, Gender, St_Date,
GenericName, BNF_Class,
              Med_StartDate, Med_StopDate, Med_Status)
 SELECT PID, CID, PMID, Age, Gender, St_Date, GenericName, BNF_Class,
      Med_StartDate, Med_StopDate, Med_Status

    FROM dbo.All_TA_updated
   WHERE PID NOT IN  (SELECT DISTINCT PID FROM dbo.Dementia_updated);
```

3. Table for residents with anti-dementia and psychotropic medications

```
CREATE TABLE Dementia_Psychotropic ( PID integer, CID integer, PMID integer, Age
integer, Gender varchar(5),
            St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
             Med_StartDate Datetime, Med_StopDate Datetime, Med_Status varchar(50));
```

```
INSERT INTO dbo.Dementia_Psychotropic ( PID, CID, PMID, Age, Gender, St_Date,
GenericName, BNF_Class,
                Med_StartDate, Med_StopDate, Med_Status)

 SELECT A.PID, A.CID, A.PMID, A.Age, A.Gender, A.St_Date, A.GenericName,
A.BNF_Class,
        A.Med_StartDate, A.Med_StopDate, A.Med_Status

  FROM dbo.All_TA_updated AS A
JOIN dbo.Dementia_updated AS D
ON A.PID = D.PID
WHERE A.BNF_Class IN ( 'Antidepressant drugs',
 'Anxiolytics','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs',
'Antipsychotic drugs');
```

4. Table for residents without anti-dementia but with psychotropic medications

```
CREATE TABLE No_Dementia_Psychotropic ( PID integer, CID integer, PMID integer,
Age integer, Gender varchar(5),
                St_Date Datetime, GenericName varchar(250), BNF_Class varchar(100),
                 Med_StartDate Datetime, Med_StopDate Datetime, Med_Status
varchar(50));

INSERT INTO dbo.No_Dementia_Psychotropic ( PID, CID, PMID, Age, Gender,
St_Date, GenericName, BNF_Class,
                  Med_StartDate, Med_StopDate, Med_Status)

 SELECT A.PID, A.CID, A.PMID, A.Age, A.Gender, A.St_Date, A.GenericName,
A.BNF_Class,
        A.Med_StartDate, A.Med_StopDate, A.Med_Status

  FROM dbo.All_TA_updated AS A
JOIN dbo.No_Dementia_updated AS D
ON A.PID = D.PID
WHERE A.BNF_Class IN ( 'Antidepressant drugs',
 'Anxiolytics','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs',
'Antipsychotic drugs');
```

5. How many residents with anti-dementia and psychotropic medications (anyone of psychotropic medications)

```
SELECT COUNT (DISTINCT PID) FROM dbo.Dementia_Psychotropic;
```

6. Residents with anti-dementia but not prescribed psychotropic medications =713

```
SELECT Count (DISTINCT PID)

FROM dbo.All_TA_updated
 WHERE PID IN ( SELECT DISTINCT PID FROM dbo.Dementia_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Depression_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Psychotic_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Anexity_updated);
```

7. Residents without anti-dementia but with prescribed psychotropic medications = 3754

```
SELECT COUNT (DISTINCT PID) FROM dbo.No_Dementia_updated
 WHERE BNF_Class IN ( 'Antidepressant drugs',
 'Anxiolytics','Monoamine-oxidase inhibitors',
'Other antidepressant drugs','Selective serotonin re-uptake inhibitors',
'Tricyclic and related antidepressant drugs',
'Antipsychotic drugs');
```

8. Residents without anti-dementia and not prescribed psychotropic medications = 3224

```
SELECT Count (DISTINCT PID)

FROM dbo.No_Dementia_updated
 WHERE PID NOT IN ( SELECT DISTINCT PID FROM dbo.Depression_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Psychotic_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Anexity_updated);
```

9. Check accuracy for number 6 (but with different table) = 3224

```
SELECT Count (DISTINCT PID)

FROM dbo.All_TA_updated
 WHERE PID IN ( SELECT DISTINCT PID FROM dbo.NO_Dementia_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Depression_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Psychotic_updated)
 AND PID NOT IN ( SELECT DISTINCT PID FROM dbo.Anexity_updated);
```

Appendix 4: Chapter - 6

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:	2324-01: Care homes' staff and pharmacists' views on managing depression in residents with dementia, particularly Alzheimer's Disease (AD)

This is a/an:	Undergraduate project	
	ERASMUS project	
	Postgraduate project	X
	Staff project	

Name of researchers: (PG/Staff projects only)	Talal Alotaibi
Name of supervisor(s):	Emma Kidd, Mathew 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 [redacted] Name *M Ivory* Date *13/11/2023*
(Deputy Chair, School Research Ethics Committee)

1

Participants' demographic information

Care home staff and pharmacist's views on the management of depression in residents with Dementia.

Hello, my name is Talal, and I am a researcher from Cardiff University. Thank you for agreeing to take part in this interview. I would like to confirm that you read the participant information sheet and signed the consent form and you are ok with that.

The aim of this research is to understand your views on the management of depression in residents with dementia in care homes. In the beginning I would like to collect some demographic information. After that, we will discuss general information about resident in care home, then we will talk about psychotropic medications *(*which are drugs act in the brain to calm people, to help them to sleep, to manage depression and anxiety. such as anti-depressants, anti-psychotics and anxiolytics). Finally, we will discuss more about management of depression in residents with dementia. I want to emphasize that there are no right or wrong answers, so please feel free to respond as you see fit.

As you know, this interview will be recorded and transcribed for analysis, and you are happy with that. During the recording, please do not disclose any identifiable information. if it happens accidently, it will be redacted from the transcript.
Before starting recording, could you please confirm your name? and do you have any questions? Recording start !

1. **What is your job title (e.g. manager or nurse) ?**

2. **How long is your experience, in general?**

☐ 2-5 years ☐ >5-10 years ☐ More than 10 years

3. **Where do you work?**

☐ residential care home. ☐ Nursing home. ☐ Specialist dementia care home
☐ Other, please specify

4. **Have you had training including medication management or experience working with residents with dementia ?**

☐ Yes ☐ No

Follow-up: could you describe the training you've had? Could you describe your experience of working with residents with dementia.

Topic Guide for the care home staff:

Title: **Care Home staff and pharmacist's views on the management of depression in residents with Alzheimer's Disease (AD)**

Section 1: General Section:

1. How many residents are there in your care home?
2. How many residents have dementia approximately?
3. Do you know the type of dementia? If yes, how many approximately have AD?
4. When new residents are admitted, what happens to their registered GP? Do they keep the original GP or move to a new GP? (prompt: does your care home liaise with one GP or multiple GPs)
5. How would you manage the review of medication for residents at admission? Would these processes be similar on a regular basis? Are there specific consideration for those with AD? (Prompt: reviewing medications, medical history)
6. In your opinion, what are the key differences in managing the medication of residents with dementia compared to those without ? (*Prompt: need to be more cautious with residents having dementia, or do you need particular training or knowledge, is it mandatory training, what do you think about the outcome of training?)*

Section 2: Psychotropic medications *(which are drugs act in the brain to calm people, to help them to sleep, to manage depression and anxiety. such as anti-depressants, anti-psychotics and anxiolytics*)

7. From your experience, how do you manage residents who are exhibiting behavioural symptoms such as depression, aggression, or noisy with respect to giving medication? Is it the same for residents with dementia? (*prompt: Call GP first? What is the usual answer of GP?* Continue with usual medication or change medication?)
8. Are there any difference between the behaviours of male and female residents? Do you mange these resident differently (prompt: I've analysed care home database, I found more males with psychotropic medication than females; what do you think about that?)
9. Regarding age, in the same database I've found resident age less than 85 prescribed more psychotropic medication, what do you think about that? is there difference if too old (>85) vs less than 85*?*

10. What are your thoughts about the clinical appropriateness of the use of psychotropic medications in the residents in your care home?? (*Prompt: I have found more than half of the residents in my study were on psychotropic medications, and most of them were on antidepressants. In your opinion, why is that?*

Psychotropic in dementia

11. From your experience, is there a difference in whether psychotropic medications (i.e. antidepressants, antipsychotics, anxiolytics) are used in residents with dementia vs. those that don't have dementia? if so why? (*prompt: show Figure below*)
12. In your experience, what do you think about the following statement: if a resident has dementia, he/she is more likely to get psychotropic medications, why do you think this is? *(Prompt: agree or disagree, and why)?*

Section 3 : Depression in dementia:

13. Based on your experience, how is depression treated in residents with dementia? Do they start with medications or with talking therapies such as cognitive behavioural therapy etc. *(prompt: A. what is usually used for first time? (medication or non-medication approach and why)*

    B. in case of non-medication used? What are these? How often are used?
14. In your experience, do you think that the treatment of depression in dementia versus non-dementia residents is different? If different how? (*prompt: will you follow same process? or need to be more caution or particular training to deal with residents with dementia?)*
15. In your experience have you found medications or talking therapies or both to be more effective in helping dementia residents with depression. Can you explain why?
16. For residents with dementia who are being treated with medications (e.g. antidepressants) for depression, in your experience
    a. Are these medication effective? If not, how would these residents be managed/reviewed? (prompt: who would contact the prescriber? What would the prescriber do - stop and start another one, or just "add on" another antidepressant) Where another medication is added, what is that likely to be? And why?
17. Do you think there are occasions where antidepressants are prescribed for residents with dementia who do not have depression? Why? (*prompt – there has been some media*

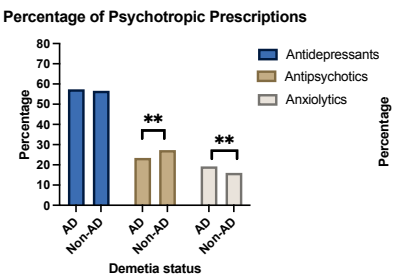
attention on the use of psychotropic medicines to treat behaviours in care home residents rather than clinical symptoms)

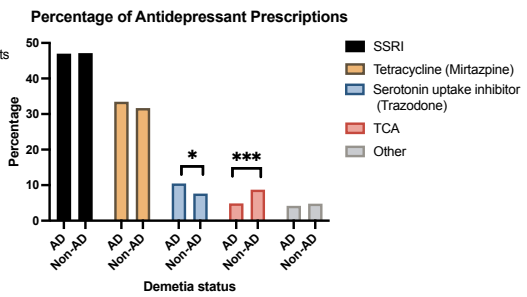
18. How do you manage residents with dementia who experience side effects which appear to be linked to their antidepressants such as a fall, fracture, and bleeding? (*Prompt: contact GP or prescriber, does it lead to a hospital admissions)*
19. In your experience, how would you arrange for non-medication-related therapies to be used in resident with depression? (prompt: social prescriber, external provider, staff in home?)
20. What do you think are the barriers of using non-medication approaches to treat depression in dementia? (*Prompt: burden? take time, funding, access to services).*
21. What do you think the facilitators of using non-medication approaches to treat depression in dementia?
22. In your opinion, what factors impact on the treatment decisions of how to manage residents with depression and dementia (prompt: staff knowledge/skillset, training, or type of care home impact)?
23. Do the views of family/friends have an impact on the choice of treatment approach (medications versus non-medications) to your residents? if so, how? Why? (prompt: how family/friends react if see agitated resident ? will they ask you to give medication to calm residents without trying non-medication first)
24. In your opinion, how could the management of depression in residents with dementia in care homes be improved?
25. Do you have anything else you would like to add?
26. Do you have any feedback on the interview?

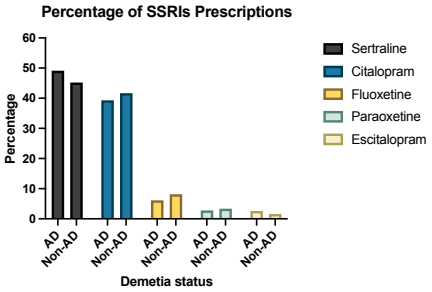
END

Thank you again for your participation in this conversation.

A list of general prompt questions that might help during the discussion:
In your opinion, why is that?
What is your opinion on this?
Could you elaborate a bit more on that?
What do you think about that?
Could you explain more?
Could you give me an example?


Percentage of Psychotropic Prescriptions
Percentage
Demetia status
AD
Non-AD
Antidepressants
Antipsychotics
Anxiolytics
**
**


Percentage of Antidepressant Prescriptions
Percentage
Demetia status
AD
Non-AD
SSRI
Tetracycline (Mirtazpine)
Serotonin uptake inhibitor
(Trazodone)
TCA
Other
*
***


Percentage of SSRIs Prescriptions
Percentage
Demetia status
AD
Non-AD
Sertraline
Citalopram
Fluoxetine
Paraoxetine
Escitalopram

CONSENT FORM

Title of research project: Pharmacists' and Care home staffs' views on the management of depression in residents with dementia

SREC reference and committee: 2324-01
Name of Chief/Principal Investigator: Talal Alotaibi, PhD student
PhD supervisors: Prof. Emma Kidd, Dr Mathew Smith

	Please initial box
I confirm that I have read the information sheet dated 18/10/2023 version 02 for the above research project.	
I confirm that I have understood the information sheet dated 18/10/2023 version 02 for the above research project and that I have had the opportunity to ask questions and that these have been answered satisfactorily.	
I understand that my participation is voluntary and I am free to withdraw at any time until the data is pseudonymised without giving a reason and without any adverse consequences.	
I understand that data collected during the research project may be looked at by individuals from Cardiff University or from regulatory authorities, where it is relevant to my taking part in the research project. I give permission for these individuals to have access to my data.	
I consent to the processing of my personal information (job title, workplace, length of experience, training or experience working with residents with dementia) for the purposes explained to me. I understand that such information will be held in accordance with all applicable data protection legislation and in strict confidence, unless disclosure is required by law or professional obligation.	
I understand who will have access to personal information provided, how the data will be stored and what will happen to the data at the end of the research project.	
I consent to being audio recorded for the purposes of the research project and I understand how it will be used in the research.	
I consent to being video recorded for the purposes of the research project and I understand how it will be used in the research.	

I understand that pseudonymised excerpts and/or verbatim quotes from my Interview may be used as part of the research publication.	
I understand how the findings and results of the research project will be written up and published.	
I agree to take part in this research project.	

When you are filling out this consent form, you can either sign it electronically or just type your initials as your signature. When you do that, it means you have read and understood what is written here, and you are agreeing to be part of the study. Kindly forward the completed form as an attachment to the researcher via email at the following address alotaibit1@cardiff.ac.uk

Name of participant (print)	Date	Signature
Name of person taking consent (print)	Date	Signature

Role of person taking consent (print)

THANK YOU FOR PARTICIPATING IN OUR RESEARCH

YOU WILL BE GIVEN A COPY OF THIS CONSENT FORM TO KEEP

PARTICIPANT INFORMATION SHEET

Care home staffs' and pharmacists' views on the management of depression in residents with dementia

You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take some time to read the following information carefully and discuss it with others, if you wish. This research is being undertaken by Talal Alotaibi, a PhD student, School of Pharmacy and Pharmaceutical Sciences in Cardiff University. My supervisors are Prof. Emma Kidd and Dr Mathew Smith. All contact details are at the end of this letter.

Thank you for reading this.

1. What is the purpose of this research project?

The aim of our project is to explore and understand your views and perspectives on treating depression in residents with dementia, particularly Alzheimer's disease (AD). We hope the data collected will help understand and improve manging depression in residents with dementia, particularly AD.

2. Why have I been invited to take part?

You have been invited because you are a care home manger, nurse or pharmacist involved with care homes and you might have worked with residents with dementia or have relevant experience. The selection process will be primarily based on a 'first come, first served' basis.

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to take part, we will discuss the research project with you and ask you to sign a consent form, either an electronic signature or typing your initials as your signature. After completing this form, it should be returned to the researcher via email (alotaibit1@cardiff.ac.uk) . If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights. You are free to withdraw your consent to participate in the research project at any time, without giving a reason, even after signing the consent form. Please note if the interview has been transcribed and become pseudonymised transcript, it will not be possible to withdraw your data.

4. What will taking part involve?

We invite you to participate in an online interview, unless you prefer a face-to-face interview. At the beginning of the interview, we will collect demographic information (job title, workplace, length of experience, training or experience working with residents with dementia) as part of the conversation in order to put this information in context. Following that, we will discuss your views and experiences in managing depression in residents with dementia.

The interview is expected to take up to 60 minutes and will take place at a time and location of your choosing. We recommend a quiet and private setting, such as your office or a meeting room at your workplace, for both online or face-to-face interviews. The interview will be recorded in audio format to enable the researcher to produce a pseudonymised transcript for analytical purposes. Any identifying information will be redacted from the transcript. In online interviews, the recording function will be used and you will have the option to turn your camera on or off. If it is on, it will record video too. In a face-to-face interview, a digital voice recorder will be used.

If you agree to participate, you will find a consent form attached to this document. Please read and sign it either electronically or by typing your name as your signature. The completed form should be emailed to the researcher as an attachment.

5. Will I be paid for taking part?

No, you will not be paid to take part. You should understand that any data you give will be as a gift and you will not benefit financially in the future should this research project lead to the development of a new treatment/method/test/assessment.

6. What are the possible benefits of taking part?

There will be no direct advantages or benefits to you from taking part, but your contribution will help us understand how depression in residents with dementia is managed.

7. What are the possible risks of taking part?

There are no expected risks in participating in this study.

8. Will my taking part in this research project be kept confidential?

All information collected from (or about) you during the research project will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9. What will happen to my Personal Data?

All personal data, including demographic information, and consent form will be collected in accordance with General data protection Regulation (GDPR).

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. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

may be found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

The interview will be recoded in an audio format to enable the researcher to produce a pseudonymised transcript for analytical purposes. Any identifying information will be redacted from the transcript. In an online interview, the recording function will be used and you will have the option to turn your camera on or off. In a face-to-face interview, a digital voice recorder will be used. All participants' personal data will be pseudonymised in the final report, so any identifiers that might identify you from the data will be removed.

Your consent form, demographic information, and recording will be retained for fifteen years after the end of the project in accordance with the University Records Retention Schedules and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. The pseudonymised information will be kept for a minimum of fifteen years after the end of the project in accordance with the University Records Retention Schedules but may be published in support of the research project and/or retained indefinitely, where it is likely to have continuing value for research purposes. In the unlikely event that there is a safeguarding issue, we may be required to share specific data with a regulatory body.

Note that it will not be possible to withdraw any pseudonymised data that has already been published or in some cases, where identifiers are irreversibly removed during the course of a research project, from the point at which it has been pseudonymised. It will take 2-3 months for a transcribed interview to become a pseudonymised transcript after the interview.

10. What happens to the data at the end of the research project?

All data will be securely stored on Cardiff University-OneDrive, where only the research team will have access.

11. What will happen to the results of the research project?

Mainly, the result of the study will be used by the researcher to write his PhD thesis. Also, it is our intention to publish the results of this research project in academic journals and present findings at conferences. Participants will not be identified in any report, publication or presentation, pseudonymised verbatim quotes from participants might be used.

12. What if there is a problem?

If you wish to complain or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact the projects supervisors (details below). If your complaint is not managed to your satisfaction, please contact the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB; e-mail: phrmyresoffice@cardiff.ac.uk

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for legal action, but you may have to pay for it. Also, in the unlikely event of harm or neglect being identified in this study, we will follow the National Wales Safeguarding Procedures (guidance available at https://safeguarding.wales/en/), and contact the relevant Regional Safeguarding Board (https://safeguarding.wales/en/rsb-i/rsb-i-r1/r1-p1/).

13. Who is organising and funding this research project?

The research is organised by Talal Alotaibi, PhD student, under the supervision of Prof. Emma Kidd and Dr Mathew Smith, School of Pharmacy and Pharmaceutical Sciences at Cardiff University. The research is currently funded by the Cultural Bureau of the Royal Embassy of Saudi Arabia.

14. Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the Cardiff University School of Pharmacy and Pharmaceutical science Research Ethics Committee.

15. Further information and contact details

Should you have any questions relating to this research project, you may contact us during normal working hours:

PhD student: Talal Alotaibi
Email: alotaibit1@cardiff.ac.uk

Supervisor 1: Prof. Emma Kidd
Email: kiddej@cardiff.ac.uk
Tel: +44 (0)29 2087 5803

Supervisor 2: Dr Mathew Smith
Email: smithmw1@cardiff.ac.uk
Tel: +44 (0)29 2087 9286

Thank you for considering taking part in this research project. If you decide to participate, you will be given a copy of the Participant Information Sheet and a signed consent form to keep for your records.

Subject: Invitation to Participate in Research Interview on Depression Management in Residents with Dementia in Care Homes

Dear care home manager / nurse / pharmacist,

I hope this email finds you in good health. Allow me to introduce myself; I am Talal Alotaibi, a PhD student at the School of Pharmacy and Pharmaceutical Sciences at Cardiff University. Currently, I am conducting a research project titled "Care Home Staffs' and Pharmacists' Views on the Management of Depression in Residents with Dementia."

The primary aim of this project is to gain a better understanding of and explore your experiences and perspectives on the management of depression in residents with dementia in care homes. Participation is open to care home managers, nurses, and pharmacists involved with care homes, and it will be based on a 'first come, first served' basis.

You are invited to participate in a semi-structure interview, either online, e.g. Microsoft Teams or, if you prefer, face-to-face, typically lasting no longer than 60 minutes. Your participation in this study is immensely valuable, and I am eager to hear your insights on this subject.

The project is under the supervision of Professor Emma Kidd and Dr Mathew Smith at Cardiff University and has received ethical approval from the School of Pharmacy and Pharmaceutical Science's Research Ethics Committee.

For more detailed information about this project, please refer to the attached participant information sheet. Please take some time to review it and decide whether you would like to participate. If you choose to do so, kindly complete the attached consent form and return it to me via email (alotaibit1@cardiff.ac.uk). Additionally, please let me know your preferred method of interview (online or face-to-face), along with your preferred date and time.

Should you have any questions or require further clarification about the study, please do not hesitate to contact me via this email address. I would be more than happy to address any queries.

Thank you for considering this invitation, and I hope to hear from you soon.

Yours Sincerely,
Talal Alotaibi

CARDIFF UNIVERSITY
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Gatekeeper Information sheet

Thank you for taking the time to read this information sheet.

You are being invited to assist in a research project. Before you decide whether or not to assist, it is important for you to understand why the research is being undertaken and what it will involve. Please take some time to read the following information carefully and discuss it with others, if you wish.

1. What is the purpose of this research project?

The aim of our project is to explore and understand participants' views and perspectives on managing depression in residents with dementia, particularly Alzheimer's disease (AD). We hope the data collected will help understand and improve the management of depression in residents with dementia, particularly AD.

2. Why have I been invited to assist in the project?

You have been invited because, through your role, you have access to potential participants that we wish to approach to ask if they would like to take part in the project. We would therefore like to ask if you would be willing to act as a "gatekeeper". Without you passing on information on our behalf, we would not be able to recruit relevant individuals.

3. Do I have to take part?

No, your role is entirely voluntary and it is up to you to decide whether or not to assist. If you decide to assist, we will discuss the research project with you and ask you to sign a gatekeeper consent form, either an electronic signature or typing your initials as your signature. After completing this form, it should be returned to the researcher via email (alotaibit1@cardiff.ac.uk) If you decide not to assist, you do not have to explain your reasons and it will not affect your legal rights. You are free to withdraw the consent for your role in the research project at any time, without giving a reason, even after signing the consent form.

4. What will taking part involve?

We would like to ask you to act in the capacity of a gatekeeper by forwarding information to potential participants on our behalf. The individuals who are suitable to take part are care home staff who are managers and/or nurses with responsibility for drug administration with at least 2-years of experiences (i.e. post-foundation years). Also, the site of care homes will be within Wales only. The project will involve the participants taking part in an interview with a PhD student at a convenient date and time for them. This interview will be conducted online, e.g. Microsoft Teams, unless participants prefer a face-to-face interview. The interview will last no longer than 60

minutes and it will conducted in a quiet and private place, such as a meeting room at the participant's place of work either online or face-to-face. During the interview, the researcher will explore participants' views on managing depression in residents with dementia in care homes.

We ask that you only forward the details of the project to them, which will include the invitation email, information sheet and consent form. Please do not amend any of these documents or provide further information. If you agree to assist, we will provide these as soon as possible. Please can you then forward them to the potential participants as soon as you can. You must not coerce or instruct the individuals to participate, it is entirely their own decision. If they would like to participate ,they will be asked to contact the researcher directly using the contact details provided (i.e. you will not need to pass information back to us). You must not provide us with any information related to the individual or attempt to answer any questions they might ask you about the project – they should contact the research team directly. You may also be asked to forward a reminder (all documentation will be provided to you) 2 weeks after the initial contact, when it is required. All involvement should take no more than 10 minutes of your time.

5. Will I be paid for taking part?

No, your assistance will be entirely voluntary with no payment.

6. What will happen to my Personal Data?

The only personal data held will be your name, work contact details and email address in order to forward the documentation onto you. 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. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

may be found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

All of your details, including your consent form will be retained for a minimum period of 15 years after the end of the project in accordance with the University Records Retention Schedules and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. The consent form will be securely stored on Cardiff University-OneDrive, where only the research team will have access in order to maintain confidentiality.

7. What if there is a problem?

If you have any concerns or complaints about the project, please contact Prof. Emma Kidd or Dr Mathew Smith using the contact details below, who will address the issue. If you remain unhappy and wish to complain formally, you can do this by contacting the Director of Research, at Cardiff School of Pharmacy and Pharmaceutical Sciences on phrmyresoffice@cardiff.ac.uk.

8. Who is organising and funding this research project?

The research is organised by PhD student Talal Alotaibi and my supervisors are Prof. Emma Kidd and Dr Mathew Smith. The research is funded by the Cultural Bureau of the Royal Embassy of Saudi Arabia.

9. Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee.

10. Further information and contact details

Should you have any questions relating to this research project, you may contact myself/us during normal working hours:

PhD student: Talal Alotaibi
Email: AlotaibiT1@cardiff.ac.uk

Supervisor 1: Prof. Emma Kidd
Email: kiddej@cardiff.ac.uk
Tel: +44 (0)29 2087 5803

Supervisor 2: Dr Mathew Smith
Email: smithmw1@cardiff.ac.uk
Tel: +44 (0)29 2087 9286

Gatekeeper Consent Form

Title of research project: **Care home staffs' and pharmacists' views on the management of depression in residents with dementia**

SREC reference and committee: 2324-01
Name of Chief/Principal Investigator: Talal Alotaibi, PhD student
PhD supervisors: Prof. Emma Kidd, Dr Mathew Smith

This project is seeking to explore and understand participants' views and perspectives on treating depression in residents with dementia, particularly Alzheimer's disease (AD). If you are willing to assist in this study, we will ask for your support in distributing information to potential participants [inclusion and exclusion criteria have been provided in the information sheet]. Any interested participants should be directed to contact the research team to discuss participation further.

All information collected from you during the research project will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation.

Please initial to confirm your understanding of the study and that you are happy to be involved in the role of a gatekeeper. **Please initial box**

I confirm that I have read and understand the gatekeeper information sheet dated 18/10/2023 version 02 provided for the above study.	
I confirm that I have understood the gatekeeper information sheet dated 18/10/2023 version 02 for the above research project and that I have had the opportunity to ask questions and that these have been answered satisfactorily.	
I understand that my participation as a gatekeeper is voluntary and that I am free to withdraw at any time, without giving a reason and that this will not affect legal rights.	
I agree to not coerce or in any way convince potential participants to take part in the study.	
I agree to distribute the information provided to potential participants at the timeframe stated in the gatekeeper information sheet and that none of the documents will be modified in any way.	
I understand that any personal information collected during the study will be anonymised and remain confidential.	

When you are filling out this consent form, you can either sign it electronically or just type your initials as your signature. When you do that, it means you have read and understood what is written here, and you are agreeing to be part of the study. Kindly forward the completed form as an attachment to the researcher via email at the following address alotaibit1@cardiff.ac.uk

Name of Gatekeeper:	Date:	Signature:
Name of Researcher:	Date:	Signature:
Name of Person taking consent: (if different from researcher)	Date:	Signature:

Gatekeeper Letter

Dear care home manager / owner,

Title of Project: Care Home staffs' and pharmacists' views on the management of depression in residents with dementia

Name of Researcher and location of researcher: Talal Alotaibi and his supervisors, Prof Emma Kidd and Dr Mathew Smith, Cardiff University School of Pharmacy and Pharmaceutical Sciences.

I would like to introduce myself: my name is Talal, and as part of my PhD, I am currently carrying out a project investigating and understanding the views of pharmacists and care home staff on the management of depression in residents with dementia, particularly Alzheimer's disease (AD).

In order to achieve this, I aim to recruit managers and/or nurses with responsibility for drug administration with a minimum of 2 years of experience (i.e. post-foundation years). I would therefore like to ask for your support in getting in touch with these individuals by forwarding information to them on my behalf. The project has been reviewed and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee.

If you would be willing to consider this, please read the attached information sheet which outlines exactly what you are being asked to do and when. It should not take up too much of your time. If you are a manager and would like to be a participant in this study, you are welcome.

Please contact me on alotaibit1@cardiff.ac.uk if you have any questions about this request.

Your sincerely,

Talal Alotaibi
alotaibit1@cardiff.ac.uk

Reminder Email

Dear care home manager / owner,

I sincerely apologize for any inconvenience. I recently reached out to you via email on [date] to ask for your support in getting in touch with managers and/or nurses with responsibility for drug administration with a minimum of 2-years of experiences (i.e. post-foundation years) by forwarding information to them on my behalf.

Since I have not received responses from potential participants, I would like you to forward this gentle reminder to all potential participants on my behalf. Participants who have already responded, thank you so much, and please ignore this reminder.

The primary objective of the project is to gain a deeper understanding of and explore your experiences and perspectives on managing depression in residents with dementia in care homes. It is under the supervision of Professor Emma Kidd and Dr Mathew Smith at Cardiff University and has received ethical approval from the School of Pharmacy and Pharmaceutical Science's Research Ethics Committee.

The interview can be conducted online, for example, via Microsoft Teams, or if you prefer, face-to-face. It is expected to take no longer than 60 minutes of your time. Your participation in this study is immensely valuable, and I would love to hear your insights on this important subject.

For more detailed information about this project, please refer to the attached participant information sheet. Please take some time to review it and decide whether you would like to participate. If you choose to do so, kindly complete the attached consent form and return it to me via email (alotaibit1@cardiff.ac.uk). Additionally, please let me know your preferred method of interview (online or face-to-face), along with your preferred date and time.

If you have any questions relating to this research project, you may contact me during normal working hours by Email, AlotaibiT1@cardiff.ac.uk.

Yours Sincerely,
Talal Alotaibi