

**MEDICATION ADHERENCE: A REVIEW OF POLICY AND  
EDUCATION IN SOUTH AFRICA**

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**ABSTRACT**

**DEDICATION**

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## ABSTRACT

Medication adherence is a patient's active and voluntary participation in following all the recommendations and instructions agreed upon with a health care provider such as a pharmacist. Adherence is a multidimensional phenomenon determined by the interplay of five factors: patient-related factors, socioeconomic factors, condition-related factors, health system-related factors, and therapy-related factors.

Medication non-adherence is a problem in many countries, especially low to middle-income countries, including South Africa (SA). In low to middle-income countries, non-adherence is often worse due to insufficient health resources and inequities in access to health care. Medication adherence is a global problem and has raised the need for research and review.

Many healthcare professionals, especially pharmacists, have an essential role in promoting medication adherence. This study described, explained and evaluated the policies in SA relating to the pharmacist's role in promoting medication adherence. Furthermore, it described medication adherence-related education at four universities in South Africa.

The study was qualitative, and a two-phased approach was employed. In the first phase, a document analysis of the pharmacist's role in supporting medication adherence was conducted as described in national policies and guidelines in SA. A total of 38 documents were analysed, including critical documents such as the South African Pharmacy Council Good Pharmacy Practice Manual and Associated SAPC rules (GPP) manual, National Drug Policy (NDP), Standard treatment guidelines (STGS) and Integrated Adherence Guidelines. The READ approach was used in conducting the document analysis and involved (1) preparing materials, (2) extracting data, (3) analysing data, and (4) distilling findings. The critical roles of pharmacists in medication adherence that were identified were in drug use, supply and management, dispensing, therapeutic drug monitoring, pharmacovigilance, pharmaceutical care, and special programmes like antimicrobial stewardship (AMS), multi-drug resistant tuberculosis (MDR-TB) care and antiretroviral treatment (ARV) and chronic conditions.

In the second phase, in-depth interviews were conducted with lecturers to investigate and report on the inclusion of medication adherence and the teaching thereof in the curriculum of the Bachelor of Pharmacy Degree (BPharm) in pharmacy institutions in SA. Purposive sampling was used, and seven lecturers from four different institutions participated in the interviews. The interviews were conducted via Zoom® and were transcribed and analysed using thematic analysis. The teaching of medication adherence in the BPharm curriculum of the respective interviewed pharmacy institutions was explored. It was found that the topic of medication adherence was integrated into all subjects throughout the curriculum and not taught as a formal course. Although medication adherence is taught in many disciplines, it is predominantly in pharmacy practice in all institutions. The teaching methods identified included lectures, case studies, workshops, tutorials, practicals, readings, tasks, assignments and videos. The perceived effectiveness of the teaching methods was explored; also the time spent teaching medication adherence and the time efficiency. Student understanding, interest and engagement with the topic were explored and determined through their assessment performance and class attendance.

In conclusion, from policies, the pharmacist's role concerning adherence is indirectly integrated into many other roles. It is often not distinguishable from that of other healthcare professionals and is often implied as part of a more generic role. Pharmacy students are educated on medication adherence and the skills and knowledge required to identify, monitor and support patient adherence to therapy. However, there is scope to increase the course content on medication adherence. There is a need to identify effective strategies for preparing pharmacists to assist patients in medication adherence.

## **DEDICATION**

**This thesis is dedicated to my beloved mother, Eunice Moyo.**

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## LIST OF ACRONYMS

ADRs	Adverse drug reactions
AIDS	Acquired Immunodeficiency Syndrome
AMS	Antimicrobial Stewardship
ART	Antiretroviral Treatment
ARV	Antiretroviral
BPharm	Bachelor of Pharmacy
CKD	Chronic Kidney disease
CMR	Comprehensive Medication Reviews
COPD	Coronary Obstructive Pulmonary Disease
COVID-19	Coronavirus disease 2019
DOT	Directly Observed Therapy
EML	Essential Medicines list
FEFO	First Expiry First Out
FIFO	First In First Out
GPP	Good Pharmacy Practice (South African Pharmacy Council Good Pharmacy Practice Manual and Associated SAPC rules (GPP).)
GRIPP	Global Research Institute in Pharmacy Practice
HAART	Highly Active Antiretroviral Therapy
HCP	Healthcare professional/provider
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
LMICs	Lower to middle-income countries
MDR-TB	Multi-drug Resistant Tuberculosis
MEMS	Medication Events Monitoring System
MMAS	Morisky Medication Adherence Scale
MTM	Medication Therapy Management
NBD	National Burden of Disease
NDOH	National Department of Health (South Africa)
NDP	National Drug Policy

PI	Patient Information
PIL	Patient Information Leaflet
QA	Quality Assurance
SA	South Africa
SAHPRA	South African Health Products Regulatory Authority
SAPC	South African Pharmacy Council
SOP	Standard Operating Procedure
STGs	Standard Treatment Guidelines
TB	Tuberculosis
TDM	Therapeutic Drug Monitoring
USA	United States of America
WHO	World Health Organisation

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background to research

Medication adherence is integral to patient care and central to achieving positive health outcomes. However, conflicting meanings and uses of the term medication adherence exist despite clinical reports and extensive research contributions to understanding the concept (Krueger et al., 2005). A widely accepted definition that will underpin this study is medication adherence is “the extent to which a person’s behaviour corresponds with agreed recommendations from a health care provider in respect of taking medications, following or implementing lifestyle changes” (Fox et al., 2018). Thus, adherence requires that patients understand, accept, and follow through with their recommended treatment regimen. In addition, the health outcomes of chronic disease patients largely depend on their treatment adherence (Bain-Brickley et al., 2011).

Patient non-adherence is a widespread and global problem encountered by all health professionals. Medication non-adherence is the failure to take medications as prescribed and is associated with an increased risk for poor health, adverse clinical events, and mortality (Hollands et al., 2019). In developing countries where there are insufficient health resources and inequities in access to health care, the rate of non-adherence is often very high (Kauppi et al., 2014). Non-adherence has clinical, humanistic, and economic outcomes. Poor adherence causes a decline in optimum clinical benefits and decreases health systems’ overall effectiveness (Nieuwlaat et al., 2014).

Health providers have a significant role in assessing the risk of non-adherence and delivering interventions to optimise adherence (Al-azeel et al., 2020). They must have access to specific training in adherence management, and the systems they work in must be designed to support delivery systems that promote adherence. Multiple methods and tools are available for measuring adherence, but guidance on the most suitable measure for healthcare professionals and researchers is still lacking (Merriel et al., 2019; Zaugg et al., 2018). However, a significant challenge in measuring adherence is the lack of a “gold standard “. Adherence is

often estimated in one of three ways: patient self-reporting, pharmacy refill records, or use of electronic lids (Simpson et al., 2006).

Healthcare professionals, especially pharmacists, play an essential role in medication adherence (Nieuwlaat et al., 2014). According to Good Pharmacy Practice (GPP) the pharmacist's scope of practice includes providing pharmaceutical care by taking responsibility for the patient's medicine-related needs and being accountable for meeting those needs (SAPC, 2008b).

van Mil et al. (2004) defines pharmaceutical care in the following way:

Pharmaceutical care is a practice philosophy for pharmacy. It is the way of pharmacists coaching individual patients with their medication. The concept deals with who should receive and use medication and should receive education on the use of medicines. The concept also deals with responsibilities, medication surveillance, counselling and evaluating care outcomes.

Pharmaceutical care motivates patients to be familiar with their medicine regimens and understand the importance of adhering to their medications. The goal is to optimise the patient's health-related quality of life and achieve positive clinical outcomes within realistic economic expenditures. In so doing, pharmacists promote adherence (Ryan et al., 2014).

In England, a research study by Clifford et al. (2010) has shown that national policies and guidelines have been conducive to increasing the role of community pharmacists in supporting patients with medication adherence. Similar research studies to describe the education, research, practice and policy in medication adherence have been done in other countries, including Australia, Denmark, Finland, Sweden, Switzerland, and the United States of America (USA) (Aslani & Krass, 2009; Bell et al., 2010; Clifford et al., 2010; Haugbølle & Herborg, 2009; Rickles et al., 2010; Schneider et al., 2009). These studies resulted from an intentional initiative that emerged from a scientific meeting of the Global Research Institute in Pharmacy Practice (GRIPP) in 2007 in Switzerland (Schneider & Aslani, 2010).

However, similar studies have not yet been conducted in South Africa (SA). The first National Burden of Disease (NBD) study in 2000 described SA as having high mortality levels due to its quadruple disease burden (Pillay-van Wyk et al., 2016). The second NBD study demonstrated

the persistence of the quadruple disease burden due to continued high HIV/AIDS and tuberculosis (TB) (Mayosi et al., 2012). Because of the overwhelming prevalence of and focus on communicable diseases such as HIV/AIDS and TB, the prevention and treatment of non-communicable diseases are compromised (Micah et al., 2020). South Africa has the most extensive antiretroviral treatment (ART) programme globally, and as of 30 June 2020, 5.27 million people were receiving ART (Horn et al., 2020). The Lancet Series (2012) update for South Africa reported a noticeable decline in HIV/AIDS and TB mortality, and this drop was achieved through intensified ART treatment (Larson et al., 2012).

To achieve optimal treatment outcomes and maintain viral suppression, patients must adhere to their treatment plans for intensified ART. Patients taking TB medication or ART find it challenging to stick to their medicines with the additional pill burden and overlapping side effects (Letang et al., 2020). There is a need to gather knowledge on the factors influencing treatment adherence, especially pill burden. Implementation of a test and treat policy and rapid scale-up of ART provision should be followed. Medication adherence must be monitored at the start of ART or TB or ART/TB initiation. Patients must be continually assessed, and support must be offered to patients to attain a successful ART and TB programme (Moosa et al., 2019).

A substantial commitment to a multidisciplinary approach is needed to make progress in promoting adherence. A multidisciplinary approach requires coordinated action from health professionals, researchers, educators, health planners, and policymakers.

## 1.2 Aim and objectives

The primary aim of this study is to describe the policy and education related to the pharmacist's role in medication adherence in South Africa.

In support of this aim, the objectives of this study are to:

1. Review, describe, and explain the pharmacist's role in supporting medication adherence according to national policies and guidelines by conducting a content analysis of national policies and guidelines.
2. Investigate and report on the inclusion of medication adherence and the teaching thereof in the BPharm degree in faculties, schools, and pharmacy departments in



South Africa by interviewing pharmacy educators responsible for teaching medication adherence to BPharm undergraduate students at universities in South Africa.

### 1.3 Significance of the study

Non-adherence to recommended therapy remains a challenge to achieving optimal clinical outcomes with resultant economic implications worldwide, especially in lower to middle-income countries (LMICs) where TB and HIV/AIDs pose a significant challenge. All healthcare professionals, especially pharmacists, have a considerable role to play in addressing the problem of non-adherence.

Identifying the gaps and understanding the current focus on medication adherence in pharmacy education programmes and national policy may help to highlight ways in which the role of pharmacists in promoting medication adherence may be strengthened. Increasing the course content on medication adherence in undergraduate and postgraduate programmes can equip future pharmacists with the skills and knowledge to enhance their ability to encourage and support medication adherence. Further research is required to develop appropriate guidelines for pharmacists and improve pharmacists' quality of education and competencies.

Within this context, this study seeks to understand and describe the extent and nature of the focus on medication adherence in pharmacy education and policy in SA to propose ways to strengthen the pharmacist's role in promoting adherence.

### 1.4 Overview of chapters

The current chapter has introduced the study and described the aim and objectives of the study. Chapter 2 is a literature review that begins with a description of medication adherence and medication non-adherence. The types of non-adherence and the factors determining medication adherence, i.e., patient-related factors, socioeconomic factors, condition-related factors, health system-related factors and therapy-related factors, are discussed. As described in the literature, methods of measuring adherence are also discussed, including the Morisky medication adherence scale, electronic devices, pill counts and other methods. The

pharmacist's role in medication adherence and the services offered are explored as identified by research and described in the literature are reviewed.

Chapter 3 describes the methodological approach used. It provides details of the research design and research process. The two phases employed for the research study are discussed in more detail, i.e., document analysis for phase one and semi-structured interviews for phase two. It provides details of the research setting, study population, sample, data collection and analysis. The chapter ends with providing details for ensuring the trustworthiness of the research process, ethical considerations followed and possible limitations of the study.

Chapter 4 is the results and discussion section. It reports on the findings of each research study phase. The results of the policy document analysis are presented, and pharmacists' critical roles in medication adherence are discussed. Phase two results on teaching medication adherence in the undergraduate pharmacy degree were reported and discussed.

Chapter 5 is the conclusion and recommendation section. It concludes the thesis by reflecting on the study aims and objectives in relation to the findings, explores the practical application of the findings, and provides recommendations for future research.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Medication adherence

Adherence is defined differently by various healthcare providers, and as suggested in Section 1.1, there is no gold standard for defining or measuring this construct. The World Health Organization (WHO) defines adherence as "the extent to which a person's behaviour- taking medication, following a diet and executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider" (WHO, 2003). This definition is consistent with that described by Fox et al. (2018) in Section 1.1 and adopted as a basis for this study. In both these definitions, the focus of adherence is the active and voluntary participation of a patient following all the recommendations and instructions given by a healthcare provider such as a pharmacist (van Driel et al., 2016). The instructions often include the medication's frequency, timing, and dose (Bosworth et al., 2011). Adherence is multi-faceted and is founded upon patients' understanding of the severity of their disease or illness, their belief in the efficacy of a particular treatment, and their ability to control their symptoms by adhering to that particular treatment (Cramer et al., 2008).

Because of a lack of uniformity in how adherence and related concepts are defined and measured in the literature, a multi-pronged approach is often employed. Medication-taking behaviours are often also described using two other terms, i.e., compliance and persistence (Burrell et al., 2005). Compliance is the extent to which patient behaviour corresponds with the prescriber's care plan as determined by the provider alone and indicates patient disobedience when not followed through. Compliance negatively implies that patients are expected to follow doctors' orders passively (Burrell et al., 2005). However, this definition has fallen out of favour due to the implication that the patient is primarily responsible if deemed 'non-compliant' (Hughes, 2004).

Medication persistence promotes adherence and has been defined as continuing one's treatment as per the prescribed treatment duration and guidelines (Bain-Brickley et al., 2011).

In cases of chronic disease, the treatment duration may be months, years, or even the person's lifetime. A patient who is persistent with their prescribed medication regimen is not necessarily adherent (Vrijens et al., 2012). A patient who completes their treatment within the prescribed duration specified by the prescriber would be persistent. However, if the patient's implementation of the treatment regimen varied from the recommendations agreed upon with a healthcare provider during this time, i.e., the dose consumed at the wrong time or the wrong quantity consumed, they would not be adherent (Khan & Aslani, 2020). Adherence is considered a more acceptable term because it recognises the patient's autonomy and requires the patient's agreement to the recommendations given by the healthcare professional (Hughes, 2004).

### 2.1.1 Medication non-adherence

Non-adherence is the patient's deviation from an agreed-upon treatment plan with their healthcare provider (Mohiuddin, 2019). The prevalence of medication non-adherence is challenging to gauge, and it remains an undermanaged problem (Ferdinand, 2017). Patients may be non-adherent during different stages of their treatment. This deviation is observed when patients decide not to fill their prescriptions in a pharmacy, discontinue treatment prematurely, take medications at the wrong time or take more or less than the prescribed dosage (Stavropoulou, 2011). Non-adherence to medication is a complex and multidimensional healthcare problem. Therefore, the WHO recommends that healthcare professionals be trained in adherence assessment as it is a significant public health concern (Gadkari, 2012).

The causes of non-adherence may be related to the patient, treatment, or healthcare provider (Hugtenburg et al., 2013). Patient factors for non-adherence have been attributed to forgetfulness, misconception, and patients' perceived effectiveness of medications. Some patients are unwilling to take their medications due to fear of adverse drug reactions (ADRs). Adverse drug reactions include side effects of medicine, such as hypoglycemia related to antidiabetic agents or diarrhoea associated with metformin (Jose & Bond, 2021). Patients' reasons for non-adherence can be intentional (deliberate) and unintentional (inability of the patient) (Milosavljevic et al., 2018).

There are several types of non-adherence, but the categories are often disputable, and there is a degree of overlap between categories. In this study, non-adherence is categorised as primary, secondary, and tertiary with respect to the intensity at which the patient does not adhere to their medication regimen, as shown in Table 1. Non-adherence is further classified as intentional or unintentional based on the patient’s attitude towards their medication regimen (Vik et al., 2004).

*Table 1: Types of non-adherence (adapted from (Jimmy & Jose, 2011).)*

TYPES OF NON-ADHERENCE	
TYPE	DEFINITION
<b>Primary</b>	The patient does not buy the medication prescribed
<b>Secondary</b>	The patient does not refill the prescription
<b>Tertiary</b>	The patient fills their prescription but does not take the medication as agreed upon with the healthcare provider

As summarised in Table 1, **primary non-adherence** occurs when a new medication is prescribed for a patient, and the patient fails to obtain the medication within an acceptable period after it was initially prescribed. Providers write prescriptions, but the patient never presents the prescription at a pharmacy to be filled or initiated. This can also be known as non-fulfilment of adherence (Vik et al., 2004).

**Secondary non-adherence** occurs when a patient fills or refills their prescription but does not take the medication as it was prescribed, leading to non-persistence adherence. With this type of non-adherence, the patient decides to stop taking medicines after starting it without being advised by a healthcare professional. Non-persistence is rarely intentional and happens when patients and providers misunderstand therapeutic plans (Jimmy & Jose, 2011).

**Tertiary non-adherence** occurs when a patient's prescription is filled, but the patient then follows their own regimen or an irregular medication intake, leading to non-conforming

adherence. Tertiary non-adherence includes a variety of ways in which medicines are not taken as prescribed; this behaviour can range from skipping doses to taking drugs at incorrect times or incorrect doses to even taking more or less than prescribed. Failure at one or more of these junctures potentially has dire health consequences for patients (Cutler & Everett, 2010).

In all non-adherence classes or categories, the patient's attitude towards their medication regimen can be intentional or unintentional. **Unintentional non-adherence** arises from a lack of capacity and or resource limitations. Such limitations prevent patients from implementing their decisions to follow treatment recommendations; for example, problems with accessing prescriptions, cost, competing demands, and polypharmacy. Sometimes individual constraints (e.g., poor inhaler technique, problems remembering doses etc.), poor communication between patient and provider, and lack of knowledge on how to use medicines can lead to unintentional non-adherence (Gatti et al., 2009; Hugtenburg et al., 2013).

On the other hand, **intentional non-adherence** more often arises from the beliefs, attitudes and expectations that influence patients' motivation to begin and persist with the treatment regimen (Horne, 2005). Deliberate non-adherence is when patients consciously decide not to follow their treatment recommendations. Intentional non-adherence often reflects a rational decision-making process in which the patient weighs their treatment's perceived advantages and disadvantages but may suggest ignorance of its value. Taking certain medications, e.g., ARVs and antidepressants, can be stigmatising and a daily reminder to the patient of their disease state (Atkins & Fallowfield, 2006; Kane, 2013).

Non-adherence to a therapeutic regimen may result in adverse patient outcomes and is associated with treatment inefficacy, increased patient morbidity and mortality, and healthcare costs (Hughes, 2004). The problems of non-adherence are more evident in specific populations, notably those with multiple morbidities and co-morbidities, which in turn require the management of numerous medicines. It is estimated that 50% of patients with chronic diseases or illnesses are non-adherent to their medication regimen (Ipingbemi et al., 2021).

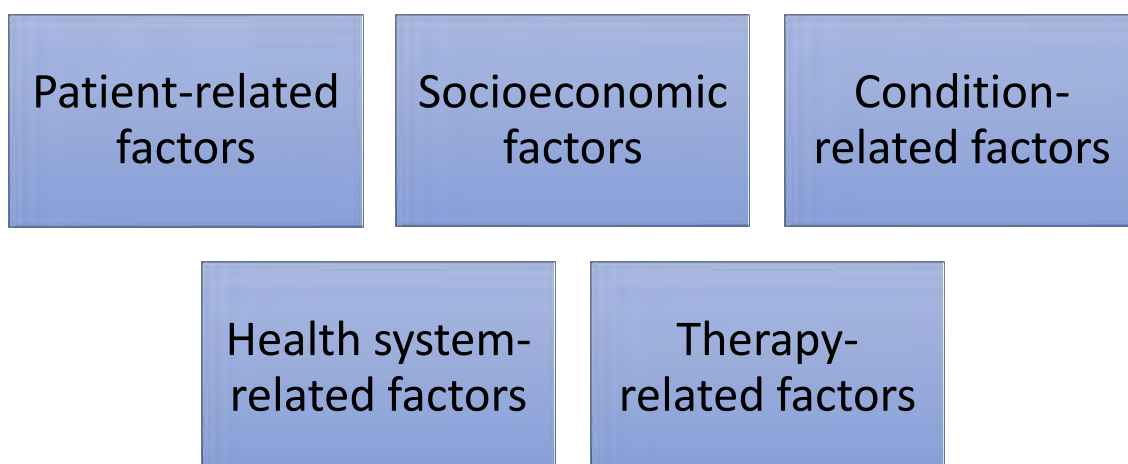
The underuse of medicines deprives the patient of the anticipated therapeutic benefits and may worsen the condition for which they are being treated. The underuse of anti-hypertensive medication is associated with hospitalisation. Medication overuse increases the risk of adverse drug reactions (ADRs); e.g., overuse of anti-migraine drugs has been reported to cause medication overuse headaches (MOH) (Mohiuddin, 2019).

An ADR is a harmful or unpleasant reaction resulting from an intervention related to medicinal product use. Adverse effects usually predict hazards from future administration and ensure the prevention of specific treatment, dosage regimen alteration, and product withdrawal. Medicine safety relies on pharmacists and other healthcare professionals being alert to possible ADRs, working with patients to optimise medicine use, and exercising vigilance in reporting ADRs (Coleman, 2016).

## 2.2 Factors that determine medication adherence

Adherence is a multidimensional phenomenon determined by the interplay of five factors: patient-related factors, socioeconomic factors, condition-related factors, health system-related factors, and therapy-related factors, summarised in Figure 1 (WHO, 2003).

*Figure 1: Factors affecting medication adherence (adapted from WHO, 2003)*



### 2.2.1 Patient-related factors

There are multiple patient-related factors associated with poor medication adherence, including patient demographics, physical and mental function, substance abuse, health beliefs, depression, and stigma (Konkle-Parker et al., 2008).

Demographic factors associated with poor medication adherence include illiteracy, i.e., inability to read instruction aids on medication. Patient location can also contribute to non-adherence. At times patients travel outside their place of regular treatment without their health passports, and refilling their prescriptions becomes a challenge leading to **secondary non-adherence**. A health passport or transfer letter is a pre-requisite for receiving treatment in health facilities in SA (Maqutu et al., 2010).

Some patients may prefer traditional spiritual healing over conventional western treatment. Some may stop taking their medications because their pastors claim to have healed them, which is **intentional non-adherence** (Heunis, 2011).

Although also related to the nature of the condition, patients with chronic conditions like TB and HIV often experience stigmas. Stigma can lead to the patients not wanting to be seen by other patients or even healthcare providers at local clinics in their community because of the fear that others might gossip about their status and condition. Such experiences have led to some patients hiding their status and health conditions from their loved ones, family, and employers, causing adherence challenges through a lack of support. Patients sometimes blame themselves for their health status and feel helpless and hopeless (Bogart et al., 2013; Kastien-Hilka et al., 2016)

Clinic schedules sometimes interfere with patients' work schedules making clinic attendance and the collection of medicines very difficult, leading to **secondary non-adherence**. Missed clinic appointments represent crucial medical and economic issues (Chariatte, 2007). In a study by Talem (2008), the most common reason cited by patients for missed scheduled clinic appointments was forgetfulness. While patients in the private healthcare sector can change appointment dates and even get dates to suit them, it's not like that in the public healthcare sector leading to patient dissatisfaction and medication non-adherence. Other reasons



provided by patients for missing their clinic appointments were; being away from home, being too busy, and feeling sick (Talam, 2008).

Patients are responsible for remembering their clinic appointments, taking their medications, and making lifestyle changes to accommodate their medications. Changing patient behaviour through education and reminders can improve medication adherence (Bogart et al., 2013).

Abuse of alcohol and illicit drugs makes patients forget to take their medication, especially during the festive season and is associated with **unintentional non-adherence**. Some medicines interact with alcohol, causing headaches, nausea, vomiting, fainting and dizziness, which may lead to patients being non-adherent to their medications (Konkle-Parker et al., 2008).

Physical impairment and cognitive limitations increase the risk of non-adherence, especially in older patients; they tend to have memory problems and may not remember to take their medication leading to **unintentional non-adherence** (Fatti et al., 2016). However, by contrast, a study conducted by Yu et al. (2018) found that patients over 60 had higher adherence levels than those under 60. The researchers attributed this to the over-60 age group being more aware of the consequences of non-adherence and more fearful of hospitalisation and relapse due to previous experiences. This group of patients tend to be more knowledgeable and possess greater insight concerning their medication as they have had a long experience with the condition.

Among factors related to disease and treatment perceptions, misconceptions about treatment and the lack of perceived benefit of therapy have been shown to reduce medication adherence, and this is caused by a lack of knowledge about the disease, lack of motivation and the reasons why the medication is needed (Gast & Mathes, 2019; Gellad, 2009).

### 2.2.2 Socioeconomic factors

Social determinants of health are the conditions in which people are born, grow, live, work, and age. Economic factors (affordability), such as higher treatment costs, are associated with

poor medication adherence. When treatment costs are high, patients often cannot afford their treatment leading to **primary non-adherence**. Similarly, living far from the healthcare facility may incur transport expenses, which may make other patients unable to go to healthcare facilities to collect their medications, leading to **primary non-adherence and secondary non-adherence** (Kastien-Hilka et al., 2016; Yeam et al., 2018).

The age group and living conditions of patients impact medication adherence. In a study conducted by Yeam et al. (2018), they looked at adolescents transitioning from the care provided by parents to self-care. The study showed that adolescents living in a stable and supportive environment show better adherence to medical treatment than adolescents growing up in an atmosphere of family conflict and lack of family cohesion. Thus suggesting that medication adherence is impacted by social factors such as family support and stability.

Other socioeconomic factors impacting medication adherence include lower education, i.e. illiteracy, lower-income level, staying alone, culture, unemployment, retirement, family dysfunction, low income, family and social support, type of occupation and lifestyle factors such as smoking, drinking, prostitution and illicit drug use (Makanjuola et al., 2014).

### 2.2.3 Condition-related factors

Condition-related factors represent specific illness-related demands faced by patients, i.e., rate of progression and severity of disease, the severity of the symptoms, level of disability (physical, social, and psychological) and the availability of effective treatment (Kvarnstrom et al., 2021). Co-morbidities, e.g., depression in conditions like HIV/AIDS and drug and alcohol abuse, can also significantly impact adherence behaviour (Sabaté & World Health Organization, 2003). Psychiatric co-morbidities may increase the distress of physical illness, thereby prolonging recovery time and leading to poor medication adherence (Kastien-Hilka et al., 2016).

Medication adherence plays an essential role in slowing the progression of chronic kidney disease (CKD); however, in a study conducted by Seng et al. (2020) on the factors affecting medication adherence among pre-dialysis chronic kidney disease patients, it was found that

more severe CKD was linked with poor medication adherence. The comorbidity factors associated with low medication adherence included metabolic diseases such as hypertension and psychiatric conditions such as depression.

Rheumatic disorders can often be complex and require that patients take multiple medications throughout the day for the rest of their lives. The prolonged and complex regimens can potentially be a source of **tertiary non-adherence** in patients with such disorders (Ismail et al., 2017). Similarly, diabetic patients with other concomitant diseases require several drugs to achieve glycaemic goals and clinical targets. The complex regimens often needed to gain the desired glycaemic control pose a challenge for patients. Non-adherence to diabetes treatment leads to poor glucose control and increases the risk of disease complications (Sunanda, 2015).

Adherence rates are generally higher among patients with acute conditions as compared to those with chronic illnesses due to the long-term use of medicines and inevitable polypharmacy associated with chronic conditions (Ismail et al., 2017).

#### 2.2.4 Therapy-related factors

Therapy-related factors including previous treatment failures, the complexity of the medication regimen, which consists of the number of concurrent medications and the number of daily doses required, duration of therapy, the incidence of side effects and frequent changes in treatment, lack of immediate benefit of treatment, therapies that are inconvenient or interfere with a person's lifestyle; and medications with a social stigma attached to its use can be associated with decreased adherence (Adeniyi et al., 2018; Krueger, 2005).

Medications such as antidepressants are slow to produce effects, and patients may believe the medicine is not working and may stop taking it, leading to secondary non-adherence. Non-adherence to antidepressants results in significantly poorer clinical outcomes, such as the increased risk of relapse and hospitalisation and increased depression severity (Ho et al., 2016).

Medication adherence is a challenge that requires the mastery of specific techniques, as with injections and inhalers (Tabor, 2004). Inadequate training in inhaler use predisposes patients toward poor inhaler technique leading to **unintentional non-adherence**. Poor inhaler technique and non-adherence to therapy result in the loss of clinical efficacy and the wastage of economic resources (Newman, 2017).

Medication side effects can decrease adherence if patients believe they cannot control or manage them. Patients mostly experience side effects from chronic medications like antiretroviral treatment. Common side effects include body weakness, insomnia, hallucinations, nausea, vomiting, dizziness, and rashes—expensive drugs requiring large out-of-pocket payments can lead to **primary non-adherence**. (Maqutu et al., 2010; Tabor, 2004).

### 2.2.5 Health system-related factors

The Department of Health administers healthcare in SA which currently does not have a universal healthcare system. There are two parallel systems, i.e., a private healthcare system and a public healthcare system which operate in tandem with one another. Most South Africans depend on the public health sector for their healthcare needs. The public hospitals in South Africa are underfunded and understaffed, leading to job dissatisfaction among the healthcare workers and affecting the running of the healthcare facility. Patients get frustrated by long waiting times, lack of privacy, and severe overcrowding. Due to this, some patients end up not getting their medications or refilling their prescriptions leading to **primary non-adherence**. (Coovadia et al., 2009).

The public healthcare system does not have adequate resources. As such, equipment is not updated, competitive wages cannot be paid to keep top doctors working locally and stocking the pharmacies with medication is a challenge. When pharmacies are not stocked up or understocked, it affects drug supply and management. Pharmacists play a role in the constant and continuous supply of medicine to ensure that adequate supplies of appropriate medications are always available in the pharmacy. The unavailability of medicines affects adherence. (Coovadia et al., 2009; Marais & Petersen, 2015)

Other healthcare system-related factors include access difficulties, i.e., the distance patients cover to get to the healthcare facility. When the distance covered by patients is far, it causes patients to be inconsistent with their clinic appointments and collecting their medications leading to **secondary non-adherence**. Short consultations conducted by HCP for patients make detecting non-adherence difficult because less time is taken to assess the patient's medication-taking behaviour and knowledge of their condition and medication. Patient and HCP interaction is critical and aids in adherence: poor communication, lack of patient education and clear instructions regarding medicine taking can lead to non-adherence. (Abera Abaerei et al., 2017; Uwimana et al., 2012).

### 2.3 Measuring adherence

The measurement of medication adherence is essential in both clinical practice and research settings. In clinical practice, accurate measurement of patient medication administration enables healthcare providers to evaluate clinical outcomes more accurately. In research settings, accurate medication adherence assessment leads to conclusive data about the intervention's efficacy (Park et al., 2015).

Several methods of measuring adherence are identified in the medical literature and deserve mention. Methods of measuring adherence can be classified as direct and indirect methods. Direct methods include directly observed therapy (DOT), measurement of drug concentration in blood, and measurement of the biological marker in the body. Indirect methods include patient self-report, pharmacy fill data, electronic medication monitoring, pill counts and assessment of patient's clinical response (Pednekar et al., 2019). Direct methods are accurate but costly and invasive, whereas indirect methods are inexpensive and non-invasive but overestimate adherence. Indirect methods are the most used to deduce non-adherence, and the Morisky Medication Adherence Scale (MMAS) is the popular measure of adherence (Anghel et al., 2019).

### 2.3.1 Morisky Medication Adherence Scale

One of the most used measures is the Morisky Medication Adherence Scale (MMAS). The MMAS was developed as a four-item scale in 1986, more than 36 years ago and is still used to predict adherence to blood-pressure medications among outpatients. It was designed to distinguish poorly adherent patients from those with medium to high adherence to their antihypertensive regimen. It was subsequently adapted into an eight-item scale in 2008. The four-item scale contained dichotomous response categories with yes or no answers. It consists of questions addressing multiple reasons for non-adherence, as shown in Figure 2. Each question measures a specific medication-taking behaviour rather than adherence behaviour to avoid bias of patients giving positive answers to please their HCP and appearing adherent. (Tan, 2014)

Figure 2: The Eight Item Morisky Medication Adherence Scale (adapted from (De Las Cuevas & Penate, 2015))

	YES	NO
1. Do you sometimes forget to take your medication?		
2. People sometimes miss taking their medications for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medication?		
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took it?		
4. When you travel or leave home, do you sometimes forget to bring your medication?		
5. Did you take all your medication yesterday?		
6. When you feel like your symptoms are under control, do you sometimes stop taking your medication?		
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
8. How often do you have difficulty remembering to take all your medication? Never/Rarely..... Once in a while..... Sometimes..... Usually..... All the time.....		

In the eight-item scale, the first seven items are dichotomous response categories with yes or no answers. The last item is a five-point Likert response which consists of two extreme sides and a neutral option linked to the middle answer options. Patients scoring higher on the scale

are evaluated as more adherent. When they score lower on the scale, they are presumed to struggle with non-adherence. By understanding how the patient scored on the scale, clinicians and health organisations can identify underlying issues that prevent patients from taking their medications correctly. (Moon et al., 2017)

The eight-item MMAS, as compared to the four-item MMAS, tries to identify and address the circumstances or situations related to adherence and has better psychometric properties, i.e., sensitivity and specificity. MMAS-4 and MMAS-8 can be used in different diseases, populations, and countries. Use of the tool results in a higher degree of concordance with pharmacy fill data and fewer items resulting in less response burden. MMAS-4 and MMAS-8 are reasonable estimates of patient medication-taking behaviour but not good explanatory tools for determining why those patients are not adherent. This leads to a poor relationship between the Morisky scale and objective clinical outcome measures. (Moon et al., 2017; Tan, 2014)

Two other scales are the 14-item Hill-Bone Compliance Scale, also developed for hypertension medications, and the 32-item Medication Adherence Scale used in congestive heart failure (Wu et al., 2008). Aside from these validated scales, many studies use one-, two- or three-item questions to assess medication adherence, such as reporting whether patients ever forget to take their medicines or take less than the prescribed amount of their medication in a certain period. Measures which depend on self-reporting often suffer from recall bias and overestimated adherence. (Burnier & Egan, 2019).

### 2.3.2 Electronic devices

Electronic measures are the only measures which allow health professionals and researchers to measure medication adherence longitudinally, in real-time, providing a detailed dose-by-dose description for a patient (Lehmann et al., 2013). Electronic devices to monitor medication adherence consist of Medication Events Monitoring System (MEMS) and similar devices used with eye droppers in glaucoma or inhalers in asthma, which electronically record the date and time when patients open a pill bottle or use an inhaler. A MEMS is a computerised monitoring system with a computer chip inside a pill bottle. The computer chip

measures the date and time the bottle was opened, and this information is downloaded to a computer using a MEMS reader. The MEMS reader is a small device that serves as a platform to transmit data from the cap to the computer. This data can be repeated and compared over time. (Park et al., 2015)

Electronic measures allow changes in adherence with time to be evaluated, providing a method to describe longitudinal behaviour and identify trigger factors contributing to non-adherence. The data collected is helpful for the patient and can give feedback to the patient regarding their medication-taking behaviour (Krummenacher et al., 2011). Healthcare providers must get informed consent from the patient for their active participation. Healthcare providers must reinforce the significance of collecting quality data by advising patients to swallow the medication immediately after opening the vial (Bruin, 2005).

The data collected through electronic monitoring is better reconciled with pill counts and structured patient interviews. Pill counts allow the healthcare provider to verify whether there is an essential discrepancy with electronically measured adherence rates. In contrast, structured interviews will enable the healthcare provider to explore patients' opinions on adherence before reading the results of the electronic measure with the patient. (Lehmann et al., 2013)

But unfortunately, there are no means of registering whether the patient would have taken their medication on all the occasions they opened the bottle cap. These devices are accurate but expensive and limited in what they can measure, i.e., patients can unlock the device but may not necessarily consume the medication. (Cross et al., 2020; Kauppi et al., 2014)

### 2.3.3 Pill counts

Pill counts are another method of objectively measuring the extent of medication adherence, but pill counts are laborious. Patients bring their medicine bottles each visit, and the healthcare provider counts the remaining tablets or capsules. Pill counts are limited in that the use of medicines is assumed if not counted in the bottle. The technique can overestimate



adherence and gives no information about the timing or pattern of doses taken. Patients may fail to have all their medicines with them at the time of the count. (De Geest & Sabaté, 2016)

To resolve the limitations posed by pill counts conducted in the pharmacy, Bangsberg and his colleagues developed a home-based pill-counting procedure (Giordano et al., 2004). Healthcare providers use telephone calls to conduct unannounced pill counts in patients' homes at undisclosed times to count their medicines. The limitation of the unannounced telephone-based pill count is that it relies on patients to count their medications, leading to bias as patients would want to appear adherent. Unannounced telephone calls are followed up by unannounced home visits where possible. Unannounced telephone-based pill counts offer an economically and logistically feasible objective method for monitoring medication adherence. (Kalichman et al., 2007)

#### 2.3.4 Other methods used in measuring adherence

Another commonly used method to measure adherence uses administrative databases from pharmacies or health plans to capture the amount of medication patients obtain. This method has the advantage of being objective and providing information over a considerable period. The disadvantage is that it only includes what is in the database. If patients fill their prescriptions by mail, at another pharmacy, or another health plan or receive samples, these fills will not be captured. (Wang et al., 2004)

Self-report methods are inexpensive and quick, allowing healthcare providers to understand patients' perspectives on non-adherence (Mannheimer et al., 2006). Self-report methods have the potential to measure both medicine-taking behaviours and identify barriers to adherence. There are three general types of self-report measures: 1) general adherence tendencies; 2) medicine-taking habits; 3) specific quantities of pills taken over an identified period expressed as a proportion of the number of pills prescribed (number of pills taken (PT)/number of pills prescribed (PP)). (Jerant, 2008)

Similar self-report methods, such as the Morisky Medication Adherence Scale, are subject to a host of confounding factors, such as recall bias, which could result in overestimating

adherence. Patients may also feel pressured to deliver acceptable responses to elicit a positive reaction from their healthcare provider (Gellad, 2009). These factors can potentially interfere with the confirmability of the test and skew non-adherence rates. Because the tool is not invasive compared to direct monitoring of medicine levels, it can provide a more convenient way to obtain real-time adherence information (Tan, 2014). Understanding a specific situation's psychometric properties (specificity and sensitivity) is essential before choosing which instrument to measure medication adherence (Park et al., 2015).

In Directly Observed Therapy (DOT), a patient is monitored while taking their medication by an observer (health care provider or a trained and supervised community member) who makes sure that the patient swallows their pill. The observer ensures that the patient takes the correct medication in the proper doses and at the right time intervals. DOT is a strategy endorsed by the WHO to improve adherence to tuberculosis treatment worldwide. DOT is also utilised in ART treatment. (Cross et al., 2020; Liu et al., 2014)

Therapeutic Drug Monitoring (TDM) involves measuring drug levels in the blood to measure medication adherence. In ART, its use is limited to protease inhibitor classes. This method is costly, especially in developing countries and is not used regularly. Biomarkers may be used to monitor adherence by adding secondary non-toxic medicines to indicate that active primary medications were taken. Similar to TDM, biomarkers are also costly to operate. (Steel, 2007)

## 2.4 Pharmacists' role in medication adherence

A WHO consultative group developed the concept of "the seven-star pharmacist," a benchmark for pharmacists to provide high-quality pharmaceutical care to patients. The concept suggests that the well-rounded pharmacist should be a compassionate caregiver, decision-maker, active communicator, lifelong learner and a good manager and possess the qualities of a good leader, teacher and researcher. (WHO, 1997) It was expanded to "nine-star pharmacists", with the addition of pharmacists being researchers and entrepreneurs (pharmapreneurs) (Sam & Parasuraman, 2015).

According to the Good Pharmacy Practice (GPP), pharmacists' scope of practice includes providing pharmaceutical care by taking responsibility for the patient's medicine-related needs and being accountable for meeting those needs (SAPC, 2008b). Pharmacists are responsible for providing pharmaceutical care to improve patient's quality of life; this involves a) identifying potential and actual drug-related problems, b) resolving actual drug-related problems, and c) preventing potential drug-related problems (Hepler, 2004).

Pharmaceutical care is a patient-centred, outcomes-oriented pharmacy practice. Pharmaceutical care entails the pharmacist working hand in hand with the patient and the patient's other healthcare providers to promote health, prevent disease, and assess, monitor, initiate and modify medication use to ascertain that medicine regimens are safe and effective (Allemann et al., 2014).

In a patient-centred approach, pharmacists actively seek feedback regarding their medicines, which could be the side effects and adverse effects the patients experience after taking their medication. Then, appropriate interventions are determined (Horvat & Kos, 2011). This approach supports patient familiarity with their medicines and medication adherence. It also allows extensive collaboration with other healthcare providers to promote medication adherence, including referrals (Leat et al., 2014).

Pharmacists in many chronic opioid therapy treatment agreements are described "as the gatekeepers" to the agreement's effectiveness. Pharmacists are accountable for ensuring that patients abide by the treatment agreement. They notify patients' prescribers of any potential aberrant drug-related behaviour or whether they could be receiving opioids from other prescribers or pharmacies. They encourage patients only to use one pharmacy for their chronic opioids to reduce the risk of overdose or death by combining drugs that interact with their current medications. (Craig, 2012)

Pharmacists have an essential role in medication adherence through their comprehensive disease prevention and management knowledge. They offer opportunistic screening, refer individuals at risk to their general practitioners, and provide ongoing support and

management services to patients with chronic conditions such as asthma and coronary obstructive pulmonary disease (COPD). (Fathima, 2013)

Pharmacists are positioned within the primary healthcare system to provide pharmaceutical care interventions (Kautzky, 2008). Pharmaceutical care motivates patients to get familiar with their medication regimens, making it easier to understand the importance of adhering to them. In addition, pharmaceutical care services provide interventions (patient care process) to prevent and treat different conditions (Molino et al., 2017). The pharmacists' patient care process includes ensuring medicines are appropriately indicated, safe, effective, and convenient for the patient to take as intended. It consists of a five-step process: Collect, Assess, Plan, Implement, and Follow-up; Monitor and Evaluate, with ongoing communication, documentation, and collaboration linking the steps throughout the process (Kennie-Kaulbach, 2012).

Pharmacists can make a significant impact on the care of patients and health promotion through medication adherence. But to do this, pharmacists must clearly define and understand roles and responsibilities within a healthcare team, develop interprofessional relationships, take responsibility for patient outcomes, continuously learn and improve on professional skills, and become indispensable members of the healthcare professional team (Mes et al., 2018).

As the medication expert in the healthcare team, pharmacists must actively and effectively monitor and promote medication adherence and persistence in therapy. Pharmacists must have the appropriate skills and knowledge and be supported by the healthcare system at a policy and practice level (Marie-Schneider & Aslani, 2010).

## 2.5 Research on medication adherence

Between 2008 and 2010, an international series of narrative, peer-reviewed articles were published on pharmacists' activities in medication adherence focusing mainly on areas of the education they receive, their practice, the research conducted and national or local policies. Several researchers who were experts in the field of medication adherence were invited to

the scientific meeting of the Global Research Institute in Pharmacy Practice (GRIPP) in 2007 in Switzerland. The meeting brought about the idea for the series to be formulated. A summary of the series concluded that:

There is a need to implement global and long-term objectives focussing on enhancing the quality of education and competencies of [community] pharmacists and the research conducted in medication adherence to develop guidelines for pharmacists and enhance the uptake of adherence promoting services in routine care (Schneider & Aslani, 2010).

In this section, some of the available literature relating to medication adherence research will be reviewed. It will include research on the causes of medication non-adherence, and because it is a topical issue in South Africa, there will be a focus on non-adherence to ART. Research relating to interventions and programs to promote adherence will also be reviewed.

### 2.5.1 Interventions and programs to promote medication adherence

A review of a study conducted by Bosworth et al. (2011) sought to understand the barriers to medicine non-adherence and the methods of overcoming them. Common obstacles and their evidence-based interventions were highlighted. For instance, in low health literacy contexts, pharmacists used teach-back methods. In addition, pictograms and providing instructions to a person to support the patient were also undertaken. Clinical strategies were put in place in instances of adverse effects and serious complications. These included: alteration of medication choice, modification of the dose regimen, and discontinuation of the medication (Bosworth et al., 2011).

The international perspective paper by Marie-Schneider and Aslani (2010) summarised eight reviews, i.e. series of narrative, peer-reviewed articles published in Pharmacy Practice editorial between 2008 and 2010. The investigated interventions were informational, behavioural and, in some instances, both. Informational interventions included the provision of general or tailored information. Behavioural interventions included reminders, dose administration aids and other complex programs. The interventions' impact was evaluated by

adherence measures such as dispensing records, Morisky Scale and Medication Event Monitoring System (MEMS) (Haugbolle & Herborg, 2009; Marie-Schneider & Aslani, 2010). Internationally, pharmacists are being educated on medication adherence and the skills and knowledge required to identify, monitor and support patient adherence to therapy. However, there is scope to increase the course content on medication adherence and highlight the global and significant impact of non-adherence to equip future pharmacists to deliver these services regularly and to all patients (Fikri-Benbrahim, 2009).

It was documented that Danish pharmaceutical education and research have focused intensely on treatment adherence for over three decades. Adherence initiatives in Danish community pharmacies have developed substantially in the past five to ten years (Haugbolle & Herborg, 2009). In community pharmacies in England, current policy and funding arrangements suggest significant scope for pharmacists to support patients with medication adherence. Further research is necessary to identify the most useful, cost-effective and sustainable approach in practice (Clifford, 2010). Several changes in pharmacy practice and national legislation have allowed pharmacists to intervene and monitor medication adherence in the US. Some of these changes have involved using technologies and providing specialised services to improve adherence (Rickles et al., 2010).

Adherence practice in community pharmacies has focused on medication counselling and programs specific to disease states. Medication adherence is a topic integrated into courses for Bachelor's and Master's level pharmacy students in Finland (Bell, 2010). Pharmacists in Switzerland have been actively involved in medication adherence research since the mid-'90s. Specific medication adherence courses have entered the curriculum of pharmacy schools, and policies in Switzerland are slowly beginning to meet the needs of chronic patients by introducing pharmaceutical cognitive services and reimbursement fees (Marie-Schneider & Aslani, 2010). Australian pharmacy schools are educating cohorts of students who will have the skills to monitor and support patient medication adherence in contemporary pharmacy practice. This is supported by research evidence and government policy and fits nicely into expanding community pharmacy services to include chronic disease state management and primary health care (Aslani, 2009).

Additional studies have demonstrated the benefit of targeted medication adherence interventions. In a study of patients prescribed cholesterol-lowering therapy by Taitel et al. (2012), it was found that patients who met with pharmacists for counselling at the initiation of their drug regimen showed higher medication adherence and refilled their prescriptions faster over 12 months than those patients who did not participate in the intervention program (Taitel et al., 2012)

In a broad systematic review of randomised controlled trials of adherence interventions for patients with cardiovascular disease or diabetes, researchers found that targeted one-on-one interventions in the pharmacy effectively improved adherence (Cutrona, 2010). Pharmacists played a vital role in delivering medication therapy management (MTM) programs, which involved enhanced patient counselling to optimise their therapeutic outcomes (De Santiago et al., 2021).

Comprehensive medication reviews (CMR) were a part of the services provided by pharmacists through the MTM program. When conducting a CMR, patients bring all their medications to the pharmacist for review (including prescription, over-the-counter and even dietary supplements). As a prime function of the CMR, the pharmacist reviews each medicine and ensures the patient takes them appropriately to avoid adverse reactions and promote optimal outcomes (Oji et al., 2016). An essential element of CMR is the communication of any potential issues or recommended modifications to medicine therapy between the pharmacist and the patient's prescriber to ensure the coordination of care for the patient (De Santiago et al., 2021; Oji et al., 2016).

A study compared medicine therapy outcomes between Medicare patients diagnosed with chronic heart failure or chronic obstructive pulmonary disease who received MTM services and those who did not. Researchers found that beneficiaries receiving MTM had higher odds of adhering to their medications than those not receiving MTM. Furthermore, improved adherence was most significant among the MTM beneficiaries who received a CMR as their pharmacy services. (Marrufo, 2013)

## 2.5.2 Research related to the role of the pharmacist in promoting adherence

In a study conducted by Rattine-Flaherty and Burton (2021) on the role of pharmacy personnel in promoting adherence to antiretroviral therapy in the Eastern Cape, it was found that functional technology and increased language and cultural training could enhance interactions with patients. In this study, pharmacy personnel were frustrated that their primary responsibility to counsel patients and provide care was overrun by other duties they had, e.g., stock management. The participants felt that this impacted patient health outcomes. It was noted that administrative policies and priorities were made without pharmacists and pharmacy personnel being consulted, making them think that important aspects of their work were neglected. However, it was also noted that many pharmacy personnel strived to adapt to their circumstances by utilising open offices for privacy when they were available, scheduling ART patient visits on the slowest days of the week and having fellow patients stand guard to protect the privacy of those at the window, thereby preserving counselling and promoting medication adherence in the face of difficult circumstances. Printing medication labels in multiple languages was beneficial and enhanced patient adherence and reduced waiting times associated with hand-written instructions.

In a study done by Kibicho and Owczarzak (2011) on pharmacists' perspectives on promoting medication adherence among patients with HIV, it was reported that the majority of adherence barriers were patient-specific, therapy-related, and health system-related. Pharmacist interventions included medication-specific education to enhance patient self-efficacy, follow-up calls to monitor adherence, practical and social support to motivate adherence, and patient referrals to other healthcare providers.

Pharmacists help patients understand the importance of adhering to their treatment by using plain language, comparisons and metaphors, and open-ended, patient-centred lines of inquiry to unearth patient understanding and correct misconceptions about drug toxicity before leaving the pharmacy. Existing research supports that becoming more familiar with patients' social and cultural norms builds trust and provides better care. Having more language training in a predominant language of a place helps improve patient relationships and enhance adherence rates (Kibicho & Owczarzak, 2011; Rattine-Flaherty & Burton, 2021).



### 2.5.3 Causes of non-adherence in patients on antiretroviral treatment

According to Stats SA (2020) estimates, the estimated overall HIV prevalence rate was approximately 13% among the South African population. The total number of people living with HIV was estimated at 7.8 million in 2020. The successful implementation of any ART programme depends on effectively controlling the viral load in the treatment population. Treatment success is seriously compromised if adherence is less than 90%, and drug resistance may develop (Bhat et al., 2010).

In a study by Maqutu et al. (2010) on the factors affecting first-month adherence to antiretroviral therapy among HIV-positive adults in SA, forgetfulness was the most frequently mentioned reason for missed doses by patients on highly active antiretroviral therapy (HAART). In rural settings, adherence was found to be significantly lower among patients who were not sources of their household income than patients who were sources of revenue. First-month adherence to HAART decreased with increasing baseline CD4 count, and this happened because patients tended to stop taking their medications once they felt better or their symptoms subsided.

Some patients don't disclose their status because of fear of stigma, which prevents them from confiding in others, leading to a lack of support (Moosa et al., 2019). The stigma they experience is both internal and external. External stigma is outright discrimination enacted by others, and this could be friends, family members and employers. Most patients get shocked upon hearing that they have HIV. Others go into denial because of the fear of others finding out about their status and then being discriminated against in society. Internal stigma is self-blame and self-shame due to feeling responsible for the condition they find themselves in due to poor choices and immoral lifestyles. Social support is essential to enable patients to adhere to their medication. (Bogart et al., 2013; Kagee et al., 2011)

Some ART patients skip their daily doses due to religious ritual observance and believing God has cured them of HIV (Bukonya et al., 2019). A study conducted by Boretzki et al. (2017) found that patient dissatisfaction with regimen complexity, i.e., dosages, administration time intervals, and additional instructions like taking medication on an empty stomach or with a

full glass of water, led to poor adherence. HCP need to address patients' reasons for nonadherent behaviour. The researchers suggested that nonadherent patients have specific reasons for their nonadherent behaviours, which could provide potential starting points for focused counselling and adherence interventions if identified.

## 2.6 Medication adherence services

Pharmacists are consistently ranked among the most trusted healthcare professionals, and research indicates a high level of satisfaction with services provided by community pharmacists. Some core services pharmacists offer include medication review and management, health promotion, vaccination, and counselling services. Pharmacists positively affect adherence through the provision of enhanced services.

(Kelly, 2014)

Pharmacists are well placed to provide information and advice on various health-related topics to a diverse cross-section of the community and population and perform an essential primary healthcare role. The community pharmacy is an accessible public health facility with the leading service offering medication dispensing. (Wilkinson et al., 2016) However, dispensing medication without the proper use and ingestion information can harm patients. Therefore, providing this service with quality for patients is essential to promote the rational use of drugs and adherence.

To conduct proper dispensing, the pharmacist and pharmacy personnel must have sufficient knowledge to guide patients on correctly using their medication, interactions with other drugs and foods, recognising potential adverse reactions, and conditions for storing their medication to preserve the medication quality. Pharmacists and pharmacy personnel must know the legislation related to the medication dispensing process, which aims to guarantee quality service delivery and be able to dispense accordingly. (Freato Goncalves et al., 2020)

## 2.7 Summary of the literature review

The definition of medication adherence is inconsistent throughout the literature, but a specific definition from the WHO has been adopted for this study. There is no gold standard for measuring adherence, and many methods are used. These methods are categorised into two, i.e., direct and indirect ways. Indirect methods are the most used because of their convenience and inexpensiveness. Such techniques include pill counts, patient self-reporting and electronic medication monitoring. Factors determining medication adherence are multi-faceted and include patient-related, socioeconomic, condition-related, health system-related and therapy-related aspects. Some research has been conducted on the pharmacist's role in medication adherence, interventions and programs to promote medication adherence, but in SA, this largely focuses on adherence to ARVs and is limited.

## CHAPTER 3

### METHODOLOGY

This chapter explains the methodological approach to this study and details the study process. The reasons for adopting a qualitative approach to understand the issues being researched are explained and justified. This chapter outlines the study's plan, including study setting, study design, population, ethical considerations, data collection and analysis.

#### 3.1 Research design

The methodological approach used was qualitative research. According to Korstjens and Moser (2017) pg271-273, "Qualitative research is defined as the investigation of phenomena, typically in an in-depth and holistic fashion, through the collection of non-narrative materials using a flexible research design". Qualitative research involves collecting and analysing non-numerical data (e.g., text, video, or audio) to understand concepts, opinions, or experiences. Qualitative research gathers in-depth insights into a problem and generates new ideas for research (Merriam & Grenier, 2019). Qualitative research seeks to find the issue of concern in its everyday context through interviews, field observations, accessing text, transcripts of meetings and documents, i.e., books, journals, questionnaire answers, census statistics etc. (Strauss, 1987).

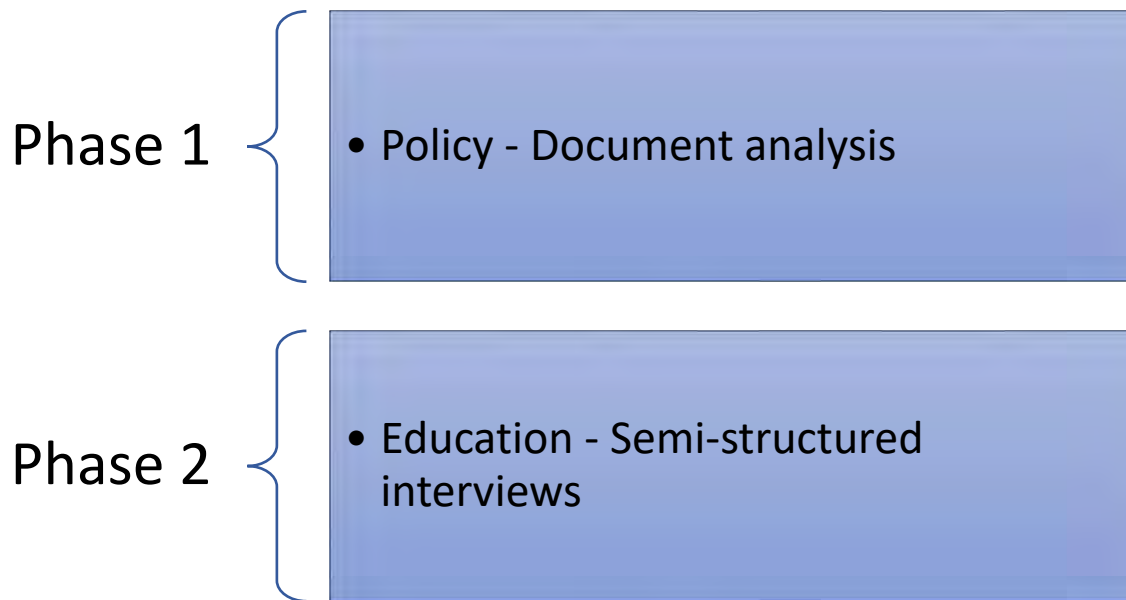
A qualitative approach appeared to be appropriate in a descriptive, exploratory study of this nature – the aim of which is to describe the policy and education related to the pharmacist's role in medication adherence in SA rather than to evaluate or measure anything.

#### 3.2 Research process

A two-phased approach was employed in this research study (Figure 3). **Phase one** included document analysis of policies and official documents relevant to the pharmacist's role in medication adherence in SA. **Phase two** consisted of semi-structured interviews exploring the teaching of medicine adherence at faculties, schools, and pharmacy departments in SA. The

interviews focused on understanding how medication adherence was included and taught in the BPharm curriculum.

Figure 3: The phases of the study



### 3.3 Phase one: Document Analysis

Document analysis is a systematic review or evaluation of printed and electronic documents. The document analysis examined the pharmacists' role in medication adherence as described in national policies and guidelines. The documents included any official printed or electronic documents, policies or guidelines published by any government department or official body such as the South African Pharmacy Council (SAPC) in the last 20 years.

The READ approach described by Bowen (2009) was adopted in the document analysis. READ is an acronym for four steps: (1) **Readying** or preparing materials to be included in the analysis, (2) **Extracting** data, (3) **Analysing** data, and (4) **Distilling** findings.

In **Step 1** – the readying phase, paper-based and electronic national policies and guidelines related to medication adherence were identified. The documents were restricted to the last twenty years (January 2001 till present) except for one document, i.e., National Drug Policy of 1996, and identified by searching national websites and databases. During this phase,

qualitative data analysis software - NVivo<sup>®</sup> - was used to name and store the documents in preparation for the analysis. In **Step 2**: Data from the documents was organised logically using a data extraction tool (see Appendix A); relevant aspects of the documents were also identified and highlighted for inclusion in the analysis using NVivo<sup>®</sup>. In **Step 3** the documents were analysed individually, and specific questions were used in analysing them which included, what is the pharmacist role in supporting medication adherence according to national policies and guidelines? **Step 4**: After the document review, i.e., having reached data saturation, the findings were refined relative to the research objectives (Bowen, 2009; Dalglish et al., 2020).

Data saturation is the collection of qualitative data to the point where a sense of closure is attained. It is reached when no new information emerges in data analysis, and the study would have provided complete information on the research (Moser & Korstjens, 2018). The researcher ensured that further data collection yielded similar results and confirmed what came up and the conclusions already made (Faulkner & Trotter, 2017).

### 3.4 Phase two: Semi-structured interviews

The objective of the study's second phase was to investigate and report on how medication adherence was included and taught to undergraduate pharmacy students in the BPharm degree in South Africa. To this end, semi-structured interviews were conducted with academic staff responsible for teaching medication adherence to BPharm students at universities in SA. The interview questions focused on the inclusion and teaching of medication adherence in the undergraduate Bachelor of Pharmacy (BPharm) curriculum. The scope of the concept of medication adherence was covered, and the teaching methods used were also addressed.

#### 3.4.1 Research Setting and Population

The study occurred in educational institutions in SA that teach undergraduate pharmacy degrees; however, interviews were conducted via Zoom. All nine universities offering the BPharm degree were invited to participate in the study; however, only four institutions accepted the invitation.

All pharmacy practice lecturers in all educational institutions offering undergraduate pharmacy education in SA were eligible for inclusion in the research population.

### 3.4.2 Research Sample

Purposive sampling was used to recruit one or more academic staff members primarily responsible for teaching medication adherence at the pharmacy institutions included in the study. Purposive sampling involves selecting participants based on the researcher's judgment about the most informative potential participants (Korstjens & Moser, 2017). In this research, a lecturer primarily responsible for teaching adherence on a BPharm programme was recognised as being informed on the inclusion and focus of medication adherence in the curriculum of their respective pharmacy institutions. After obtaining gatekeeper permission from the relevant University authorities, suitable participants for the study were identified or invited to participate by the Deans or Heads of the Schools or Departments of Pharmacy who were willing to participate in the study. The individuals identified were then approached and invited to participate in the study (Appendix B). If they were willing, they were invited to sign a consent form (Appendix C).

### 3.4.4 Data collection

Data was collected through Zoom-based semi-structured interviews, electronically recorded with the interviewee's permission. The interviews were conducted at a time pre-arranged with the participant. An interview guide for asking questions was used in the interviews (Appendix D), which was given to the participants before the interview to allow them time to prepare their responses. However, the interviewer was free to explore the interviewees' responses and ask questions beyond the interview guide, consistent with the research topic. The interview guide enhanced the issues and questions covered by every participant.

The interview had at least four levels of operation, as described by Kairuz et al. (2007). Before the interview, a preparatory stage involved putting the participant at ease and ensuring they were well-informed about the interview and what it entailed. At the first level, the participant explained their role in teaching medication adherence, the stage in the curriculum at which it is taught and their knowledge about it. At the second level, the interviewee described their

experience teaching medication adherence. The third level was the post-interview stage, in which the researcher transcribed the interview and wrote the report of the interview, reflecting the interview and interpretation. At the fourth level, the interviewer invited the interviewee to review the transcript and report and provided corrections required and further comments (Kairuz et al., 2007).

The interview guide and the interview process were piloted by the researcher on a lecturer not included in the the study. This allowed for adjustments to be made to the improve the clarity of the questions asked and to guage the approximate length of time conducting the interview involved.

### 3.4.5 Data analysis

Thematic analysis was used to analyse the interview transcripts. Thematic analysis identifies patterns or themes within qualitative data to find repeated patterns of meaning (Clarke & Braun, 2014; Braun & Clarke, 2006). A theme is a pattern that highlights something significant about the data (Joffe & Yardley, 2004).

The approach to thematic analysis was a six-phase one described by Braun and Clarke (2006). Step 1: This involved becoming familiar through repeated reading of the data to the point of familiarity with the depth and content of the data. In this case, the data was the transcripts from the interviews conducted. Step 2: After getting acquainted with the data, the data was organised meaningfully and systematically, and initial codes from the data were generated using the qualitative data analysis software - NVivo®. Step 3: The codes were sorted into potential themes, i.e., main themes and sub-themes with the research objectives. Step 4: The themes were reviewed and refined. All the data relevant to each theme was gathered. Step 5: involved the final refinement of the themes and included a clear definition of the themes. Step 6: involved writing up and producing a report. The analysis provided a concise, coherent, logical, non-repetitive, and interesting account of the data across all themes (Braun & Clarke, 2006; Guest et al., 2011).



### 3.5 Ensuring the trustworthiness of the research process

Lincoln and Guba (1985) presented four criteria: credibility, dependability, confirmability, and transferability to develop reliability in qualitative research. In 1994 they added a fifth criterion, authenticity. These five criteria will be used in this research study to ensure the trustworthiness of the process.

**Credibility** refers to the truth of the data, the participant views and the interpretation and representation of them by the researcher. Credibility addresses how closely participants' views match the researcher's presentation of them. **Dependability** refers to the constancy of the data over similar conditions. **Confirmability** refers to the researcher's ability to demonstrate that the data represent the participants' responses, not their biases or viewpoints. **Transferability** refers to findings that can be applied to other settings or groups. **Authenticity** refers to the ability and extent to which the researcher expresses the feelings and emotions of the participant's experiences in a precise manner (Cope, 2014). **Table 2** explains how the researcher ensured Lincoln and Guba's criteria for trustworthiness were achieved in the study.

*Table 2: Provisions made by the researcher in addressing the trustworthiness of the research study*

Quality Criterion	Provision made by the researcher
<b>Credibility</b>	<ul style="list-style-type: none"> <li>• Ensure the participants feel comfortable during the interview and can express their views honestly</li> <li>• The researcher independently reviews the interview transcript</li> <li>• The researcher describes their experiences as a researcher</li> <li>• Verification of research findings with the participants</li> </ul>
<b>Dependability</b>	<ul style="list-style-type: none"> <li>• To ensure replication of the study findings with similar participants in similar conditions is possible, the research process and method were logically recorded in detail to allow the study to be repeated</li> </ul>
<b>Confirmability</b>	<ul style="list-style-type: none"> <li>• Demonstrated that the data represent the participants' responses and not viewpoints of the</li> </ul>

	<p>researcher by describing how conclusions and interpretations were established</p> <ul style="list-style-type: none"> <li>• Detailed methodological description allowing for the integrity of research results to be scrutinised</li> <li>• Recognition of possible shortcomings in the research study's methods and potential effects associated with them were identified</li> <li>• Provision of rich quotes from the participants that depict each emerging theme were provided</li> <li>• Participants were invited to review the transcripts and the interpretations thereof in the report</li> </ul>
<b>Transferability</b>	<ul style="list-style-type: none"> <li>• Provision of background data to establish the context of the study</li> <li>• Provision of sufficient information on the research study process and detailed description so that those who seek to transfer the study findings in their context can assess transferability</li> </ul>
<b>Authenticity</b>	<ul style="list-style-type: none"> <li>• Expression of feelings and emotions experienced by participants and reporting them as quotes</li> </ul>

### 3.6 Ethical considerations

The study was conducted with the research proposal approved by the Faculty of Pharmacy (Appendix E), and the Rhodes University Human Ethics Committee granted ethics approval (Appendix F).

#### 3.6.1 Avoidance of harm

The participants' names were not divulged to anyone other than the researcher and the researcher's supervisor during or after the study. All the information provided and gathered during the interview was only used for research purposes. For reporting purposes, pseudonyms, e.g., "Participant A", was used to protect the participants' identities. No harm was inflicted on the participants because of this study.

### 3.6.2 Voluntary participation

Participants were not induced, persuaded, or coerced into participating in the research. The decision to participate in the study was entirely the participant's and voluntary. Participants were provided with a "Participant Information Sheet" (see Appendix B). This information sheet gave the participants information regarding the study, their rights, and confidentiality. Before, during, and after the study, participants were monitored continually, allowing for withdrawal at any point of the research study process.

### 3.6.3 Informed consent

Participants signed a consent form (see Appendix C) after completing the participant information sheet and their questions answered. The consent form served as the participant's approval to participate in the study and was signed voluntarily. The participant remained with a copy of their signed consent form.

### 3.6.4 Confidentiality and anonymity

All efforts were taken to protect the participants' confidentiality with the data obtained from the participants in Phase 2 of the study. The interview recordings were secured, password-protected, and stored electronically by the Research Supervisor, in a password protected secure Cloud based storage sight supported by the University. The participants signed consent forms were stored in a different file from the recordings in the Cloud based storage. The recordings were destroyed as soon as the transcript was made and verified. For anonymity, no participant-identifying features were attached to the transcripts.

## 3.7 Possible limitations

Due to the global pandemic of COVID-19 virus at the time of the study, conducting face-to-face interviews was a significant challenge. However, with the developments and movement of technology, there were other means of conducting interviews. For this research study, video interviews were conducted via Zoom.

## CHAPTER 4

### RESULTS AND DISCUSSION

This chapter reports on the findings of each research study phase. In Section 4.1, the results of the policy document analysis are presented. Phase 2 results follow this in Section 4.2, which focuses on teaching medication adherence in the undergraduate pharmacy degree. The two sections are summarised in Section 4.3, which concludes the chapter.

#### 4.1 Phase 1 - Document analysis of the pharmacist's role in medication adherence as described in national policies and guidelines

A document analysis of the pharmacist's role in supporting medication adherence as described in national policies and guidelines was conducted. A total of 38 documents were identified (Table 3) and analysed using NVIVO® software according to file classification i.e., guidelines, policy and SAPC documents (Figure 4). Pharmacists were not explicitly named in some manuscripts but generally included as health care professionals/providers and clinicians.

*Table 3: Documents identified for analysis*

<b>Author</b>	<b>Title</b>	<b>Governing body</b>	<b>Year published</b>	<b>Reference</b>
1.National Department of Health	Essential Medicines List	National Department of Health	2017	(NDOH, 2017c)
2.National Department of Health	Strategic Framework Cancer	National Department of Health	2022	(NDOH, 2022)
3.National Department of Health	PHC Standard Treatment Guidelines and Essential Medicines List	National Department of Health	2020	(NDOH, 2020e)

4.National Department of Health	PHC Standard Treatment Guidelines and Essential Medicines List	National Department of Health	2018	(NDOH, 2018c)
5. National Department of Health	Adherence Flip File	National Department of Health	2020	(NDOH, 2020a)
6.National Department of Health	Communicable Diseases Hypertension	National Department of Health	2021	(NDOH, 2021b)
7.National Department of Health	TB	National Department of Health	2021	(NDOH, 2021c)
8.National Department of Health	Clinical Genetics	National Department of Health	2021	(NDOH, 2021a)
9.National Department of Health	Referral Policy for South African Health Services and Referral Implementation Guidelines	National Department of Health	2020	(NDOH, 2020d)
10.National Department of Health	Sexual and Reproductive Health Rights	National Department of Health	2019	(NDOH, 2019b)
11.National Department of Health	HIV/AIDS HIV/AIDS TB Maternal and Child Health Communicable Diseases Primary Health Care Mental Health	National Department of Health	2019	(NDOH, 2019a)
12.National Department of Health	A health promotion tool for health professionals	National Department of Health	2018	(NDOH, 2018b)

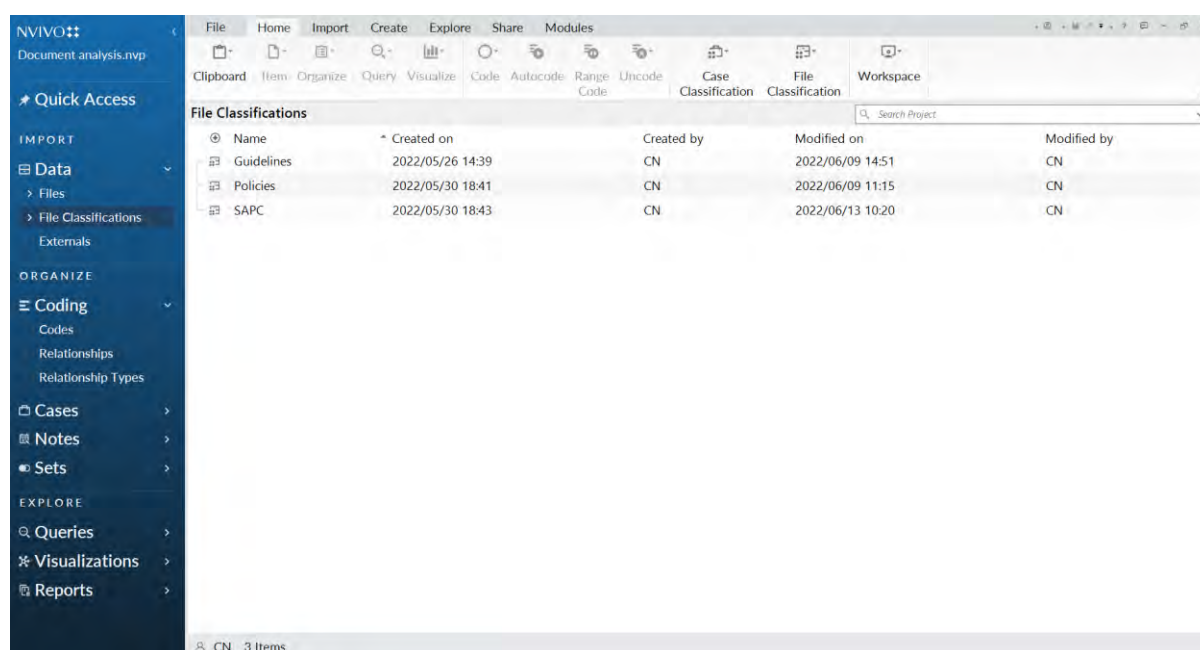
13.National Department of Health	Antimicrobial Resistance	National Department of Health	2018	(NDOH, 2018a)
14.National Department of Health	Integrated Adherence Guidelines	National Department of Health	2016	(NDOH, 2016)
15.National Department of Health	Tuberculosis HIV/AIDS TB Maternal and Child Health Ideal Clinic Primary Health Care	National Department of Health	2014	(NDOH, 2014)
16.National Department of Health	Adult Primary Care	National Department of Health	2013	(NDOH, 2013)
17.National Department of Health	Quality improvement guide	National Department of Health	2012	(NDOH, 2012b)
18.National Department of Health	Management of Drug-Resistant Tuberculosis	National Department of Health	2012	(NDOH, 2012a)
19.National Department of Health	EPI Vaccines Guidelines	National Department of Health	2010	(NDOH, 2010)
20.National Department of Health	Therapeutic Interchange	National Department of Health	2021	(NDOH, 2021d)
21.National Department of Health	National Consolidated Guidelines for the management of HIV	National Department of Health	2020	(NDOH, 2020c)
22.National Department of Health	District Health Planning And Monitoring Framework	National Department of Health	2017	(NDOH, 2017a)

23.National Department of Health	The National Health Promotion Policy and Strategy	National Department of Health	2015	(NDOH, 2015)
24.Government of South Africa	National Drug Policy for South Africa	Government of South Africa	1996	(NDOH, 1996)
25.South African Pharmacy Council	Pharmacy Act (No. 53 OF 1974)	Department of Health	2002	(SAPC, 2002)
26.South African Pharmacy Council	GNR.1158 of 20 November 2000: Regulation relating to the practice of pharmacy	Department of Health	2000	(SAPC, 2000)
27.South African Pharmacy Council	Pharmacy Act (53/1974) (as amended): Rules relating to good pharmacy practice	Department of Health	2019	(SAPC, 2019)
28.South African Pharmacy Council	BN 108 of 24 October 2008: Rules relating to Code of Conduct	South African Pharmacy Council	2008	(SAPC, 2008a)
29.South African Pharmacy Council	BN 241 of 2022: Immunisation and Inject Technique	South African Pharmacy Council	2021	(SAPC, 2021e)
30.South African Pharmacy Council	BN 101 of 2021: Rules Relating to the services to which a Pharmacist may levy a fee	South African Pharmacy Council	2021	(SAPC, 2021b)
31.South African Pharmacy Council	BN 59 of 2018: Competency Standards	South African Pharmacy Council	2018	(SAPC, 2018)

32.South African Pharmacy Council	BN 180 of 2021: Pharmacist Providing Family Planning Services	South African Pharmacy Council	2021	(SAPC, 2021d)
33.South African Pharmacy Council	Pharmacy Act (53/1974), as amended: Primary Care Drug Therapy Pharmacist (PCDT)	South African Pharmacy Council	2021	(SAPC, 2021c)
34.South African Pharmacy Council	BN 74 of 2021: Competency Standard for Pharmacy Support Personnel	South African Pharmacy Council	2021	(SAPC, 2021a)
35. World Bank	Evaluation of the National Adherence Guidelines for Chronic Diseases in South Africa: Healthcare Provider Perspectives on Different Care Models	World Bank	2017	(NDOH, 2017b)
36. National Department of Health	Revised Adherence Guidelines SOPs	National Department of Health	2020	(NDOH, 2020f)
37. National Department of Health	Adherence Guidelines SOPs	National Department of Health	2020	(NDOH, 2020a)
38. South African Pharmacy Council	Good Pharmacy Practice Manual and Associated SAPC rules	South African Pharmacy Council	2008	(SAPC, 2008b)



Figure 4: File classification of documents analysed



The screenshot shows the NVIVO software interface with a table titled 'File Classifications'. The table has columns for Name, Created on, Created by, Modified on, and Modified by. The data rows are as follows:

Name	Created on	Created by	Modified on	Modified by
Guidelines	2022/05/26 14:39	CN	2022/06/09 14:51	CN
Policies	2022/05/30 18:41	CN	2022/06/09 11:15	CN
SAPC	2022/05/30 18:43	CN	2022/06/13 10:20	CN

The analysis of the documents identified key roles of the pharmacist contributing to the promotion of medication adherence. Although not always directly involved with medication adherence, some of the roles identified can be seen as supporting or contributing to adherence indirectly; for example, the pharmacist’s management of drug supply can ensure continuous accessibility to medicines required by a patient to ensure medication adherence. The key roles identified included:

- Drug use, supply and management,
- Therapeutic drug monitoring,
- Pharmacovigilance,
- Pharmaceutical care,
- Dispensing process
- Special programmes like antimicrobial stewardship (AMS), multi-drug resistant tuberculosis (MDR-TB) care and antiretroviral treatment (ARV) and chronic conditions.

These roles are summarised in Table 4.2 and in more detail in Appendix G. The roles are named, and examples of supportive quotes from the documents analysed are provided. In

the table, clarification is also offered as to whether this is a role specific to the pharmacist or a function that can be implied by the broader role of the pharmacist as a healthcare practitioner or clinician. A discussion of each of the roles is provided after that. In the discussion, the documents included in the analysis will be referenced by their Document number provided in Table 4 to indicate that they have been included as part of the document analysis results.

Table 4: Identified pharmacists' roles in medication adherence

ROLE IN MEDICATION ADHERENCE	SPECIFICITY OF THE ROLE	AN EXAMPLE OF A SUPPORTING QUOTE	DOCUMENT, PAGE NO# AND REFERENCE
<b>DRUG USE SUPPLY AND MANAGEMENT</b>			
<b>Constant and continuous supply of medicine</b> - ensure that adequate supplies of appropriate medication are always available	Pharmacist	<i>"the purchasing, acquiring, importing, keeping, possessing, using, releasing, storage, packaging, repackaging, supplying or selling of any medicine or scheduled substance or the supervision thereof."</i>	<b>D26, pg4 (SAPC, 2000)</b>
<b>Medicine distribution and administration</b> - promoting the rational use of drugs. Safe and effective administration of drugs.	Pharmacist	<i>"...special role for pharmacists, particularly in quality assurance and in the safe and effective administration of drugs."</i>	<b>D24, pg19 (NDOH, 1996)</b>
<b>Medicine review and management</b> - confirm patient adherence to a medicine regimen or treatment plan and identify patients requiring additional monitoring. Monitoring, receiving, recording, and reporting quality defects of medicine.	Pharmacist	<i>"Confirm patient adherence to a medicine regimen or treatment plan."</i>	<b>D24, pg19 (NDOH, 1996)</b>
<b>Control over medicines</b> - responsibility to exercise control over all medicinal and related products purchased or supplied. Pharmacists do not purchase, sell, or provide any product where they have any reason to doubt its safety, quality, or efficacy.	Pharmacist	<i>"A pharmacist has a professional responsibility to exercise control over all medicinal and related products, which are purchased or supplied."</i>	<b>D38, pg26 (SAPC, 2008b)</b>
<b>DISPENSING OF MEDICINES</b>			
<b>Phase 1: Interpretation and evaluation of the prescription</b> <ul style="list-style-type: none"> <li>• Assessment of the prescription</li> </ul>	Pharmacist	<i>"The prescription used for the facility must be legally compliant."</i>  <i>"...interpretation of applicable diagnostic and laboratory tests..."</i>	<b>D14, pg93 (NDOH, 2016)</b>

<ul style="list-style-type: none"> <li>• Interpretation of the type of treatment and the prescriber's intention for the patient</li> </ul>	Pharmacist	<i>"Patient prescription should be cancelled on system if patient is no longer stable, needs active management or requires regimen change."</i>	<b>D33, pg4 (SAPC, 2021c)</b>
<ul style="list-style-type: none"> <li>• Identifying problems with the prescription and communicating with the prescriber for a way forward</li> </ul>	Pharmacist		<b>D14, pg94 (NDOH, 2016)</b>
<b>Phase 2: Preparation and labelling of the prescribed medication</b>			
<ul style="list-style-type: none"> <li>• Counting and packing medications</li> </ul>	Pharmacist	<i>"...preparation or packaging of any medicine or scheduled substance...."</i>	<b>D26, pg4 (SAPC, 2000)</b>
<ul style="list-style-type: none"> <li>• Clearly labelling medicine containers</li> </ul>	Pharmacist	<i>"...the repackaging of medicines."</i>	<b>D26, pg5 (SAPC, 2000)</b>
<b>Phase 3: Provision of information and instructions to the patient to ensure the safe and effective use of medicine</b>			
<ul style="list-style-type: none"> <li>• Patient counselling</li> </ul>	Pharmacist	<i>"Counsel patients on the safe and rational use of medicines and medical devices (including selection, use, contraindications, storage, and side effects)"</i>	<b>D31, pg20 (SAPC, 2018)</b>
<ul style="list-style-type: none"> <li>• Monitoring patient outcomes</li> </ul>	Pharmacist	<i>"Identify patients requiring additional monitoring."</i>	<b>D31. Pg22 (SAPC, 2018)</b>
<ul style="list-style-type: none"> <li>• Identifying areas for modification</li> </ul>	Pharmacist	<i>"Confirm patient adherence to a medicine regimen or treatment plan."</i>	<b>D31, pg21 (SAPC, 2018)</b>
<b>THERAPEUTIC DRUG SUPPLY MANAGEMENT</b>			
<b>Therapy decision-making</b> - decision on safe and appropriate therapy	Pharmacist	<i>"...decision on safe and appropriate therapy."</i>	<b>D33, pg4 (SAPC, 2021c)</b>
<b>Therapy monitoring</b> - monitoring of the outcomes of therapy	Pharmacist	<i>"Monitor therapeutic outcomes"</i>	<b>D31, pg23 (SAPC, 2018)</b>

<b>Medication reconciliation</b> – Taking the appropriate action in cases where medication errors are detected	Pharmacist	"...decision on safe and appropriate therapy."	D33, pg4 (SAPC, 2021c)
<b>PHARMACOVIGILANCE</b>			
<b>Managing adverse events</b> - treating adverse events following immunisation and anaphylactic shock	Pharmacist	"...treating of adverse events following immunisation and anaphylactic shock."	D29, pg3 (SAPC, 2021e)
<b>Reporting adverse events</b> - reporting of adverse events following immunisation; recording and reporting adverse drug reactions and events	Pharmacist	"All health care workers, including doctors, dentists, pharmacists, nurses and other health professionals are encouraged to report all suspected adverse reactions to medicines...."	D1, pg609 (NDOH, 2017c)
<b>PHARMACEUTICAL CARE</b>			
<b>Dose adjustment</b> – when necessary, adjust the dose accordingly and change the medication	Healthcare Professional	"If necessary, adjust the dose (e.g., simvastatin, hydrochlorothiazide in liver disease; tenofovir in kidney disease) or change medication (e.g., avoid ibuprofen in hypertension, asthma)"  "...adjustment of ART (where necessary) which has been prescribed previously."	D11, pg6 (NDOH, 2019a)  D30, pg3 (SAPC, 2021b)
<b>Medicine decision-making;</b> safety evaluation of a patient's medicine-related needs by determining the indication, safety, and effectiveness of the therapy	Pharmacist	"...evaluation of a patient's medicine-related needs by determining the indication, safety and effectiveness of the therapy."  "Confirm the patient's diagnosis, that the medication is necessary and that its benefits outweigh the risks."	D30, pg3 (SAPC, 2021b)  D26, pg4 (NDOH, 2018a; SAPC, 2000)
<b>Co-operation with other healthcare professionals</b> – develop and maintain relationships with other healthcare providers and co-operate with them to achieve positive medicine-related health outcomes for patients	Pharmacist	"The pharmacist must endeavour to foster, develop and maintain the role of the pharmacist as a member of the health care team with expertise in medicine-related health outcomes."	D11, pg6 (NDOH, 2019a)
<b>Patient referral</b> - referral to another health care provider where necessary. Where appropriate, refer patients before issuing medications when	Pharmacist	"...referral to another health care provider where necessary."	D38, pg20 (SAPC, 2008b)

issues are identified			
<b>Pharmacist-initiated therapy</b> - discussing the use of appropriate medicines and obtaining consensus from the patient, considering patient preferences, allergies, and medical history	Pharmacist  Healthcare Provider	<i>"Provide prophylaxis / treatment"</i>  <i>Treat as recommended by guidelines for PMTCT."</i>	<b>D29, pg3 (SAPC, 2021e)</b> <b>D8, pg17 (NDOH, 2021a)</b>
<b>SPECIAL PROGRAMMES – ANTIMICROBIAL STEWARDSHIP PROGRAMMES</b>			
<b>AMS Clinician</b>			
<b>Antimicrobial prescription review and use</b> - conduct antibiotic prescription reviews to decide if an antimicrobial is indicated and ensure optimal administration to prevent unnecessary or inappropriate initiation of antibiotics.	Clinician	<i>"Timely antimicrobial initiation"</i>  <i>"Accurate antimicrobial use and allergy history"</i>	<b>D13, pg23 (NDOH, 2018a)</b>  <b>D13, pg23 (NDOH, 2018a)</b>
<b>Drug switch, adjustment, and administration</b> - Ensuring timely antibiotic initiation. Ensure safe medication administration to patients, minimise adverse events, improving clinical outcomes and patient outcomes.	Clinician	<i>"Antimicrobial dosing and de-escalation"</i>  <i>"The prescriber, professional nurse and pharmacist need to check prescription charts with laboratory findings and patient identifiers before administering the antimicrobial."</i>	<b>D13, pg23 (NDOH, 2018a)</b>  <b>D13, pg36 (NDOH, 2018a)</b>
<b>History taking, managing, and reporting adverse events</b> – proper antimicrobial use and allergy history.	Clinician	<i>"Accurate antimicrobial use and allergy history"</i>	<b>D13, pg23 (NDOH, 2018a)</b>
<b>AMS Team</b>			
<b>Medication availability and reconciliation</b> - Ensuring medications are available timeously for administration. Detecting medication errors and	Pharmacist	<i>"Ensuring medications are available timeously for administration."</i>  <i>"Medication reconciliation"</i>	<b>D13, pg23 (NDOH, 2018a)</b>

<p>taking appropriate action to revert and correct them.</p> <p><b>Patient education</b> – providing information on antimicrobial use and resistance. Importance of medication adherence</p> <p><b>Regular chat review</b> – conducting regular and daily chat reviews to ensure timely administration of antibiotics and optimal use of antibiotics.</p> <p><b>Therapeutic drug monitoring</b> - monitoring outcomes of therapy</p>	<p>Pharmacist</p> <p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"Patient education"</i></p> <p><i>"Regular chart reviews and feedback by pharmacist"</i></p> <p><i>"Therapeutic drug monitoring if indicated."</i></p>	<p><b>D13, pg23 (NDOH, 2018a)</b></p> <p><b>D13, pg23 (NDOH, 2018a)</b></p> <p><b>D13, pg23 (NDOH, 2018a)</b></p> <p><b>D13, pg24 (NDOH, 2018a)</b></p>
<b>SPECIAL PROGRAMMES: MDR-TB CARE</b>			
<p><b>Drug storage, monitoring and availability</b> - Constant and continuous supply of drugs – ensure availability of second-line anti-TB and ancillary drugs. Dispatch drugs for patients who have been discharged to local clinics or hospitals</p> <p><b>Drug storage and monitoring</b> – ensure proper storage of the drugs (right conditions away from the sun) and monitoring drug stock levels.</p> <p><b>Pharmacovigilance - Reporting adverse events</b> - recording and reporting adverse drug reactions and events</p>	<p>Pharmacist</p> <p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"Ensure availability of second-line anti-TB and ancillary drugs."</i></p> <p><i>"Ensure correct storage of the drugs."</i></p> <p><i>"All HCWs, including doctors, dentists, pharmacists, nurses and other health professionals are encouraged to report all suspected adverse reactions to medicines (including vaccines, X-ray contrast media, traditional and herbal remedies), especially when the reaction is not in the package insert, potentially serious or clinically significant."</i></p>	<p><b>D18, pg21 (NDOH, 2012a)</b></p> <p><b>D18, pg21 (NDOH, 2012a)</b></p> <p><b>D18, pg129 (NDOH, 2012a, 2020d)</b></p>
<b>SPECIAL PROGRAMMES: ART AND CHRONIC CONDITIONS</b>			

<p><b>Adherence clubs (AC):</b> pre-packing treatment</p>	<p>Pharmacist</p>	<p><i>"First month's supply (of all medicines on the prescription) to be dispensed by the pharmacy at the tertiary and central hospitals."</i></p>	<p><b>D9, pg23 (NDOH, 2020d)</b></p>
<p><b>Enhanced adherence counselling (EAC):</b> counselling patients struggling with adherence and with less optimal outcomes, e.g., high viral load, and monitoring them</p>	<p>Healthcare professional</p>	<p><i>"Required actions would include lifestyle modification, adherence to mutually agreed chronic illness management plans and prescribed medication, and responsible self-management with the support of various health professionals."</i></p>	<p><b>D16, pg7 (NDOH, 2013)</b></p>
<p><b>Central Chronic Medicine Dispensing and Distribution:</b> activating stable patients on CCMDD, dispensing the 1st supply of medicine to patients and co-operating with CCMDD providers concerning Pick up Points (PuP) for patient medication. Following up on patients who don't collect their CCMDD parcels and de-activating them when the need arises.</p>	<p>Pharmacist</p>	<p><i>"Pharmacist or Pharmacy Assistant is responsible for pre-packing Treatment for clubs or medication can be dispensed and distributed via the CCMDD Programme."</i></p>	<p><b>D14, pg90 (NDOH, 2016)</b></p>



#### 4.1.1 The role of the pharmacist in drug use, supply, and management

Drug management is the set of practices to ensure the timely availability and appropriate use of safe, effective, quality medicines and related health products in any healthcare setting. The National Drug Policy (NDP) aims to ensure an adequate and reliable supply of safe, cost-effective drugs of acceptable quality to all citizens of South Africa and the rational use of medicines by prescribers, dispensers, and consumers. The NDP deals with developing, providing, and using medications within the public and private sectors. The pharmacist's role is to implement the NDP in daily practice (Mes et al., 2018; Meyer et al., 2017).

According to the Regulation relating to the practice of pharmacy, the pharmacist is responsible for "the purchasing, acquiring, importing, keeping, possessing, using, releasing, storage, packaging, repackaging, supplying or selling of any medicine or scheduled substance or the supervision thereof" (D26, pg4). This responsibility leads to a constant and continuous supply of medicines, ensuring that adequate supplies of appropriate medication are always available for patients.

Medicines save lives, improve health, and promote trust and participation in health services; they are a vital link between the patient and health services. The National Drug Policy (NDP) states, "Pharmacists, particularly those in the community, have a central community educational role in instructing patients in the correct use of drugs." (D24, pg19). Pharmacists are responsible for providing pharmaceutical care to improve patient's quality of life by identifying potential drug-related problems, resolving drug-related problems, and preventing potential drug-related problems (Hepler, 2004). They also "liaise with a prescriber or other healthcare professionals to ensure the optimal use of medicines" (D31, pg21).

Medicine procurement is a significant determinant of drug availability and total health costs. The availability and absence of medicines positively and negatively impact medication adherence. For each level of healthcare in the public sector, a limited list of essential medicines is prepared as the basis for the supply of medicines and for prescribing in the public sector (Pharasi, 2012). An essential medicines list

(EML) names medicines considered optimal treatment choices to satisfy the healthcare needs of most of a target population at an affordable cost, thereby promoting adherence. It is a guiding model that indicates priorities in drug needs to ensure that a regular supply of safe and effective medicines is continuously available in sufficient quantities in a health system (WHO, 1995). Pharmacists "... ensure that adequate supplies of appropriate medication on the EDL [EML] are always available." D16, pg69, thus promoting adherence.

According to the WHO (1995),

Essential medicines satisfy the priority health care needs of a population. They are selected due to disease prevalence, public health relevance, evidence of efficacy and safety, and comparative cost-effectiveness. They are intended to be available in functioning health systems at all times, in appropriate dosage forms, of assured quality and at prices individuals and health systems can afford.

The EML helps pharmacists procure medicines leading to adequate stock, easier dispensing, and better quality assurance. The EML promotes rational prescribing due to more experience with fewer medicines, thus promoting adherence. There are no irrational treatment alternatives available which could negatively impact adherence. It also reduces confusion and increases treatment adherence (Pharasi, 2012; WHO, 1995).

Pharmacists always ensure that there is always stock on hand and " exercise professional judgment to prevent the supply of unnecessary and excessive quantities of medicines and other products, particularly those that are liable to be misused or abused." (D38, pg27). Stock is held in the medicine supply system to ensure essential items' availability. The selection of items to stock is based on their value to public health and the regularity and volume of consumption. Pharmacists are "involved in a multi-disciplinary approach to the rational utilisation of drugs." (D24, pg19). Most manufacturing companies in SA close in December, and the

pharmacist's role is to ensure that stock is available in the pharmacy for that duration.

Pharmacists have a unique role "... particularly in quality assurance and in the safe and effective administration of drugs." (D24, pg19). Quality Assurance (QA) in public medicine supply systems ensures that each medicine reaching a patient is safe, effective and of standard quality, thereby promoting adherence. The repackaging of medicines and dispensing practices are carried out to maintain this quality. Pharmacists minimise drug losses due to expiry by following FEFO/FIFO when dispensing medication to patients, constantly checking expiry dates, ensuring that patients receive safe and effective medicines, and promoting adherence.

According to the GPP manual, "A pharmacist has a professional responsibility to exercise control over all medicinal and related products, which are purchased or supplied." (D38, pg26). Pharmacists ensure that suppliers with acceptable quality standards are selected. When receiving stock, packaging meets contract requirements and can withstand handling and storage conditions. Storage and transportation conditions are adequate to ensure the quality and security of drugs and medical supplies in storage. Pharmacists are not to "purchase, sell or supply any product where the pharmacist has any reason to doubt its safety, quality or efficacy." (D38, pg26), and they also "do not re-dispense a medicine, previously returned to the pharmacy by another patient, which had been in that patient's possession." (D38, pg27).

Medication adherence is improved when medication is made available for patients. Medication availability rules out health system-related factors that could affect medication adherence. When medication is made available at an affordable cost, it tackles primary and secondary non-adherence. Tertiary non-adherence is a patient-related factor, and patients would have filled in their prescriptions but failed to take their medication as prescribed, negatively impacting adherence.

#### 4.1.2 The role of dispensing in promoting medication adherence

Several guidelines and policies exist for South African pharmacists to promote good dispensing practices and avoid medication errors. The National Drug Policy's objective is "to ensure that all medicines are dispensed according to regulations and good dispensing practice" (D24 pg19p). These regulations include the GPP manual and the Standard Operating Procedure (SOP) for dispensing.

Dispensing, as defined by the GPP manual, is:

The interpretation and evaluation of a prescription, the selection, manipulation or compounding of the medicine, the labelling and supply of the medication in an appropriate container according to the Medicines Act and the provision of information and instructions by a pharmacist to ensure the safe and effective use of medicine by the patient (D38 pg77).

Thus, integral to the dispensing process is ensuring the "safe and effective use of medicines by the patient" (D38 pg77). Medication dispensing errors can lead to medication non-adherence caused by the health care provider, i.e., the pharmacist. This type of non-adherence is called non-conforming, as the medication is not taken as prescribed due to dispensing errors. (Kapur et al., 2016; Schellack, 2020). Statistically, dispensing errors are low, but due to the large volumes of medicines dispensed by pharmacists, they can transcribe into many errors that impact medication adherence negatively (Schellack, 2020).

The GPP manual clearly describes the three phases of dispensing, developed and prescribed in the rules to prevent medication errors (SAPC, 2008b).

The dispensing process is divided into three phases, namely:

- Phase 1: Interpretation and evaluation of the prescription.
- Phase 2: Preparation and labelling of the prescribed medicine.
- Phase 3: Provision of information and instructions to the patient to ensure medicine's safe and effective use (D38 pg77-78)

## Phase 1: Interpretation and evaluation of the prescription

Dispensing medication is one of the core functions of pharmaceutical care and the pharmacist's role. It involves the pharmacist taking responsibility for the patient's medicine-related needs and being accountable for meeting those needs. The Therapeutic Interchange policy states that it's the responsibility of the person dispensing a prescription to "evaluate prescriptions carefully prior to the dispensing thereof..." and in cases where medication errors or potential errors are detected, take appropriate action. (D20, pg7). As part of the first phase of the dispensing process, the pharmacist is responsible for "ensuring the legality/authenticity of the prescription" (D38 pg78). Pharmacists have a role in "identifying the medicine and checking the pharmaceutical form, strength, appropriate dosage, presentation, method of administration and duration of treatment;" (D38, pg78).

The pharmacist executes this role by assessing the prescription to ensure the optimal use of medicine, including the safety of the medication, possible contradictions, and drug-drug interactions, thereby promoting medication adherence (Weir et al., 2020). This phase is also an opportunity for the pharmacist to engage the patient to ensure that the medicine dispensed and the dosage and instructions for administration have been agreed upon with the patient.

Medication errors and non-adherence can occur when a pharmacist fails to fulfil this aspect of the dispensing process. These could include incorrect medicine, incorrect dose, incorrect preparation, incorrect dosage interval, incorrect route, wrong patient, incorrect duration of treatment, extra doses, and contraindications (Gudeta & Mechal, 2019; Schellack, 2020).

In such instances, even if patients adhere to their medication, the therapeutic outcome will not be desired due to the medication error. This invariably negatively impacts medication adherence, resulting in adverse patient effects and is associated with treatment inefficacy, increased patient morbidity and mortality, and increased healthcare costs (Hughes, 2004; Khalili et al., 2011).

When a pharmacist identifies a problem with the prescription, they liaise and communicate with the prescriber for a way forward. By cooperating with other

health care providers, as outlined by the GPP manual, "Whenever necessary, the pharmacist should communicate with the prescriber regarding any identified problems and work out a plan of action with the prescriber and the patient" (D38 pg79); they can avoid medication errors and facilitate medication adherence.

Pharmacists also have a role in "interpreting the type of treatment and the prescriber's intentions" (D38 pg78) for the patient and making them understand their condition and the importance of adhering to their medication. When a pharmacist cannot dispense medication to a patient, the pharmacist has a role in "helping the patient to resolve the problem when the prescription cannot be dispensed" (D38 pg78).

## Phase 2: Preparation and labelling of the prescribed medication

According to the GPP manual, the pharmacist's role in this phase is the "...preparation or packaging of any medicine or scheduled substance...." (D26, pg4). This is a critical phase that influences medication adherence in patients. The exact number of prescribed medications and the respective quantities must be dispensed: "The container of the medicine must be clearly labelled with the correct directions along with any other information for the safe, proper and effective use of the medicine" (D38 pg79).

As Garcia et al. (2017) suggest, packaging and containers are meant to preserve the medication quality up to the usage time. Correct packaging will support medication adherence and, as the GPP manual suggests:

The container must be appropriate for the product dispensed, bearing in mind the need to protect the product from moisture and sunlight as well as from mechanical stresses imparted by transport and use of the product (D38 pg82).

Labelling and packaging issues can cause up to 33 per cent of medication errors (Truter et al., 2017). "Labelling of dispensed products must be clear, legible and indelible. Lettering must be "mechanically printed as far as possible" (D38 pg79).

According to the GPP manual, "The pharmacist must be available in the pharmacy to intervene, to advise and to check the dispensing of any prescription under his/her supervision" (D38 pg81). After checking all the prepared medications against the prescription and being satisfied with the medication prescribed after being evaluated for compliance with pharmacy legislation as stipulated in Good Pharmacy Practice, i.e., the correct name, dosage, units, route, frequency and duration of treatment, the pharmacist signs the prescription and gives the patient the medication (SAPC, 2008; Truter et al., 2017).

Signing the prescription is a sign of acceptance of accountability for the dispensing of a prescription. Accountability must be accepted by the pharmacist or other authorised person who signs the prescription or copy of the prescription, accepting liability for the correctness of the dispensing of the medicine and confirming that the medicine was supplied (D38 pg79).

### **Phase 3: Provision of information and instructions to the patient to ensure the safe and effective use of medicine**

In this phase, the pharmacist's role is to provide information and advice to patients regarding the effective use of medicine and the safety of the therapy. According to the GPP manual, "Advising a patient or the patient's agent/caregiver (physical presence is preferred) must be carried out by a pharmacist or other authorised person" (D38 pg80).

The pharmacist provides verbal instructions to the patient on how to administer the medication. These instructions aim to reduce medication errors and advance patient safety, including how the drug would be used, potential side effects, drug-food interactions, and potential adverse reactions. The GPP manual states, "Information provided to patients regarding their medicine use must always be done with professional judgement, and the prescriber should be contacted when necessary" (D38 pg81). Pharmacists advise when to take medicine, i.e., concerning food and other medication, how to take medicine, i.e., chewed, swallowed, whole or taken

with plenty of water and how to store the medicine to retain the quality of the treatment.

It is during this phase that medication adherence is established and promoted. The pharmacist is also responsible for following up on patient adherence to the treatment and ensuring that the patient's medicine-related needs are met (SAPC, 2008c). The pharmacist "confirms [s] patient adherence to a medicine regimen or treatment plan." (D31, pg21) by ensuring that patients understand how, when, and why they must take their medications.

The pharmacist answers all the questions a patient would have, thereby improving medication adherence (Paes & Sa, 2017; SAPC, 2008c).

To assess the barriers to adherence, the pharmacist should include the patient in the treatment experience and talk to the patient. Poor communication between patient and provider and a lack of knowledge on how to use medicines can lead to unintentional non-adherence. The more trust the patient has in the pharmacist, the more they will open up and disclose any challenges or difficulties with taking their medication. With the provider's support and reinforcement, an open and honest connection between the patient and the medical care supplier favours adherence (Adeniyi et al., 2018).

During this dispensing phase, pharmacists can also provide written information to patients. According to the General Regulations to the Medicines and Related Substances Act, 101 of 1965, when pharmaceutical manufacturers want to register their product with SAHPRA, Professional Information (PI) and Patient Information Leaflets (PILs) are compulsory for each dossier. As stated, a "patient information leaflet, containing the information as prescribed in the General Regulations published in terms of the Medicines Act, should be available at the point of dispensing" (D38 pg80). PILs are used to improve patients' knowledge about the medication and adherence to the treatment (Garcia et al., 2017; Schellack, 2020).

Significantly, patient safety can be impacted when the PIL contains information that the patient cannot understand or act on (that is, where information has been written at a higher level than the average patient's health literacy – layman's term) or the



patient is unable to find the relevant information in the PIL. Patients' safety is improved by improving adherence (Gudeta & Mechal, 2019; Schellack, 2020).

Many factors may determine a patient's medication adherence. It is important to note that each patient is unique; therefore, as the GPP manual states, "Information must be structured to meet the needs of individual patients" (D38 pg80). The pharmacist should approach each patient individually to deduce the level of adherence and which barriers could prevent the patient from taking their medication appropriately. Pharmacists employ several strategies to improve adherence, including counselling, patient education, and memory enhancement. Patient education and counselling and providing appropriate written information or pictograms are essential strategies for empowering patients to self-manage their medications daily and ensure that they use their drugs safely and appropriately, thereby improving medication adherence (Garcia-Cardenas et al., 2013). Counselling is the final checking process to ensure the correct medicine is supplied to the right patient. Lack of counselling can significantly contribute to failing to detect dispensing errors (Kapur et al., 2016).

Patient education is not always sufficient to persuade the patient to comply with the doctor's medication orders. The information must be presented in clear, easy-to-understand language, and the patient must understand the benefits of adherence and the consequences of non-adherence. When patients feel empowered and cared for, they are more willing to play an active role in their treatment (Fikri-Benbrahim et al., 2013; Ipingbemi et al., 2021).

The pharmacist is responsible for "... identifying areas for modification, implementation of modifications (taking into legal account requirements), revise the patient record and record the action taken" (D38 pg81). Pharmacists examine patients, anticipate potential reasons for non-adherence, and implement programs for enhancing drug adherence and attaining the best possible health outcome (Gast & Mathes, 2019).

Detailed advice is very crucial when certain medicines are supplied and in certain circumstances, such as in:

- the supply of medications that can cause drowsiness or sedation
- the supply of medications that have a narrow therapeutic index (e.g., cytotoxic, and other immunosuppressants, warfarin, digoxin, insulins)
- the taking of medicines that require therapeutic monitoring or specific biochemistry or haematology monitoring (e.g., warfarin and other anticoagulants, antithrombotic, digoxin, clozapine)
- when there is a change in the dose or frequency of administration
- when the brand of medicine has changed
- when the medication is a prescription drug
- with each supply of medicine for which there are valid reasons for regular reinforcement of information (e.g., teratogenic, cytotoxic, or other medicines that are reported to pose a risk to patients and carers through inappropriate use or handling; anticonvulsants; major contraindications; special patient needs, such as language preference, vision, hearing or cognitive impairment, or cultural issues)
- when the medicine is for a child (Kapur et al., 2016; Schellack, 2020; Truter et al., 2017)

Giving detailed advice ensures that patients adhere to their medications by being fully informed about their medicines and what they can expect. "Cautionary/advisory labels and instructions must always be used" (D38 pg79). When patients don't know that their medication causes drowsiness, they may stop taking it, affecting the medicine's therapeutic outcome. Patients have different job occupations that should be considered when taking medication. For a patient who works a night shift, taking medication that causes drowsiness in the morning will be ideal and improve medication adherence. The same goes with patients on diuretics; taking medicine in the morning will be more suitable than at night as the medication will make them frequently urinate and skip a diuretic if planning to be out for the day (Atkins & Fallowfield, 2006; Birand et al., 2019; Davis et al., 2014).

Dispensing also occurs in the absence of a prescription from the prescriber, which can be pharmacist-initiated therapy. Patients may request access to medication through self-care. Pharmacists “provide prophylaxis or treatment” (D14 pg57), and they “treat as recommended by guidelines” (D14 pg63). Pharmacists are often patients' first source of advice and can significantly influence rational medicine use in communities. The World Health Organization (WHO) defines self-care as the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness and disability with or without the support of a healthcare provider. Pharmacists have the responsibility that even when patients seek medication that is not scheduled or available 'over the' counter, they must still ensure that it is suitable for the patient to use, promoting medication adherence (Gudeta & Mechal, 2019; Schellack, 2020).

#### 4.1.3 Pharmacist role in medication adherence in special programmes

##### Antimicrobial stewardship (AMS)

Antimicrobial stewardship (AMS) is a systematic approach to improving antimicrobial use to improve clinical outcomes and patient outcomes, ensure cost-effective therapy and minimise adverse events relating to their use, including the development of antimicrobial resistance (Godman, 2018). AMS is the responsibility of every pharmacist regardless of the practice setting. It is essential for pharmacists with specialised training in infectious diseases and stewardship to provide leadership to an AMS programme; thus, a clinical pharmacist with advanced AMS training leads AMS programmes (NDOH, 2018a).

The AMS committee comprises high-ranking managers in the hospital, and a chief pharmacist is part of the committee. The AMS Team is responsible for the operationalisation of AMS and includes a pharmacist as part of the team. Pharmacists are the first point of contact for the public and are responsible for providing information and education on antimicrobial use and resistance (Garau & Bassetti, 2018; NDOH, 2018a).

Antibiotics are the most prescribed medicines in both the community and hospital healthcare setting and are crucial, life-saving medicines in the fight against infectious diseases. AMS programs are based on multidisciplinary actions involving all health professionals. Pharmacists' activities in AMS teams are associated with a reduction in antibiotic consumption and associated costs. The increasing use of antibiotics, including their misuse, has escalated the prevalence of antimicrobial resistance (AMR), thus leading to non-adherence.

### **Pharmacist's role as an AMS clinician: Antimicrobial prescription review and use**

Pharmacists have an established role in hospitals as promoters of evidence-based medicine and cost-effective prescribing (Ourghanlian et al., 2020; Wickens et al., 2013). They also play a role in the preservation of antibiotics through the monitoring, evaluating and guiding of appropriate antimicrobial use (Heil et al., 2016).

Pharmacists conduct antibiotic prescription reviews to decide if an antimicrobial is indicated and ensure optimal administration to prevent unnecessary or inappropriate initiation of antibiotics. As stated, "The prescriber, professional nurse and pharmacist need to check prescription charts with laboratory findings and patient identifiers before administering the antimicrobial." (D13, pg36).

Antimicrobial resistance in the community is driven by the over-prescription of antibiotics (Horton et al., 2019). In a study conducted in SA intensive care unit (ICU) known as the PISA study, patients in ICU were found to be on as many as ten antibiotics at a time, which is associated with poor patient outcomes (Paruk, 2012).

### **Drug switch, adjustment, and administration**

The administration of antibiotics is a critical driver of antibiotic resistance and includes seven steps. To ensure optimal administration of antimicrobials, the pharmacist should provide "Timely antimicrobial initiation" (D13, pg23) and safe medication administration to patients, minimise adverse events, and improve clinical outcomes and patient outcomes, promoting adherence.

Steps to the administration of antibiotics (NDOH, 2018a).

1. Early administration of a correct antibiotic and ensuring time elapsed between antimicrobial prescription and actual antimicrobial administration is less than one hour.
2. Correct dose in terms of weight and renal function to ensure optimal dosing.
3. Appropriate route of delivery, i.e., “IV to oral switch” (D13, pg23) when patients are clinically stable
4. Correct duration as per patient therapy and documentation on the prescription chart, e.g., Empiric therapy is to be reviewed every 48-72 hours and “regular chart reviews and feedback.”
5. Correct frequency according to the dosing schedule prescribed.
6. Right patient aligned to the respective patient identifiers.
7. Proper documentation visible on the prescription chart

An incorrect dose, frequency and duration negatively impact medication adherence, leading to poor adherence and an increased possibility of antimicrobial resistance. Ingesting an incorrect dose at an incorrect frequency with an incorrect duration is related to non-adherence to medication and may be caused by the pharmacist. Antibiotics, if “administered too early, the patient may experience more side-effects.” and “Late administration of time-dependant antibiotics (e.g., amoxicillin) results in a concentration of drug below the minimum inhibitory concentration, which may lead to AMR” (D13, pg36). All antimicrobial prescribing and administration aspects must be reviewed daily (NDOH, 2018a).

### History taking, managing and reporting adverse events

Pharmacist conduct "accurate antimicrobial use and allergy history" (D13, pg23) and medication history taking to inform prior antimicrobial use. This ensures that patients are given safe and effective medication. Pharmacists also play a significant role in pharmacovigilance through medication error reporting and adverse drug reaction identification (NDOH, 2018a; Ourghanlian et al., 2020).

## Pharmacist role as part of the AMS team

According to the NDOH (2018a) document, the pharmacist's role as part of the AMS team is the same as being an AMS clinician but with other added functions. These roles include:

- antimicrobial prescription review and use
- drug switch, adjustment, and administration
- history taking, managing, and reporting adverse events

Additionally, they have other roles, and these are:

- Medication availability and reconciliation; Pharmacists ensure that medications are available timeously for administration, detect medication errors and take appropriate action to revert and correct them.
- Patient education: Pharmacists provide information to patients concerning their condition and treatment regimen, promoting medication adherence.
- Regular chart review: pharmacist conducts regular chart
- Therapeutic drug monitoring, if indicated

Pharmacists play all the roles in AMS, ensuring safe medication administration to patients, minimising adverse events, and improving clinical outcomes and patient outcomes, thus improving and promoting medication adherence (D13 pg24). Pharmacists can play a crucial role in implementing the AMS program, and although, to date, in SA, this has not been a coordinated effort, recent evidence has shown success in the private sector (Meyer et al., 2017).

Currently, the pharmacist's role in the AMS team depends on the level of training received. However, most decision-making about infection management and antibiotic use remains with the surgical and intensive care unit (ICU) teams; pharmacists have a limited role (Ourghanlian et al., 2020). As custodians of medicine, pharmacists are well placed to lead and drive the antibiotic stewardship

initiative through audit and data collection and through relationship-building with prescribers to influence crucial prescribing decisions. There is a need to broaden the definition of surgical teams to recognize the role pharmacists can play in patient care, leading to optimized outcomes and increased adherence (Garau & Bassetti, 2018; Heil et al., 2016).

### MDR-TB care

Pharmacists have an essential role in managing and preventing TB, especially in improving the availability and accessibility of drug treatment, adherence to therapy, and educating patients on the treatment and disease. According to the Management of Drug-Resistant Tuberculosis document, pharmacists "ensure availability of second-line anti-TB and ancillary drugs." (D18, pg21).

Management of TB patients requires a multi-disciplinary approach by a multi-disciplinary team. Pharmacists form a crucial part of that multi-disciplinary team. As part of the multidisciplinary team, pharmacists can be involved at different stages in the value chain for TB control (Mitrzyk, 2008). Pharmacists do this by ensuring that all essential medications and this, including anti-TB medicines, are available in sufficient quantities and are of good quality and "monitor drug stock levels." (D18, pg21) to avoid any stock-out situations and "ensure correct storage of the drugs." (D18, pg21).

Pharmacies can also serve as centres for directly observed treatment short-course therapy (DOTS) for patients living in their vicinity. Pharmacists "dispatch drugs for patients who have been discharged to the local clinic or hospital." (D18, pg21). The DOTS programme ensures that patients take each dose of anti-TB medication as prescribed and helps prevent the emergence of drug resistance, thus promoting adherence. Adherence is promoted through a patient-centred approach, which includes facilitating access to treatment, choosing the most convenient time and place for direct observation of therapy with the patient, and providing other social and medical services when possible (Barbosa et al., 2012; Bekker et al., 2022).

Pharmacists interact with many people daily and are in an ideal position to distribute educational material to the public on the treatment of TB and preventative

measures (Mitrzyk, 2008). Pharmacists are critical players in the prevention and treatment of tuberculosis by promoting adherence, assessing patients for risk factors for resistant disease, providing information about disease control and prevention, and monitoring for effectiveness, adverse effects, and drug interactions (Clark et al., 2007).

Medicine counselling is a standard of care pharmacists provide to patients, including those receiving tuberculosis drugs. Pharmacists knowledgeable about tuberculosis and its treatment enable them to adequately answer drug interaction and adverse reaction questions and alleviate fears about the spread of tuberculosis in the community (Kastien-Hilka et al., 2016). Pharmacists have a significant role in preventing and managing tuberculosis, including administering DOT, promoting public awareness of tuberculosis, being part of the infectious disease consultation service, and being patient advocates to facilitate adherence and mediate when non-adherence is noted. Patient adherence and completion of a prescribed TB medication regimen is the most important preventative measure against MDR-TB (Makanjuola et al., 2014; Mitrzyk, 2008).

#### 4.1.4 Summary of document analysis

The information in these documents suggested the country's research agenda and objectives, provided supplementary research data, provided context, and tracked changes and development.

Although many policies and documents imply the pharmacist's role in promoting medication adherence, not many address it directly. It becomes clear from policy that the pharmacist's role with respect to adherence is indirectly integrated into their many other roles. Furthermore a large focus on the pharmacist's role appears to be related to their drug supply management role. This could imply that policy documents largely view the role of the pharmacist to be directly related to drug supply management, rather than the provision of clientele-focussed clinical services. Similarly, the role of the pharmacist in many policies is not clearly distinguishable from that of other healthcare professionals and is often implied as part of a more generic role.



## 4.2 Phase two – Pharmacy education and medication adherence

In this sub-section, the focus will be on education for medication adherence.

### 4.2.1 Introduction

The objective of this phase of the study was to investigate and report on the inclusion of medication adherence and the teaching thereof in the curriculum of the BPharm degree in pharmacy institutions in SA. To this end, in-depth interviews were conducted with lecturers. Seven lecturers represented four different institutions in these interviews ( Table 5), and their responses are tabulated in Appendix H. The interviews were transcribed and analysed as described in the methodology section.

*Table 5: Interviewed participants*

<b>Name of institution</b>	<b>Participants</b>
Institution A	Participant 7
Institution B	Participant 5
Institution C	Participants 1 and 6
Institution D	Participants 2, 3 and 4

Thematic analysis was conducted to identify initial codes (Figure 5) and these initial codes were then used to create a coding framework in the NVIVO® software programme, which was then used for the further analysis of the data (Figure 6).



- Suggestions for future teaching

#### 4.2.2 Participant perceptions of medication adherence

As part of the interview questions, participants were asked what they understood by the term "medication adherence". This question was asked to gain insight into the participants' understanding of medication adherence since this would potentially impact how they taught it. Some participants viewed medication adherence as a broad concept, while others focussed on the rational drug use aspects of the concept. On the one hand, some viewed it as requiring active involvement and agreement - but others saw it as about following instructions and patient behaviour and even discussed the concept of intentional non-adherence as integral to their understanding of the concept.

##### *Broad concept*

Some participants defined medication adherence as a broad concept because they felt there was much to include when describing it. Participant 2 stated the following: "I don't know how to answer it because, for me, it's very broad" (P2, 08:01). This participant went on to explain what they meant by defining medication adherence as a broad concept: "But I also think for me; it goes beyond that it's also about just also many other aspects around medication behaviour that come with, you know, with not just taking medicine." (P2, 08:36).

The participant highlighted that medication adherence has many other aspects around medication behaviour that comes with not just taking medicine. It involves medicines being taken at the right time, at the right dose, by the right route for the right indication at the right time for the right patient (Ambwani, 2006).

##### *Rational drug use*

Some of the participants explained their understanding of medication adherence using the concepts of rational drug use. Participant 2 explained medication adherence in the following way: "So obviously, as a pharmacist, you're always concerned about, you know, your patient taking the medicines at the right time in the right dose and in the prescribed manner." (P2, 08:01). Similarly, Participant 3 stated:

Medication adherence, in my understanding, from a patient's perspective, is taking medication as prescribed by a healthcare professional in the right dosage at the correct dose at the correct time in the correct manner and completing the course of treatment. (P3, 03:45)

Rational use of medicines requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period and at the lowest cost to them and their community (Ambwani, 2006). The concept can be simplified as the six rights, i.e., the right drug or medicine at the right dose by the right route for the right indication at the right time for the right patient, promoting adherence (Ambwani, 2006).

Both participants cited above included elements of this concept in their definition, e.g., correct time and the right dose. However, both participants emphasised medication adherence being about patient behaviour – what the patient does - "taking the medicines" is clear. Furthermore, there is no indication as to what their understanding of "right" or "correct" is, and it is almost assumed or implied that there is only one "right" way.

In contrast, other participants emphasised the patient's active involvement in the process.

### *Active involvement and agreement*

In defining medication adherence, two participants emphasised the patient's involvement in decision-making. So essentially, in their understanding, the patient is involved in deciding what is "right" and "correct" for them through active agreement. For example, Participant 1 said: "But the patient should feel that they're involved, and they've agreed to a certain course of action in terms of their medication." (P1, 06:42). They furthermore stressed the agreement aspect by saying: "After they have agreed with the healthcare professional about taking certain medication." (P1, 06:42) and "So, for me, the emphasis is on the agreement that it just can't be the healthcare professional telling a patient what to do" (P1, 06:42). The active involvement of the patient was also stressed when they said: "They should also be willing to be persistent

when it comes to taking the advice or medical advice that's given by the healthcare professional" (P1, 06:42).

Similarly, Participant 6 offered the following: "But medication adherence would be a situation where the healthcare professional has engaged the patient in the process and decided on a regimen or agreed upon a regimen that is acceptable to the patient." (P6, 02:11). They further included the emphasis on the agreement when describing non-adherence as "... it is the patient's not sticking to an agreed upon medication regimen" (P6, 02:11).

In the definitions and discussions of medication adherence in Section 2.1, the patient's active involvement was emphasised as central to the concept. Medication adherence is more than simply imposing decisions or what is "right" or "correct" for patients. Patient participation means the involvement of the patient in decision-making or expressing opinions about different treatment methods, which includes sharing information, feelings and signs and accepting health team instructions. Active participation of patients is associated with improved treatment outcomes and medication adherence (Vahdat et al., 2014).

### *Following instructions*

Participant 1 defined medication adherence as the patient's ability to conform: "My understanding is that a patient should be able to conform, firstly, to instructions given by the healthcare professional after they have agreed with the healthcare professional about taking certain medication." (P1, 06:42).

Before the patients can conform, there needs to be an agreement between the patient and the healthcare professional on how the medicines should be taken. It is not just following an instruction from the healthcare professional without the patient's consent. Adherence is a patient's active and voluntary participation in following all the recommendations and instructions given by a healthcare provider such as a pharmacist (van Driel et al., 2016).

Participant 1 went on to emphasise the need for persistence:

After they've agreed on taking a certain course of action. So, for me, adherence means that a patient can conform to the instructions and persist with taking the medication that they have been given or instructed to take by a healthcare professional after agreeing with that healthcare professional to do so (P1, 06:42).

To achieve a better therapeutic outcome, patients should be persistent in taking their medications and not stop taking them abruptly or without the healthcare professional's instruction. Patients are encouraged to follow through with their medication regimen. Participant 4 mentioned in particular the kind of instructions that patients follow from their healthcare professionals, and this was lifestyle modifications: "following things like diet, exercise instructions, which they're provided to by healthcare professionals." (P4, 05:58). The instructions often include the medication's frequency, timing, dose, and lifestyle modifications (Bosworth et al., 2011). Medication adherence is not about taking medicines only but involves lifestyle modifications to supplement and improve treatment success. Lifestyle modifications are essential in all conditions, especially in chronic diseases like diabetes and hypertension. Both these conditions are better controlled and managed with treatment and lifestyle modifications such as dieting and exercising (Assaf-Balut et al., 2017).

The participant's understanding of the healthcare professional's role in medication adherence ensures that patients can conform to their medication regimens.

### *Patient behaviour towards taking medication*

Regarding patient behaviour towards taking medication, Participant 1 stated that: "adherence would be sticking to the regimen." (P6, 02:11). Sticking to a treatment regimen is behaviour towards taking medication. Another participant, Participant 4, stated that: "so, it's an extent to which a person's behaviour is a person's behaviour towards taking their medication and, you know, following things like diet, exercise instructions, which they're provided to by healthcare professionals." (P4, 05:58).

Patient behaviour plays a crucial role in adherence and the success of the treatment (Albury et al., 2019). Patient medication-taking behaviour is a complex issue, as multiple

terms describe the degree to which patients follow treatment advice (Section 2.1.1). Still, adherence is used to describe patient medication-taking behaviour.

### *Intentional non-adherence*

Under the concept of intentional non-adherence, Participant 6 said:

The patient then would not adhere that this might be intentional, so they chose not to take it as they were told. So, for example, if we agreed that they would take it three times a day at 8 am, 2 pm, and 8 pm. And the patient then chooses to take that at 6 am and 12 pm and then at ten at night, changing the dosing interval (P6, 02:11).

Non-adherence is the patient's deviation from an agreed-upon treatment plan with their healthcare provider (Mohiuddin, 2019). As stated by Participant 6, when patients take their medication on their own time, not stipulated by the healthcare provider, it is intentional non-adherence. With intentional non-adherence, patients consciously decide not to follow their treatment recommendations, and this may result in adverse patient outcomes and is associated with treatment inefficacy, increased patient morbidity and mortality, and healthcare costs (Hughes, 2004).

The definition of medication adherence used in this study is "the extent to which a person's behaviour corresponds with agreed recommendations from a health care provider in respect of taking medications, following or implementing lifestyle changes" (Fox et al., 2018). This definition combines all the concepts identified in the participants' perceptions of medication adherence. Most participants described a part of the definition of medication adherence; however, only one participant (P1) covered or mentioned at least half of the aspects mentioned in this definition.

### 4.2.3 Teaching medication adherence in the BPharm curriculum

This section describes the teaching of medication adherence in the BPharm curriculum of the respective interviewed pharmacy institutions. This section includes an exploration of how medication adherence as a topic is integrated into the BPharm

curriculum, the stage and year it is covered, how it is taught, i.e., as a formal course or integrated into the curriculum, disciplines it is taught under, topics covered, methods used in teaching, effectiveness of methods used in teaching and time spent teaching medication adherence.

#### 4.2.3.1 Stage and year medication adherence is covered

From the participants' responses, the principles of medication adherence are usually actively taught between the first and third years of the programme. Participants 2 and 3 stated it is taught in the first year, while Participant 1 said it was in the second year. Participants 3 and 4 suggested it was introduced at the third-year level.

The concept is usually consolidated and integrated into other aspects in the programme's fourth year. For example, Participant 2 said, "And then in the final year, we don't necessarily teach adherence, but I think we consolidate the principles taught across the four years, the three years, sorry." (P2, 14:31).

#### 4.2.3.2 Taught as a formal course or integrated throughout the curriculum

Medication adherence does not appear to be generally taught as a formal course but is a topic integrated into most subjects throughout the curriculum. For example, Participants 3, 5, and 6 said the following:

- "But it's always an under arching or overarching theme in all our teachings" (P3, 06:29)
- "So basically, all your other divisions marry into the practice." (P5, 03:15)
- "It's covered in multiple places. We would introduce the students to it when we first teach them about the patient journey. ... So yes, in various ways, it's taught throughout the curriculum." (P6, 04:02)

According to the international reviews on medication adherence that emerged from GRIPP (See Section 1.1), countries included in the review also did not teach medication adherence specifically as a standalone subject but as part of other subjects and where relevant as part of a therapeutic area (Marie-Schneider & Aslani, 2010).



#### 4.2.3.3 Disciplines where medication adherence is taught

Medication adherence is taught in many disciplines but predominantly in pharmacy practice in all institutions and pharmacology in institutions B and C. Some participants explicitly mentioned medication adherence as being taught in pharmacy practice, while others mentioned the courses under pharmacy practice that teach medication adherence. However, all participants teach medication adherence in pharmacy practice in their respective institutions.

#### 4.2.3.4 Topics covered in teaching medication adherence

Several topics were covered in teaching medication adherence, identified from the participants' responses. The topics covered were:

- Definition, factors, and consequences of medication adherence
- Importance of medication adherence and strategies to improve it
- Ways of measuring non-adherence
- Adherence as taught in pharmacology
- Adherence in the elderly
- Role of the pharmacist
- Pharmaceutical care
- Communication health behaviour

#### *Definition, factors, and consequences of medication adherence*

More than half of the participants mentioned teaching the definition of medication adherence. Participant 1 stated: "So just covering what it is" (P1, 14:20), and Participant 2 stated: "Okay, so, they start by looking at, you know, the definition of adherence" (P2, 13:07). For the students to understand the topic medication adherence, it is crucial that the topic is clearly defined and understood by the students.

Participant 5 stated: "but to give them the ground knowledge to give them the foundational knowledge or to give them the basis of medication adherence" (P5, 03:15). The definition of medication adherence is of utmost importance and is the first topic or

subject matter that lecturers deal with at the beginning of teaching students about medication adherence. Still, under defining medication adherence, Participant 6 mentioned teaching students different kinds of adherence. As stated, "So, in that course, they would specifically get taught about the different kinds of adherence" (P6, 04:02).

Two participants mentioned the importance of clarifying the difference between adherence and compliance to students. Participant 5 stated, "The important thing is that they need to know what I mean, they need to know the difference between adherence and compliance, and then you will assist them on that as well." (P5, 03:15). Whereas participant 6 stated that:

"I'm glad we've moved from the concept of compliance because adherence, I like the definitions that include the patient in the process. So, its patient centred. I hope the students understand that aspect and that its completely patient centred. And ultimately, it's what's going to demonstrate the outcomes ... medicine outcomes if the patient takes medicine as they should." (P6, 04:02)

As discussed in Section 2.1 of the literature review there are misconceptions about what adherence is and its definitions. Also as seen from the participants responses, there is no one definition for medication adherence.

Two participants highlighted the teaching of factors and consequences of non-adherence. Participant 3 stated:

We also cover the factors and consequences associated with non-adherence, so disease adherence, patient-related factors, factors related to the healthcare team, and medical factors. And then, we speak about factors which influence adherence and how they influence adherence. So, for example, demographics, gender, age, socioeconomic status and so forth influence adherence. (P3, 08:23)

Participant 6 stated: "the factors that contribute to adherence, the factors that hinder adherence." (P6, 04:02).

Students are taught about the factors that contribute to adherence and factors that hinder adherence. These factors can be patient-related, medical, or even socioeconomic, as mentioned by participant 3. Students need to know the factors of non-adherence to know what to watch out for when dealing with non-adherent patients in practice. And knowing the consequences of non-adherence helps them counsel and advise patients better.

In their national US-based study, Rickles et al. (2012) suggested that while faculty members and students agreed that the fundamental concepts of medication adherence are well covered in pharmacy curricula, intervention strategies and ways to measure adherence were not well covered.

### *Importance of medication adherence and strategies to improve it*

It is not enough to teach students about medication adherence, non-adherence, and the factors contributing to non-adherence (Rickles et al. 2012). Literature has noted that non-adherence is a massive challenge in the health sector (See Section 2). So, students ought to be taught strategies to improve non-adherence. Two participants mentioned teaching the importance of medication adherence. Participant 1 stated, "So, for example, if someone is teaching TB, and they need to emphasise the need for a patient to continue taking their meds, then they do just happen to mention adherence " (P1, 13:05). There is a need to emphasise the need for patients to continue taking their medications, as stopping medicines could negatively impact their therapeutic outcome and lead to non-adherence.

Two participants mentioned teaching strategies for improving medication adherence in their institutions. For example, Participant 5 taught the strategies to improve non-adherence under an HIV/AIDS module and highlighted the use of pictograms as adherence strategies:

When I do HIV and AIDS in the fourth year, I also talk to them about adherence. I give them the pillars of adherence strategies used to, for patients to make sure that they adhere and all of that, yeah, so I do cover that in on the under the HIV, but generally, they know its adherence for all the medication. (P5, 00:53)

Participant 5 went on to state that: "So you know, where you give them pictograms and tell them that this is how this is how you take it and things like that and the importance of why you should adhere." (P5, 03:15).

Participant 6 specifically highlighted the use of asthma care plans for asthma management as a way of improving adherence, stating: "We would look at different ways of trying to improve adherence. So, for example, when patients are taught about asthma management, they're taught about how to develop an asthma care plan." (P6, 04:02).

Although, as illustrated here, various participants explained some of the strategies to counter non-adherence that they teach the students, there does not appear to be a consolidated and consistent approach. This is similar to the situation in the US described by Rickles et al. (2012).

### *Ways of measuring non-adherence*

As part of teaching medication adherence, some participants mentioned including ways of measuring non-adherence in their BPharm curriculum. Participant 1 stated that: "it's important and maybe the type of ways in which TB medication adherence is assessed like the DOTS programme" (P1, 13:05). Participant 1 highlighted the use of the DOTS programme in measuring non-adherence. Participant 2 stated:

And then they also go into how to measure non-adherence. So, the various ways to look at, you know, maybe blood samples, using pharmacy data regarding when a patient is coming back for a refill, pill counts, and other surrogate markers for certain medicines. So that's more clinical, and then yeah and urine levels. So, they also look at how to measure non-adherence clinically and then at how to calculate adherence. So, this is like the mathematics and the percentages (P2, 13:06).

Participant 2 mentioned the various ways of measuring non-adherence and included direct and indirect methods. Direct methods include directly observed therapy (DOT), measurement of drug concentration in blood, and measurement of the biological markers in the body. Indirect methods include patient self-report, pharmacy fill data,

electronic medication monitoring, pill counts and assessment of patient's clinical response (Pednekar et al., 2019).

Participant 3 spoke about teaching about the MMAS scale to calculate adherence, stating: "And in that, we speak about the MMAS scale or the medication adherence report scale. Students are briefly taught how to calculate adherence" (P3, 08:23). It is important for students to be taught about the different ways of measuring adherence so that they deduce which method would be suitable for which condition when dealing with patients in their daily practice to come.

### *Adherence as taught in pharmacology*

Only one participant mentioned adherence as being taught in pharmacology, looking at pharmacokinetics. Participant 5 stated that:

Like if they're doing pharmacology and looking at pharmacokinetics. So, in kinetics, we'll be talking about the half-life, and we'll be talking about the steady state. So, you, you take that, and you bring that into your practice session. And you explain to them why it's important that they learn to do that. So that now when they explain it to the patient, you're not to tell them to take it three times a day or every eight hours (P5, 03:15).

In pharmacology, students are made to understand the instructions they give patients relating to the half-life of a drug and its steady state. Participant 5 also stated that:

But unless you want to bring all the other the pharmacology and things like that, and also the formulations, that also cause adherence problems, you know, are you giving the right formulation for the right age, you know, that kind of thing. And then, the condition is the right formulation for that condition. So, and you know, so all of those things (P5, 03:15).

The importance of formulation and rational drug use was emphasised, and pharmacists must ensure that each formulation or drug dispensed is for the right patient, age, and condition. Babies and the elderly are usually given syrups and suspensions because of their inability to swallow tablets and capsules. Also, medicines work in a particular way in the body through pharmacokinetics. Pharmacokinetics is not for the patients to know

but for the pharmacist. The knowledge of pharmacokinetics will help the pharmacists in counselling and advising patients appropriately about the medications they take and also help in the manufacturing industry.

### *Adherence in the elderly*

Only one participant mentioned having a geriatric elective where students are taught about adherence in the elderly. This is a course under pharmacy practice where medication adherence in the elderly is taught. In teaching this course, Participant 6 stated that: "And there the students are taught specifically about medication adherence in the context of elderly patients" (P6, 04:02). Participant 6 added: "And it's presented as a seminar session by one of the students, and they have a task that they have actually to develop an adherence aid for patients." (P6, 04:02). In this elective course students are fully engaged with the topic through leading seminar sessions and executing tasks to develop adherence aids for elderly patients.

### *Role of the pharmacist*

The pharmacist's role is an important topic or subject that pharmacy students are taught about in pharmacy institutions and not necessarily under medication adherence. Students are taught the pharmacist's role generally and specifically under specific topics inclusive of medication adherence. Four participants mentioned teaching the role of the pharmacist in their respective institutions.

Participant 2 stated that: "And then they look at the pharmacist's role in terms of adherence. You know, looking at the information that a pharmacist can provide, and there they start to borrow from a few theories." (P2, 14:31). The role of the pharmacist taught here is as a counsellor. The pharmacist has to have the correct information and advice to give to patients. Participant 3 highlighted teaching the seven-star aspect of the pharmacist, particularly the pharmacist as a caregiver and communicator.

A WHO consultative group developed the concept of "the seven-star pharmacist," a benchmark for pharmacists to provide high-quality pharmaceutical care to patients. The concept suggests that the well-rounded pharmacist should be a compassionate

caregiver, decision-maker, active communicator, lifelong learner and a good manager and possess the qualities of a good leader, teacher and researcher (WHO, 1997).

### *Pharmaceutical care*

Only one participant mentioned teaching pharmaceutical care as part of medication adherence in their institution and displayed it as a patient-centred approach involving pharmacists interacting with patients. The participant stated, "We're looking at a patient-centred approach in terms of how we interact with patients as pharmacists" (P2,11:03).

The participant went on to explain the importance of pharmaceutical care, and this is in aiding adherence. The participant stated that: "We also weave in that it's implied that one of the reasons why you're providing pharmaceutical care is to ensure or to aid adherence." (P2, 16:42). Pharmaceutical care motivates patients to get familiar with their medication regimens, making it easier for them to understand the importance of adhering to their medications (Molino et al., 2017).

### *Communication and health behaviour*

Two participants mentioned including communication and health behaviour in their curriculum, and one of the participants particularly mentioned that lectures on adherence followed classes on health behaviours and communication. Adherence is also taught as a behavioural construct. Participant 2 stated that:

So, they look at the transtheoretical model of behaviour change because they look at adherence as a behavioural construct. And so, then they look at, you know, certain models that fit into that. And what's also said is this, these lectures on adherence follow from the lectures on health behaviours and communication. (P2, 14:31)

Participant 5 highlighted the importance of communication and the type of communication depending on the patient and caregiver. It is imperative to note that people in the community have different levels of education and understanding. As a pharmacist, it is important to communicate to patients and their caregivers in the

simplest terms possible and not use any medical jargon (Bogart et al., 2013). Participant 5 stated that:

So here you are talking about medication adherence, all of what's essential for the patient to adhere to, and then the communication. What's the type of communication and depending on your patient, depending on your caregiver, how do you level to their to so that they understand you (P5, 03:15).

Effective health communication is critical to health and well-being. It plays a more significant role in promoting medication adherence in patients (Albury et al., 2019).

#### 4.2.3.5 Methods used in teaching medication adherence

Teaching methods help lecturers conduct teaching in an agreeable, student-friendly and successful manner by initiating and maintaining a link between the subject matter and the student (Um, 2019). There are strategies for teaching methods, and these are autocratic and democratic. Autocratic strategies are teacher and content centred, whereas democratic strategies are student centred. Examples of autocratic strategies are lectures, demonstrations, programmed instructions and tutorials. Examples of democratic strategies are discussions, projects, self-study and discoveries. (Hamid & Setiawan, 2019; Um, 2019)

The methods used in teaching medication adherence and their effectiveness were explored in this section. Nine teaching methods were identified from the participants' responses, and these included:

- Lectures
- Case studies
- Workshops
- Tutorials
- Practicals
- Readings
- Tasks
- Assignments



- Videos

Several research studies on medication adherence education have been conducted, and the teaching methods used have been identified in the international perspective review paper on adherence by Marie-Schneider and Aslani (2010). In the US, teaching strategies often involve student pharmacists consuming placebo medications (e.g., small candies) for a short period to gain a sense of what it is like to be a patient. Through this experience, specific medication-use barriers are identified, and students reflect on their experience (Rickles et al., 2010). In a study by Clifford (2010), various teaching methods were reported to be used, including lectures, workshops and practicals. Two institutions reported using a health psychologist to teach this component, which points to a growing multi-disciplinary nature of teaching and learning activities in pharmacy practice in England.

### *Lectures*

Most of the participants mentioned delivering lectures on medication adherence, with some highlighting that they start with lectures and then go on to use other methods of teaching medication adherence. Participant 2 stated that: "So, we start with lectures. So, it is just, you know, lectures, where, you have slides" (P2, 17:38). Also, participant 6 stated that: "Probably, I would say, mostly our standard delivery of lecture methods. So, in the classroom, it's lectured." (P6, 08:33).

The lecture is the most common method of teaching. Lecturing delivers concepts and a lot of information in a short time. Lecturing also conveys information that is difficult to present in another way. The lecturer is more active, whilst students are passive listeners. The lecture method comprises content presentation and explanation of facts, principles and relationships. (Antepohl & Herzig, 1999; Tarpada et al., 2016) All the institutions use this method to introduce the topic of medication adherence to their students.

### *Case studies*

Most of the participants mentioned using case studies when teaching medication adherence, usually after the delivery of lectures. In support of this, Participant 2 stated, "We would use examples and case scenarios and things to consolidate those principles

further." (P2, 17:32). Lectures on their own are not enough to make students understand the topic of medication adherence. Examples and case scenarios consolidate the principles learnt in lectures. Students can apply what they learned during classes in those case studies.

One participant highlighted they use case scenarios specifically when teaching measuring adherence by stating that: "When it comes to measuring adherence, I use two case studies" (P4, 08:37). Measuring adherence is very practical and requires practice outside of just lectures.

In a study by Rickles et al. (2010), students were given medication profiles reflecting non-adherence to drug therapy. The students were expected to detect, assess, and intervene in the medication non-adherence. Students were given these same scenarios at the beginning and end of the course to increase their understanding on medication adherence.

### *Workshops*

Only one participant mentioned using workshop examples in teaching medication adherence in their institution. Participant 2 stated that: "What we tend to do a lot in pharmacy practice is to workshop examples, but that's part of, you know, our teaching" (P2, 17:38). A workshop is a teaching structure that pushes students to be creative and responsible in their own learning. In workshops, students take charge of their own learning, become active and engaged in their work and development of understanding. (Mukurunge et al., 2021)

### *Tutorials*

Only one participant mentioned using tutorials in teaching medication adherence in their institution. Participant 4 stated that: "in that, and there are tutorials as well" (P4, 08:37). Tutorial teaching method is a follow-up on lectures. According to Kumar et al. (2016), tutorial classes for medical students are used to develop and test their own ideas, clarify the material presented in lectures, apply general concepts to the solution of specific problems, define new problems and seek solutions to them, hone problem-solving skills and encourage students in self-learning.

## *Practicals*

Two participants made mention of using practicals in teaching medication adherence.

Participant 1 stated that:

And of course, then the practicals, where it can be on a different topic, but then elements of the importance of adherence or how to improve adherence would come in, and so that would help the students to learn more about that (P1, 19:31)

Practicals are based on the importance of adherence and ways of improving adherence. Participant 6 made mentioned students developing asthma care plans in practicals. Participant 6 stated, "I suppose in the third year practicals, they have to look at the development and actual practical development of asthma care plan "(P6, 08:33).

Practicals are a demonstration method. The demonstration method teaches by exhibitions and explanations combined to illustrate a procedure or experiments. Practicals correlate theory to practice and make material and concepts understandable to students (Abrahams & Millar, 2008).

## *Readings*

Only one participant mentioned incorporating readings when teaching students about medication adherence. The readings are journal articles on adherence to help students better understand the topic:

So, if any articles or journal articles are available on adherence, I encourage the students to read those to understand adherence better. Because in lectures, they don't get, they do get the basic information, but they don't get enough time to explore what the topic is about in depth (P1, 18:40).

Readings help students understand what they are taught in lectures and can widen their knowledge at the pace they are reading at.

## *Tasks*

Two participants made mention of using tasks in teaching medication adherence. The tasks were both group work and individualised as well.

- "Where some of it is group work, some of it is individualised" (P4, 08:37)
- "Yeah, certainly in the elective, there are tasks", and "But I suppose there is also some task activity that engages the students in the process." (P6, 08:33)

The students complete a task in pairs or groups, and the teacher monitors and offers encouragement. Tasks have clearly defined outcomes to help students understand a certain aspect of a subject or topic.

### *Assignment*

As part of an assignment, the students are made to speak to the community about illnesses and encourage them to adhere to their medications. As stated by participant 6: "We do have assignments, where students have to go out and speak to somebody about illness or speak to them about some aspect of their well-being" (P6, 11:44).

An assignment is a self-study which supplements classroom teaching and provides training for information seeking and behavioural retrieving. Learning experiences from various sources is developed (Chen et al., 2013).

### *Videos*

Only one participant mentioned using videos to teach students calculations for assessing adherence, "And also, just a few videos, I think one or two videos that I asked them to watch on the calculations for assessing adherence." (P1, 19:31). Teachers make use of technology in the classroom to make teaching processes more efficient and aid in student learning. Videos can be a great way to keep students interested in the content of a subject or topic (Wood et al., 2007).

It was concluded in the international perspective on adherence paper that didactic teaching should be supplemented with workshops where students can discuss and resolve clinical cases which highlight nonadherence (Marie-Schneider & Aslani, 2010).

All the participants used lectures or didactic lectures to teach medication adherence. A few of the participants depend on just the lectures. Still, most participants use different teaching methods to make students better understand and engage with the topic as already stated case scenarios consolidate the principles taught in lectures. Fewer participants use teaching methods like assignments, workshops and even videos. This is because, in some institutions, medication adherence is not assessed during coursework but at the end of the course and assessed only in exams. Having practicals helps students to engage with the topic and creates a platform to ask questions they wouldn't have been able to ask in class or during lectures.

#### 4.2.3.6 Effectiveness of methods used

After identifying the different methods of teaching medication adherence employed by the participants, their perceptions of the effectiveness of the methods were explored. Two consistent responses were identified, and these were effective and somewhat effective. No participant stated that their method was ineffective.

The perceptions of the teaching methods as effective were based on assessments. For example, Participant 1 said that:

I think they were for the level of, um, given the level of lectures that were given, the amount of information that was given to them, they seem to engage well, and I think it was effective. I would base my effectiveness really on an assessment. The assessments said they had any questions related to adherence; most seemed to be able to answer them quite well. Some of them were applied questions, and they could answer them quite well. So, in that regard, I would say that they were effective. (P1, 20:55)

Participants who responded to their teaching methods as being only “somewhat” effective attributed it to student attendance in lectures and tutorials. Participant 3 highlighted challenges in measuring the effectiveness of the technique they used in teaching, saying:

Well, it depends on how you measure effectiveness. If you measure effectiveness in terms of how your students are practising the theory that

they learn, that's one thing, I won't be able to answer that because I'm not sure that they are (P3, 12:38).

Some participants were unsure how to respond to the question of the effectiveness of the methods they used. The students seem to understand theoretically, and the participants are concerned if the students do understand the topic in practice. Another participant had a challenge with students having to attend lectures:

"Yeah, effective. Somewhat, I would say somewhat effective. But then the biggest challenge obviously when we when it comes to students in trying to teach this is ensuring that they attend these lectures, the tutorials" (P4, 09:45)

#### 4.2.3.7 Time spent teaching medication adherence

The time spent teaching medication adherence is crucial to note as it suggests the emphasis and focus that is put on a topic or subject. The time spent teaching medication adherence was based on the number of lectures. It was noted that the duration of a lecture differed amongst the institutions. On average, four lectures are dedicated to teaching the topic or subject of medication adherence. Most of the participants' lecture period was 45 minutes.

One participant highlighted that their lecture could be 90 minutes or 120 minutes: "So depending on my lectures to if it's like 90 minutes, or it's 120 minutes, yeah." (P5, 02:55).

#### *Time sufficiency*

Most participants felt that their time teaching medication adherence in their respective institutions was insufficient. Participant 1 highlighted this notion when they said:

Yes, that time was insufficient; I think it was enough to cover the basics. But suppose you want to go a bit more in-depth. In that case, I might have needed a bit more time with adherence, notably because, at some point, I introduced specific calculations and didn't have enough time for the students to try and apply that knowledge or use those calculations in an

example. So just because of time, I didn't have enough time to do that (P1, 15:27).

There is a need for more time to be dedicated to teaching medication adherence to fully exhaust the topic, make students understand and engage with it, in turn, promote medication adherence. Participant 6 also expressed concerns that insufficient time was devoted to medication adherence and suggested that: "we should give a lot more time to medication adherence. I think it's an important topic. And if not as a course on its own, it should be a topic specifically taught within our program." (P6, 08:07).

Only one participant responded that the time they spent teaching medication adherence in their institution was sufficient: "I think so because the important thing is that they need to know what I mean, they need to know the difference between adherence and compliance, and then you will assist them on that as well." (P5, 03:15).

#### 4.2.4 Participants' perceptions of student understanding, engagement and assessments of the topic of medication adherence

This section looks at the participants' perceptions of students' understanding of medication adherence as taught at their respective institutions according to the teaching methods and time spent teaching them.

##### 4.2.4.1 Student understanding of the topic

The perception of participants was that the students either understood the topic or did not fully grasp it. The uncertainty around whether the topic was fully understood seemed to lie with doubt about students' ability to apply and practice the theory they were taught in class in the practical context.

Participants who responded that their students understand the topic when they teach them attributed their response to the topic being relatable, student body language during lectures and student performance in tests and assessments. Participant 1 attributed their perceptions of student understanding of the topic to the assessments given to them and the responses given by students in class when asked if they understood the topic:

I think they do. As I said, assessments are the only means to check whether they understand the topic. So, from the assessments that were given, it seems that they understood the topic, understood the topic well. When asked if they understood, they mentioned that they did (P1, 24:24).

Participant 1 supported this claim by adding:

Their body language during lectures seemed to reflect that they did, but ultimately, the only way to check if they did is through assessment, and so far, I think they've understood what was given to them (P1, 24:24).

Participant 2 highlighted the possibility of students understanding theory but not sure of daily practice application: "and if we go by performance in tests, I do think there is an understanding of the theory, yes." (P2, 21:03). Participant 5 said a similar thing:

And then, yeah, you take them from the basics so they might understand. And they can ask questions if they don't, and then they get tested in the exams. So, you know, if they're not answering it, then maybe they didn't understand it, but that won't be the majority of the students (P5, 08:12).

#### 4.2.4.2 Student level of interest and engagement

Participant perceptions of the student's level of interest and engagement with the topic of medication adherence were explored, and six categories of responses emerged. These were:

- Always interested
- Fully engaged
- Keen
- Somehow interested
- Affected by COVID-19
- Poor

The responses consisted of two extreme sides and a neutral option linked to the middle answer options. The two extreme sides were: high student level of interest and engagement under the responses always interested, fully engaged and keen, and low



student level of interest under the responses affected by COVID-19 and poor. The middle answer option was from the response somewhat interested.

## High student level of interest and engagement

### *Always interested*

One participant mentioned that their students were always interested and engaged in the topic of medication adherence when taught to them as it is a relatable topic or subject:

I think students are always interested. You know, I think, particularly when you teach it from a kind of perspective of asking students if they'd ever had medicines before, how adherent they were, what non-adherence means, I think they do engage in it (P6, 14:13).

### *Fully engaged*

Most participants experienced full engagement from their students teaching medication adherence, which was attributed to the relatable topic and the very interactive sessions. Participant 2 stated: "Look, I do think students engage with it and enjoy it because it's very relatable, it's very practical." (P2, 21:24). Similarly Participant 3 said: "Discussion is always encouraged. And lack of participation is always discouraged. But because it is such a relatable topic, I found that we were still in class the year I taught it. It was students were very, very engaging." (P3, 15:48).

### *Keen*

Being keen was one of the responses one participant gave concerning student understanding and engagement with the topic. Participant 1 responded: "They seemed keen, but as I said, it was part of another course that I had been teaching" (P1, 26:13).

### *Somewhat interested*

One of the responses to student understanding and engagement with the topic of medication adherence from the participant was "somewhat interested". Participant 1 supported this by saying: "There was interest, there was engagement, but I think that

there is room for improvement, but they could be more engaged and more interested than they were, in this case." (P1, 26:13). This participant highlighted the possibility of improvement in student understanding and engagement in their institution.

## Low student level of interest and engagement

### *Affected by COVID-19*

Due to COVID-19, face-to-face interactions were banned, and online learning was utilised as an alternative to teaching. Participants highlighted that they felt they were speaking to the screen and not getting any engagement from the students because some students can get online and be occupied by other things. Participant 3 said:

Yes, they catch the recording at a later stage. And I'm not sure if this is what our students typically do. We speak to the screen, and you have a live meeting like we are now, and students don't want to share their voices.

(P3, 16:47)

Participant 5 likewise suggested: "Well, you know, let's be honest, with COVID, it was challenging to judge because you're talking to a screen, but when in a face-to-face, I have, I have the maximum engagement of students because I believe in interactiveness." (P5, 08:39). COVID-19 posed a significant learning challenge; the transition from face-face to online learning wasn't very smooth it led to students being less engaged with their work and attending classes. Some who attended classes were logging into the system for attendance, reflected in the work they submitted and the lack of engagement during online classes.

### *Poor*

Participant 3 mentioned that their student level of interest and engagement when teaching medication adherence was poor, and attributed this to online hybrid teaching:

"But we speak about this all the time, in terms of student engagement with online material being so poor, and even if we have a discussion forum, or, you know, an online lecture, students don't like to attend." (P3, 13:58)

Participant 3 went on further to state: "So yeah, engagement is poor, but that's not an adherence issue. I think it's a general online hybrid teaching and learning thing." (P3, 17:10). As already mentioned under the effects of COVID-19, online hybrid learning was perceived to have a severe impact on student engagement and class attendance.

In situations or circumstances where student engagement is low, lecturers always encourage the students to engage in class discussions, which helps in clearing any doubts or misconceptions they may have about the topic. Engaging with the topic also helps students better understand and raises the lecturer's awareness of what the students know and understand.

#### 4.2.4.3 Student assessments

How students were assessed on medication adherence was explored with participants. Some of the ways or methods of student assessments have been mentioned previously under methods used in teaching medication adherence. These standard methods or practices of assessment appeared to be:

- Assignments
- Case scenarios
- Tutorials
- Practical

Three of the other ways or methods of student assessments identified were:

- Tests
- Reports
- Exams

##### Assignments

Students were assessed using graded assignments. Participant 3 stated that: "There was a graded assignment covering health behaviours, patient ethics, and patient communication, including adherence." (P3, 17:51).

##### Case scenarios

With case scenarios, they were found in assignments, tests and exams. Students were asked case scenario-based questions on medication adherence to deduce their level of understanding of the topic. Participant 1 explained that: "So, they had a written test that there were questions there, mainly there was a case scenario question" (P1, 27:32). Participant 2 and 6 also described using case scenarios, with Participant 6 saying: "mainly, there was a case scenario question in both the exam and the tests" (P6, 27:32). While Participant 2 said: "but we also do have assignments that may be like case-based or scenario-based assignments, where students would have to apply" (P2, 22:27)

## Tutorials

Only one participant mentioned having quiz tutorials for assessments. Participant 3 stated that: "And normally, we will do a quiz or tutorial as well, to do some formative learning" (P3, 17:51)

## Practicals

Only Participant 6 mentioned having practicals for marks as part of their assessments: "And yeah, the fourth-year elective, there's the practical aspect. And that gets marked, they have actually to create an adherence device for an elderly person." (P6, 15:24).

## Tests

Tests were the most common form of assessment used. Most participants mentioned having tests as part of student assessments on medication adherence. They stated that:

- "So, assessment was via a test" (P1, 27:32)
- "So, it will generally be tests and exams" (P2, 22:27)
- "So, before COVID and lockdown, we used to have two class tests and a formal exam, and adherence was covered in those class tests and the formal exam." (P3, 17:51)
- "But what counts is the test and then the final exam, that's all included." (P4, 13:58).  
"Yeah, so they so we have tests..." (P5, 09:33)

## Reports

Having reports as part of student assessments was highlighted by participant 6, who stated: "And then the research methodologies the report that they submit gets assessed." (P6, 15:24)

## Exams

Like tests, exams were also a common form of student assessment. All participants conduct exams at the end of teaching medication adherence in their respective institutions. This was supported with comments like:

- "it was also via the exam" (P1, 27:32)
- "So, it will generally be tests and exams" (P2, 22:27)
- "And as I said, we also have that exit, exit oral exam." (P2, 22:48).
- "So, before COVID and lockdown, we used to have two class tests and a formal exam, and adherence was covered in those class tests and the formal exam." (P3, 17:51)
- "But what counts is the test and then the final exam, that's all included." (P4, 13:58)
- "Yeah, so they so we have tests, and we have final exams." (P5, 09:33)
- "It's a theoretical assessment, so exams" (P6, 14:13)
- "So, it's only in the exam." (P7, 10:57)

### 4.2.5 Suggestions for future teaching

As the participants interviewed were mostly experienced lecturers in pharmacy practice and had taught medication adherence for some time, they were also asked for suggestions for future teaching. This question appeared to lead participants to reflect on their teaching skills honestly and explore what changes they would like to make to improve their teaching. The suggestions brought forward to improve the teaching of medication adherence included:

- Adherence as a subject
- Assessments counting for marks

- Assignments
- Practical projects
- Practical teaching and patient tracking

#### 4.2.5.1 Adherence as a subject

In all the institutions, medication adherence was not taught as a subject. Instead, it was embedded in other topics, thereby perhaps not being given the necessary attention. Participant 6 stated: "It's an interesting question that you now raise. I, I've often thought for a long time, I'd love to. I would love actually to teach it here and as a subject." (P6, 09:46). Participant 6 went on to explain that teaching medication adherence as a subject or topic on its own would help students to understand better and engage with the topic. When the topic is raised in other subjects or courses, students already know what it is, and there is a danger that they will only relate medication adherence to that subject, course context, and content. This is in line with one of the recommendations that arose from GRIPP, that "medication adherence should be emphasized more and additional classes should be dedicated to this subject" (Marie-Schneider & Aslani, 2010).

#### 4.2.5.2 Assessments counting for marks

Participants who included assessments that did not contribute toward class marks felt that this might be a key to getting students to taking the subject more seriously. Participant 4 suggested the following:

So, in terms of trying to improve, I would make this count towards maybe a final mark, whatever tutorials we might have, instead of them just getting examined on a portion of it during a test or the final exam. I would rather also make sure that the smaller tutorials we have in between and the case studies I give them count a certain percentage towards the final mark, that way, we get better engagement. (P4, 10:07)

When assessments don't count for marks, there is a potential for a lack of commitment from the students to the tasks given to them, but when assessments count for marks,

student engagement with the topic is improved (Trotter, 2006). Participant 1 highlighted the notion that assessments drive learning:

Yes, I'd like to improve my methods, mainly by giving assessments more assessments, because there's a saying, "assessment drives learning". So, the more they engage with different types of assessments, not necessarily high stakes assessments that count for many marks, but low stakes assessments where they need to see how far they've gone (P1, 22:02).

Assessments drive learning and capture students' time and energy. When there are no assessments, students do not do the associated studying; for example, students will rarely write unassessed essays (Gibbs, 2010). Assessments consolidate prerequisite skills or knowledge before introducing new material. Assessments also help students monitor their progress, develop self-evaluation skills, and to feel a sense of accomplishment. Students tend to gain higher marks from coursework assignments than they do from examinations. Students consider coursework to be fairer than exams, to measure a more excellent range of abilities than exams and to allow students to organise their work patterns to a greater extent. (Gibbs, 2010; Trotter, 2006)

#### 4.2.5.3 Assignments

Assignments were suggested as a useful tool by Participant 6 to improve teaching of medication adherence: "And I think, you know, as an assignment that looks at medication adherence, it would be good" (P6, 11:44).

#### 4.2.5.4 Practical projects

Practical projects help the student to understand the relationship between theory and practice. Practical projects also help students to engage and have a better understanding fully (Abrahams & Millar, 2008). Participant 6 described what they viewed as a practical project that could be used to teach the difficulties associated with medication adherence:

I would love to get the students to do a practical project where they are given, for example, a vitamin tablet, and they must take that vitamin tablet

in an adherent manner, so and then for them to reflect and report on these specific problems with adherence. (P6, 09:46)

Participant 6 further added:

Part of my reasoning for providing those projects is to develop and improve the student's understanding of the factors contributing to or hindering medication adherence. And I think introducing that as compulsory or not, but standard for all students, a project of that sort of nature, would also be beneficial to hear from patients. (P6, 09:46)

The positive use of “pill-taking” experiences, as described by Participant 6, to teach students about challenges experienced by patients in medication adherence is well described in the literature (Seet et al., 2020). However, it needs to be noted that although “pill-taking experiences”, can help students appreciate the difficulties and complexities associated with medication adherence, according to researchers Witry et al. (2017), such approaches are less able to address “the psychosocial aspects of adherence”. Witry et al. (2017) suggest that interaction with patients who take medication could assist students in understanding patients' experiences and perspectives. This was something that was proposed by participants and is reported in the next sub-section.

#### 4.2.5.5 Practical teaching and patient tracking

Practical teaching and patient tracking were the last suggestions from the participants. Practical teaching was suggested as it creates room for student engagement and involvement with medication adherence. Students being allowed to actively engage with patients and patient records at health facilities was suggested as aid them gaining practical experience with medication adherence by Participant 1:

And if they are practicals that they can engage in, for example, if they can go into a facility and do the calculations, for example, for adherence, to check how adherent patients are or have like real-life interactions where they assess adherence or try and improve adherence over a prolonged time. (P1, 22:02)



Participant 3 also highlighted the need for a system of education that could allow educators to teach adherence practically and track patients. Suggesting that this would make students more accountable and fully engaged:

Um, you know, in an ideal world, it would be wonderful if time and the education system could allow us to teach adherence practically and track patients. But our current circumstances are not well laid out to choose to, you know, to dispense the medication by a student and track how that patient takes the medication over a long time. (P3, 12:56)

Marie-Schneider and Aslani (2010) support this notion that the teaching of medication adherence should be supported by students having the opportunity to discuss and resolve clinical cases in which nonadherence is highlighted.

#### 4.2.6 Participant feedback

In order to confirm the trustworthiness of the data collected and analysed during this phase of the study, the interview transcript and the final report was sent to participants for member-checking. Participants were asked the following:

Please review the interview transcript and how I have used your comments in my report. Please indicate that you are satisfied that your identity and that of your University have been adequately concealed and that no identifying features that might disclose your identity are included. Please indicate if the way I quoted you in the report reflects what you intended.

Participant responses suggested that they were satisfied that their identity was adequately concealed and that what they said was adequately interpreted and reported. Examples of typical feedback received ranged from “I am happy with the transcript and report” to “Thank you for your email and the opportunity to participate in your study. I find the results very enlightening and am quite satisfied that you have represented what I said well and there is nothing included that could lead to the identity of myself or my university being revealed” to “I take it the transcript will not be submitted as that contains identifying information? will only be the results sections where all info has been redacted? If so, all is well on my end, I am happy with it”.

#### 4.2.7 Summary of the teaching of medication adherence

As reported in this results section, pharmacy students are educated on medication adherence and the skills and knowledge required to identify, monitor and support patient adherence to therapy. However, there is scope to increase the course content on medication adherence. Furthermore, while medication adherence is a topic integrated into most disciplines and across many courses at the four institutions included in the study, it is perhaps necessary to consider a consolidated course or module focusing explicitly on medication adherence.

The results presented in this chapter were largely consistent with the global perspective that emerged from GRIPP and summarised by Schneider and Aslani (2010). The summary emerging from the GRIPP series of papers medication adherence concluded that teaching medication adherence should focus on the definition of adherence and the related terms; the prevalence of the problem; determinants of nonadherence; clinical and economic impacts of nonadherence; theoretical frameworks underpinning patient medication-taking behaviour; identifying nonadherence; strategies to monitor and support adherence in daily practice within a holistic and interdisciplinary approach; and skills and knowledge that are required to be able to deliver the services, e.g. communication skills and motivational interviewing (Marie-Schneider & Aslani, 2010).

#### 4.3 Chapter Summary

This chapter reports on the findings of the two-phased research study conducted. Document analysis of the pharmacist's role in medication adherence as described in national policies and guidelines was conducted. A total of 38 documents were identified and analysed. The critical roles of pharmacists that were identified were in drug use, supply and management, dispensing, therapeutic drug monitoring, pharmacovigilance, pharmaceutical care, and special programmes like antimicrobial stewardship (AMS), multi-drug resistant tuberculosis (MDR-TB) care and antiretroviral treatment (ARV) and chronic conditions. The pharmacist's role in many policies was not distinguishable from that of other healthcare professionals and was often implied as part of a more generic role.

In-depth interviews were conducted with lecturers to investigate and report on the inclusion of medication adherence and the teaching thereof in the curriculum of the BPharm degree in pharmacy institutions in SA. It was found that the topic of medication adherence is integrated into all subjects throughout the curriculum and not taught as a formal course. The teaching methods identified included lectures, case studies, workshops, tutorials, practicals, readings, tasks, assignments and videos. Student understanding, interest and engagement with the topic were explored and determined through their assessment performance and class attendance. It was concluded that there is scope to increase the course content on medication adherence, mainly to focus on understanding the patient's perspective of barriers and facilitators to adherence.

## CHAPTER 5

### CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

In the first part of this study, an analysis of policy documents and guidelines was conducted to outline the pharmacist's role in medication adherence in South Africa., as described by policy documents. The second phase of the study explained how pharmacy students are prepared to promote medication adherence during their undergraduate training. In this final chapter, conclusions are drawn, recommendations for future research and practice are offered, and the study's limitations are highlighted.

#### 5.1 Study conclusions

National policies and guidelines from the past twenty years were analysed to identify and describe the pharmacist's role in promoting medication adherence in South Africa. Although the pharmacist's role mainly comprises the traditional dispensing role, it is more than just that. The critical roles of pharmacists in medication adherence were concluded to be medication use, supply and management, dispensing, therapeutic drug monitoring, pharmacovigilance, pharmaceutical care, and special programmes like antimicrobial stewardship (AMS), multi-drug resistant tuberculosis (MDR-TB) care and antiretroviral treatment (ARV) and chronic conditions.

The pharmacist's roles relating to medication adherence defined in the documents do not explicitly mention a pharmacist; mention is made of a health care worker or clinician. Pharmacists are medicine experts with frequent patient contact and are often the last healthcare professional to interact with the patient. The fact that in policy documents, their roles in medication adherence are not generally distinguishable from that of other healthcare professionals is a cause for concern. The overlapping of roles and the lack of accountability it may lead to has the potential for chaos in the health sector due to many healthcare professionals undertaking the same role. Pharmacists as individuals and as a profession have an important and unique role to play in promoting and improving medication adherence and need to be proactive in having this role recognised in healthcare in SA.

It is, however, clear from the study that national policies specifically support medication adherence as part of a complex health service. The development and implementation of these policies are a sign that medication adherence is becoming increasingly important. However, there is still a long way to go, not only to ensure that specific national policies are guiding the delivery of adherence-promoting services but that pharmacists are delivering services to their patients regularly within the overall context of the healthcare system.

As reported in the results, pharmacy students at the institutions participating in the study are educated on medication adherence and the skills and knowledge required to identify, monitor and support patient adherence to therapy. However, participants highlighted the need for more dedicated time in the curriculum for the teaching of medication adherence and greater opportunity for students to engage with and understand the topic. More specific emphasis on medication adherence is important to equip students for future practice.

Medication adherence is currently integrated into most disciplines and across most years of study. Multiple teaching and assessment methods are employed to improve student understanding and engagement with the topic. However, there is scope to increase the course content on medication adherence, mainly to focus on understanding the patient's perspective of barriers and facilitators to adherence.

## 5.2 Future recommendations for practice and research

Regarding policy and medication adherence, it is recommended that pharmacists in SA, as a profession, lobby to have their role in medication adherence more recognised. More research into the current and potential roles of the pharmacist in this area must be conducted and used to support such a drive. There is a need for policies and guidelines to distinguish health professional roles more explicitly for the smooth running of the health sector and the improvement of adherence.

In terms of teaching medication adherence in the BPharm programme, it is recommended that medication adherence be given more prominence in the curriculum. It should be given more time and taught as a distinct module. It is also recommended that a practical approach to teaching medication adherence be adopted, to allow

students to become more engaged and involved. A practical approach could also include “pill-taking” experiences, patient interactions, and tracking.

There is a need to identify effective strategies for preparing pharmacists to assist patients in medication adherence, and future research in this area should be expanded to include student perceptions.

### 5.3 Limitations of the study

Nine institutions offer undergraduate pharmacy education in this country, yet only four universities chose to participate in this study. Although no university actively refused participation, some did not respond to the gatekeeper invitation, or once gatekeeper permission was received, there was no response to the invitation extended through the Head or Dean of the pharmacy school. This limited participation can be viewed as a limitation since it may not provide a complete picture of the situation in SA. And also the lack of data saturation was a limitation in this study. However, the qualitative nature of the study and the lack of need to generalise the findings means that the information received from participants is valuable. It provides a start to understanding the situation and proposing changes.

### 5.4 Final concluding comments

Medication adherence remains a global problem, and pharmacists have a significant role in promoting and improving adherence. However, the outcomes of this study suggest that currently, in SA, neither policy nor pharmacy education can be viewed as doing everything possible to support the pharmacy profession in this role fully. The profession needs to work toward getting the unique contribution it can make to this critical issue recognised when policies are drafted. Furthermore, a strengthened focus on medication adherence in undergraduate pharmacy education could enhance the pharmacist's future role in promoting medication adherence. In the absence of previous South African research in this area, this study can be viewed as making a significant contribution to the existing body of international research.

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## APPENDICES

### Appendix A : Data extraction tool for document analysis

Author	Title	Governing body	Year published	Phenomenon of interest	Context	Reference
1.National Department of Health	Essential Medicines List	National Department of Health	2017	Pharmacist role Pharmacist role as part of the health care team	Guides/Guidelines	(NDOH, 2017c)
2.National Department of Health	Strategic Framework Cancer	National Department of Health	2022	Pharmacist role	Strategic Documents and Plans	(NDOH, 2022)
3.National Department of Health	PHC Standard Treatment Guidelines and Essential Medicines List	National Department of Health	2020	Pharmacist role as part of the health care team	Manuals and Toolkits	(NDOH, 2020e)
4.National Department of Health	PHC Standard Treatment Guidelines and Essential Medicines List	National Department of Health	2018	Pharmacist role as part of the health care team	Manuals and Toolkits	(NDOH, 2018c)

5. National Department of Health	Adherence Flip File	National Department of Health	2020	Pharmacist role as a health care worker and health promoter	Guides/Guidelines	(NDOH, 2020a)
6. National Department of Health	Communicable Diseases Hypertension	National Department of Health	2021	Pharmacist role as part of the health care team	Guides/Guidelines	(NDOH, 2021b)
7. National Department of Health	TB	National Department of Health	2021	Pharmacists/pharmacist assistant role	Guides/Guidelines	(NDOH, 2021c)
8. National Department of Health	Clinical Genetics	National Department of Health	2021	Pharmacist role as a healthcare provider	Guides/Guidelines	(NDOH, 2021a)
9. National Department of Health	Referral Policy for South African Health Services and Referral Implementation Guidelines	National Department of Health	2020	Pharmacist role	Guides/Guidelines	(NDOH, 2020d)
10. National Department of Health	Sexual and Reproductive Health Rights	National Department of Health	2019	Pharmacist role Pharmacist Assistant role Pharmacist role as part of the health care team	Guides/Guidelines	(NDOH, 2019b)

11.National Department of Health	HIV/AIDS HIV/AIDS TB Maternal and Child Health Communicable Diseases Primary Health Care Mental Health	National Department of Health	2019	Pharmacist role	Guides/Guidelines	(NDOH, 2019a)
12.National Department of Health	A health promotion tool for health professionals	National Department of Health	2018	Pharmacist role as a health care professional	Guides/Guidelines	(NDOH, 2018b)
13.National Department of Health	Antimicrobial Resistance	National Department of Health	2018	Pharmacist role	Guides/Guidelines	(NDOH, 2018a)
14.National Department of Health	Integrated Adherence Guidelines	National Department of Health	2016	Pharmacist role Pharmacist role as a clinician Pharmacist Assistant role	Guides/Guidelines	(NDOH, 2016)
15.National Department of Health	Tuberculosis HIV/AIDS TB Maternal and Child Health Ideal Clinic Primary Health Care	National Department of Health	2014	Pharmacist role as a health care worker	Guides/Guidelines	(NDOH, 2014)

16.National Department of Health	Adult Primary Care	National Department of Health	2013	Pharmacist role as part of the health care team	Guides/Guidelines	(NDOH, 2013)
17.National Department of Health	Quality improvement guide	National Department of Health	2012	Pharmacist role	Guides/Guidelines	(NDOH, 2012b)
18.National Department of Health	Management of Drug-Resistant Tuberculosis	National Department of Health	2012	Pharmacist role Pharmacist role as a health care worker	Guides/Guidelines	(NDOH, 2012a)
19.National Department of Health	EPI Vaccines Guidelines	National Department of Health	2010	Pharmacist role	Guides/Guidelines	(NDOH, 2010)
20.National Department of Health	Therapeutic Interchange	National Department of Health	2021	Pharmacists/pharmacist assistant role	Policies	(NDOH, 2021d)
21.National Department of Health	National Consolidated Guidelines for the management of HIV	National Department of Health	2020	Pharmacist role as a health care worker	Policies	(NDOH, 2020c)
22.National Department of Health	District Health Planning And Monitoring	National Department of Health	2017	District pharmacist role	Policies	(NDOH, 2017a)

	Framework					
23.National Department of Health	The National Health Promotion Policy and Strategy	National Department of Health	2015	Pharmacist role as a health promoter	Policies	(NDOH, 2015)
24.Government of South Africa	National Drug Policy for South Africa	Government of South Africa	1996	Pharmacist role	Policies	(NDOH, 1996)
25.South African Pharmacy Council	Pharmacy Act (No. 53 OF 1974)	Department of Health	2002	Pharmacist role	Act	(SAPC, 2002)
26.South African Pharmacy Council	GNR.1158 of 20 November 2000: Regulation relating to the practice of pharmacy	Department of Health	2000	Pharmacist role in accordance with the Pharmacy Act  Scope of practice of a pharmacist  Services provided in pharmacies	Regulation	(SAPC, 2000)
27.South African Pharmacy Council	Pharmacy Act (53/1974) (as amended): Rules relating to good pharmacy practice	Department of Health	2019	Pharmacist role	Rules	(SAPC, 2019)



28.South African Pharmacy Council	BN 108 of 24 October 2008: Rules relating to Code of Conduct	South African Pharmacy Council	2008	Pharmacist role	Rules	(SAPC, 2008a)
29.South African Pharmacy Council	BN 241 of 2022: Immunisation and Inject Technique	South African Pharmacy Council	2021	Pharmacist role: Immunisation Services	Board notices	(SAPC, 2021e)
30.South African Pharmacy Council	BN 101 of 2021: Rules Relating to the services to which a Pharmacist may levy a fee	South African Pharmacy Council	2021	Pharmacist role: PIMART services	Board notices	(SAPC, 2021b)
31.South African Pharmacy Council	BN 59 of 2018: Competency Standards	South African Pharmacy Council	2018	Competency Standards For Pharmacists	Board notices	(SAPC, 2018)
32.South African Pharmacy Council	BN 180 of 2021: Pharmacist Providing Family Planning Services	South African Pharmacy Council	2021	Pharmacist role: Providing Family Planning Services	Proposed Legislation	(SAPC, 2021d)
33.South African	Pharmacy Act (53/1974), as amended: Primary	South African Pharmacy Council	2021	Pharmacist role: Primary Care Drug Therapy	Proposed Legislation	(SAPC, 2021c)

Pharmacy Council	Care Drug Therapy Pharmacist (PCDT)					
34. South African Pharmacy Council	BN 74 of 2021: Competency Standard for Pharmacy Support Personnel	South African Pharmacy Council	2021	Pharmacist's assistant role and competency standards	Proposed Legislation	(SAPC, 2021a)
35. World Bank	Evaluation of the National Adherence Guidelines for Chronic Diseases in South Africa: Healthcare Provider Perspectives on Different Care Models	World Bank	2017	Pharmacist role Pharmacist assistant role	Report	(NDOH, 2017b)
36. National Department of Health	Revised Adherence Guidelines SOPs	National Department of Health	2020	Clinician role	Report	(NDOH, 2020f)
37. National Department of Health	Adherence Guidelines SOPs	National Department of Health	2020	Pharmacist role Pharmacy assistant role	Guides/Guidelines	

38. South African Pharmacy Council	Good Pharmacy Practice Manual and Associated SAPC rules	South African Pharmacy Council	2008	Code of conduct for pharmacists Pharmacist role	Rules	(SAPC, 2008b)
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## Appendix B: Participant information sheet



### Faculty of Pharmacy

#### **PARTICIPANT INFORMATION SHEET**

Please read the Participant Information Sheet, which provides brief information about this study. Knowing what is involved will help you decide if you want to take part in the research or not. Please read this information sheet carefully and ask questions about anything you don't understand or may want to know more about.

Dear Research Participant,

You are kindly asked to participate in a research study titled "Medication adherence: a review of education, research, practice, and policy in South Africa". You have been selected as a potential participant because you are a pharmacy practice lecturer in an educational institution offering undergraduate pharmacy education.

Should you agree to participate in the study, your participation will be in the form of a Zoom-based interview with the researcher. The interview will last anywhere between 45 minutes to about an hour. You will be asked to share your experiences in teaching medication adherence. The interview will be recorded and transcribed, but your name or that of your institution will not be included on the transcript or used for reporting purposes to maintain confidentiality and anonymity. Although your identity will remain confidential throughout and after the study, and every precaution will be taken to conceal your identity and your institution, the research study results may be presented at scientific conferences and specialist publications. Because of the small number of pharmacy schools in the country, there is a potential risk that others may recognise the institution through inference; however, every precaution will be taken to minimise this risk. You will also be invited to review the final research report to confirm that it is a true representation of what you said and to confirm that you are satisfied that your identity is not revealed.

Please note that participation in this study is voluntary. Your decision to participate or not will not affect your current or future relationship with the researchers or anyone else at Rhodes University. You are free to withdraw at any time, without penalty or reason.

Please feel free to ask the researcher to clarify anything unclear to you. You have the right to query concerns regarding the study at any time. Please feel free to immediately report problems to either the researcher or their supervisor during the study. The telephone numbers of the researcher and their supervisor are provided below. Please feel free to call these numbers if the need arises.

You must also be aware that the University's Research Ethics Committee-Human has approved the study's ethical integrity (REC-H). The REC-H consists of independent experts responsible for ensuring that research participants' rights and welfare are protected and that studies are conducted ethically. Studies cannot be undertaken without REC-H's approval. Queries regarding your rights as a research subject can be directed to the Research Ethics Committee (Human).

If you do decide to participate in the study, aside from giving up your time, we do not expect or anticipate that there will be any risks or costs for you associated with taking part in this study. We cannot guarantee that you will receive any direct benefits from participation in the study. You do, however, have a right to receive feedback about the overall results of this study. This feedback will be in the form of a one-page summary. You will receive this feedback via email once the study has been completed.

Thank you for your time and consideration.

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Student Researcher: Cynthia N Nyoni

Cell: +27 (0)67 187 6303

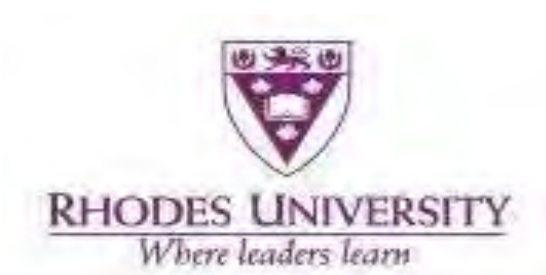
Email: [g17n4621@campus.ru.ac.za](mailto:g17n4621@campus.ru.ac.za)

Supervisor: Prof S.F Burton

Cell: +27 (0)73 355 6849

Email: [s.burton@ru.ac.za](mailto:s.burton@ru.ac.za)

## Appendix C: Participant consent form



Faculty of Pharmacy

### PARTICIPANT CONSENT FORM

I, ..... [PRINT FULL NAME] at this moment give my informed consent to participate in the study entitled, "**Medication adherence: A review of education, research, practice, and policy in South Africa.**"

In giving my consent, I state that:

- I have read the Participant Information Sheet and have understood what my involvement in the study entails.
- I have had the purpose and nature of the study explained to me in writing, and I have had the opportunity to ask questions about the study.
- I understand the study's purpose, what I will be asked to do, and any risks/benefits involved.
- I understand that being in this study is entirely voluntary, and I do not have to participate.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- My decision to partake in the study will not affect my relationship with the researcher, my respective place of work [name of institution], or anyone else at Rhodes University now or in the future.
- I understand that this study's results may be published and that publications will not contain my name or any identifiable information about me.
- I consent to the interview being audio recorded.
- I understand that I am free to contact the researcher to seek further clarification and information.

Signature:

Date:

## Appendix D: Interview guide

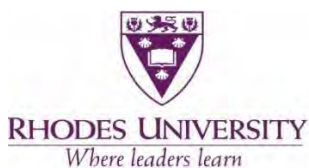
<p><b><u>Introduction</u></b></p>	<p>I want to thank you for taking the time to meet with me via Zoom today. My name is Cynthia Nomagugu Nyoni. I am a master's student at Rhodes University. I would like to talk to you about your experiences in teaching medication adherence in your institution. Part of my research objectives is to report on undergraduate education about medication adherence in pharmacy institutions in SA.</p> <p>The interview should take less than an hour. I will be taking notes during the session though I will not note all your responses. Therefore, the Zoom meeting will be recorded to avoid misquoting you or miss any of your answers and comments.</p> <p>All responses will be kept confidential, and any information included in my report will not identify you as a respondent.</p> <p>Are there any questions about what I have just explained?</p> <p>Are you willing to participate in this interview?</p> <p><b>Interviewee:</b></p> <p><b>Date:</b></p> <p><b>Consent:</b></p>
<p><b><u>Questions</u></b></p>	<p>1) Adherence is a widespread and global problem encountered by all health professionals. What do you understand by the term medication adherence?</p>

	<p>2) Is the topic adherence covered in the undergraduate BPharm curriculum? At what stage or year is the topic of medication adherence covered?</p> <p>3) In which courses is medication adherence taught and to what extent, i.e., course content?</p> <p>4) Is it taught as a standalone subject or part of other topics?</p> <p>5) How much time is spent teaching the topic? Do you think it's sufficient?</p> <p>6) What methods are used in teaching medication adherence? How effective are the methods? Would you have any suggestions on improving the methods you just mentioned?</p> <p>7) In your opinion, do you think the students understand the topic? Can you explain how you have arrived at this answer?</p> <p>8) What is the level of interest in and student engagement with the topic?</p> <p>9) How are the students assessed for the subject?</p>
<p><b><u>Closing</u></b></p>	<p>Is there anything more you would like to add?</p> <p>I will analyse the information you gave me and will invite you to review the transcript.</p>



	<p>Thank you so much for all the valuable information you have provided and for your time. That concludes our interview.</p>
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## Appendix E: Faculty of Pharmacy Higher Degrees Committee approval letter



Faculty of Pharmacy  
Artillery Road, Makhanda, 6139  
PO Box 94, Makhanda, 6140  
South Africa  
Tel: +27 (0) 46 603 8381  
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E-mail: dean.pharmacy@ru.ac.za

[www.ru.ac.za](http://www.ru.ac.za)

24 November 2021

Ms Cynthia Nyoni  
Faculty of Pharmacy  
Rhodes University

Dear Ms Nyoni

### **RE: Approval from the Faculty of Pharmacy's Higher Degrees Committee**

The Faculty of Pharmacy's Higher Degrees Committee (HDC) has recommended for approval your MPharm research project entitled:

*Medication Adherence: a Review of Education, Research, Practice, and Policy in South Africa*

Please ensure that the Faculty of Pharmacy's HDC is notified should any substantive change(s) be made, for whatever reason, during the research process.

Yours sincerely



Dr Carmen Oltmann  
Deputy Dean

## Appendix F : Ethical approval letter



**Rhodes University Human Research Ethics Committee**  
PO Box 94, Makhanda, 6140, South Africa  
t: +27 (0) 46 603 7727  
f: +27 (0) 46 603 8822  
e: [ethics-committee@ru.ac.za](mailto:ethics-committee@ru.ac.za)  
**NHREC Registration number: RC-241114-045**

<https://www.ru.ac.za/researchgateway/ethics/>

14 July 2022

Prof Susan Burton

Email: [S.Burton@ru.ac.za](mailto:S.Burton@ru.ac.za) [s.burton@ru.ac.za](mailto:s.burton@ru.ac.za)

Review Reference: 2021-5310-6472

Dear Prof Susan Burton

**Title:** MEDICATION ADHERENCE: A REVIEW OF EDUCATION, RESEARCH, PRACTICE, AND POLICY IN SOUTH AFRICA

Researcher: Prof Susan Burton

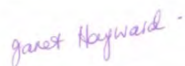
Supervisor(s): Prof Sue Burton,

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Human Research Ethics Committee (RU-HREC). Your Approval number is: 2021-5310-6472

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying you when the annual report is due.

Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Sincerely,



**Dr Janet Hayward**

**Chair: Rhodes University Human Research Ethics Committee, RU-HREC**

cc: Ethics Coordinator



			D24, pg19 (NDOH, 1996)
<b>Medicine review and management</b> - confirm patient adherence to a medicine regimen or treatment plan and identify patients requiring additional monitoring. Monitoring, receiving, recording, and reporting quality defects of medicine.	Pharmacist	<p><i>"Confirm patient adherence to a medicine regimen or treatment plan."</i></p> <p><i>"Liaise with the prescriber or other healthcare professionals to ensure the optimal use of medicines."</i></p> <p><i>"Identify patients requiring additional monitoring."</i></p>	<p>D31, pg21 (SAPC, 2018)</p> <p>D31, pg21 (SAPC, 2018)</p> <p>D31, pg22 (SAPC, 2018)</p>
<b>Control over medicines</b> - responsibility to exercise control over all medicinal and related products purchased or supplied. Pharmacists do not purchase, sell, or provide any product where they have any reason to doubt its safety, quality, or efficacy.	Pharmacist	<p><i>"A pharmacist has a professional responsibility to exercise control over all medicinal and related products purchased or supplied."</i></p> <p><i>"A pharmacist must not purchase, sell or supply any product where the pharmacist has any reason to doubt its safety, quality or efficacy."</i></p> <p><i>"A pharmacist must exercise professional judgment to prevent the supply of unnecessary and excessive quantities of medicines and other products, particularly those that are liable to be misused or abused."</i></p>	<p>D38, pg26 (SAPC, 2008b)</p> <p>D38, pg26 (SAPC, 2008b)</p> <p>D38, pg27 (SAPC, 2008b)</p> <p>D38, pg27 (SAPC, 2008b)</p>

		<i>"A pharmacist should not re-dispense a medicine, previously returned to the pharmacy by another patient, which had been in that patient's possession."</i>	
<b>THERAPEUTIC DRUG MONITORING</b>			
<b>Therapy decision-making</b> - decision on safe and appropriate therapy	Pharmacist Pharmacist	<i>"...decision on safe and appropriate therapy."</i> <i>"...decision on safe and appropriate therapy."</i>	<b>D33, pg4 (SAPC, 2021c)</b> <b>D30, pg3 (SAPC, 2021b)</b>
<b>Therapy monitoring</b> - monitoring of the outcomes of therapy	Pharmacist Pharmacist Pharmacist	<i>"...monitoring of the outcomes of therapy."</i> <i>"Monitor therapeutic outcomes"</i> <i>"...monitoring of the outcomes of therapy."</i>	<b>D33, pg4 (SAPC, 2021c)</b> <b>D31, pg23 (SAPC, 2018)</b> <b>D30, pg3 (SAPC, 2021b)</b>
<b>Medication reconciliation</b> – Taking the appropriate action in cases where medication errors are detected	Pharmacist	<i>"In cases where medication errors are detected, take appropriate action."</i>	<b>D20, pg7 (NDOH, 2021d)</b>
<b>PHARMACOVIGILANCE</b>			

<b>Managing adverse events</b> - treating adverse events following immunisation and anaphylactic shock	Pharmacist	<i>"...treating of adverse events following immunisation and anaphylactic shock."</i>	<b>D29, pg3 (SAPC, 2021e)</b>
<b>Reporting adverse events</b> - reporting of adverse events following immunisation; recording and reporting adverse drug reactions and events	Pharmacist	<i>"...reporting of adverse events following immunisation."</i>	<b>D29, pg3 (SAPC, 2021e)</b>
	Pharmacist	<i>"All health care workers, including doctors, dentists, pharmacists, nurses and other health professionals are encouraged to report all suspected adverse reactions to medicines...."</i>	<b>D1, pg609 (NDOH, 2017c)</b>
<b>PHARMACEUTICAL CARE</b>			
<b>Dose adjustment</b> – when necessary, adjust the dose accordingly and change the medication	Healthcare Professional	<i>"If necessary, adjust the dose (e.g., simvastatin, hydrochlorothiazide in liver disease; tenofovir in kidney disease) or change medication (e.g., avoid ibuprofen in hypertension, asthma)"</i>	<b>D11, pg6 (NDOH, 2019a)</b>
	Pharmacist	<i>"...adjustment of ART (where necessary) which has been prescribed previously."</i>	<b>D30, pg3 (SAPC, 2021b)</b>
<b>Medicine decision-making-</b> safety evaluation of a patient's medicine-related needs by determining the indication, safety, and effectiveness of the therapy	Pharmacist	<i>"...evaluation of a patient's medicine-related needs by determining the indication, safety and effectiveness of the therapy."</i>	<b>D26. Pg4 (SAPC, 2000)</b>
	Healthcare Professional	<i>"Confirm the patient's diagnosis, that the medication is necessary and that its benefits outweigh the risks."</i>	<b>D11, pg6 (NDOH, 2019a)</b>

		<i>"Check all medication (prescribed, over-the-counter, herbal) is necessary and for possible interactions especially if on hormonal contraceptive or treatment for TB, HIV, epilepsy."</i>	<b>D11, pg6 (NDOH, 2019a)</b>
<b>Co-operation with other healthcare professionals</b> – develop and maintain relationships with other healthcare providers and co-operate with them to achieve positive medicine-related health outcomes for patients	Pharmacist	<i>"The pharmacist must endeavour to foster, develop and maintain the role of the pharmacist as a member of the health care team with expertise in medicine-related health outcomes."</i>	<b>D38, pg20 (SAPC, 2008b)</b>
	Pharmacist	<i>"The pharmacist must endeavour to foster, develop and maintain effective relationships with professional colleagues and other health care providers and to co-operate with them to achieve positive medicine-related health outcomes for patients and the community."</i>	<b>D38, pg20 (SAPC, 2008b)</b>
	Pharmacist	<i>"Liaise with the prescriber or other healthcare professionals to ensure the optimal use of medicines."</i>	<b>D31, pg21 (SAPC, 2018)</b>
<b>Patient referral</b> - referral to another health care provider where necessary. Where appropriate, refer patients before issuing medications when issues are identified.	Pharmacist	<i>"...referral to another health care provider where necessary."</i>	<b>D29, pg3 (SAPC, 2021e)</b>
	Pharmacist	<i>"...referral to another health care provider where necessary."</i>	<b>D33, pg4 (SAPC, 2021c)</b>
	Pharmacist	<i>"...where appropriate refer patient for addressing issues identified before issuing medications or refer to facility as appropriate."</i>	<b>D14, pg101 (NDOH, 2016)</b>
	Health Professional		



		<i>"Healthcare providers working in areas other than genetics, across the levels and continuum of care, need to be trained on how to recognise, manage and refer the patient for genetic services."</i>	<b>D8, pg17 (NDOH, 2021a)</b>
<b>Pharmacist-initiated therapy</b> - discussing the use of appropriate medicines and obtaining consensus from the patient, considering patient preferences, allergies, and medical history	Pharmacist  Clinician	<i>"Discuss the use of appropriate medicines and obtain consensus from the patient, taking into account patient preferences, allergies and medical history."</i>  <i>"Provide prophylaxis / treatment"</i>  <i>"Treat as recommended by guidelines for PMTCT."</i>	<b>D31, pg23 (SAPC, 2018)</b>  <b>D14, pg57 (NDOH, 2016)</b>  <b>D14, pg63 (NDOH, 2016)</b>
<b>DISPENSING OF MEDICINES</b>			



<p><b>Phase 2: Preparation and labelling of the prescribed medication</b></p> <ul style="list-style-type: none"> <li>• Counting and packing medications</li> <li>• Clearly labelling medicine containers</li> </ul>	<p>Pharmacist</p> <p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"...preparation or packaging of any medicine or scheduled substance..."</i></p> <p><i>"...the repackaging of medicines."</i></p> <p><i>"The date of dispensing and the statement "Use within 30 days" must be clearly indicated."</i></p>	<p><b>D26, pg4 (SAPC, 2000)</b></p> <p><b>D26, pg5 (SAPC, 2000)</b></p> <p><b>D27, pg3 (SAPC, 2019)</b></p>
<p><b><u>Phase 3: Provision of information and instructions to the patient to ensure the safe and effective use of medicine</u></b></p> <ul style="list-style-type: none"> <li>• Patient counselling</li> <li>• Monitoring patient outcomes</li> <li>• Identifying areas for modification</li> </ul>	<p>Pharmacist</p> <p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"Counsel patients on the safe and rational use of medicines and medical devices (including selection, use, contraindications, storage, and side effects)"</i></p> <p><i>"Identify patients requiring additional monitoring."</i></p> <p><i>"Confirm patient adherence to a medicine regimen or treatment plan."</i></p>	<p><b>D31, pg20 (SAPC, 2018)</b></p> <p><b>D31. Pg22 (SAPC, 2018)</b></p> <p><b>D31, pg21 (SAPC, 2018)</b></p>
<p><b>SPECIAL PROGRAMMES: ANTIMICROBIAL STEWARDSHIP</b></p>			

<p><b>AMS Clinician</b></p> <p><b>Antimicrobial prescription review and use</b> - conduct antibiotic prescription reviews to decide if an antimicrobial is indicated and ensure optimal administration to prevent unnecessary or inappropriate initiation of antibiotics.</p>	<p>Clinician</p> <p>Clinician</p>	<p><i>"Timely antimicrobial initiation"</i></p> <p><i>"Accurate antimicrobial use and allergy history"</i></p>	<p>D13, pg23 (NDOH, 2018a)</p> <p>D13, pg23 (NDOH, 2018a)</p>
<p><b>Drug switch, adjustment, and administration</b> - Ensuring timely antibiotic initiation. Ensure safe medication administration to patients, minimise adverse events, improving clinical outcomes and patient outcomes.</p>	<p>Clinician</p> <p>Clinician</p> <p>Clinician</p> <p>Clinician</p>	<p><i>"Antimicrobial dosing and de-escalation"</i></p> <p><i>"IV to oral antimicrobial switch"</i></p> <p><i>"Timely antimicrobial initiation"</i></p> <p><i>"The prescriber, professional nurse and pharmacist need to check prescription charts with laboratory findings and patient identifiers before administering the antimicrobial."</i></p> <p><i>"If administered too early, the patient may experience more side-effects."</i></p> <p><i>"Late administration of time-dependant antibiotics (e.g., amoxicillin) results in concentration of drug below the minimum inhibitory concentration, which may lead to AMR"</i></p>	<p>D13, pg23 (NDOH, 2018a)</p> <p>D13, pg23 (NDOH, 2018a)</p> <p>D13, pg23 (NDOH, 2018a)</p> <p>D13, pg36 (NDOH, 2018a)</p> <p>D13, pg36 (NDOH, 2018a)</p> <p>D13, pg36 (NDOH, 2018a)</p>

<b>History taking, managing, and reporting adverse events</b> - proper antimicrobial use and allergy history.	Clinician  Clinician	<i>"Accurate antimicrobial use and allergy history"</i>  <i>"Adverse events"</i>	<b>D13, pg23 (NDOH, 2018a)</b> <b>D13, pg23 (NDOH, 2018a)</b>
<b>AMS team</b> <b>Antimicrobial prescription review and use</b> - conduct antibiotic prescription reviews to decide if an antimicrobial is indicated and ensure optimal administration to prevent unnecessary or inappropriate initiation of antibiotics.	Pharmacist	<i>"Accurate antimicrobial use and allergy history"</i>	<b>D13, pg23 (NDOH, 2018a)</b>
<b>Drug switch, adjustment, and administration</b> - Ensuring timely antibiotic initiation. Ensure safe medication administration to patients, minimise adverse events, improving clinical outcomes and patient outcomes.	Pharmacist  Pharmacist	<i>"Antimicrobial dosing and de-escalation"</i>  <i>"IV to oral antimicrobial switch"</i>	<b>D13, pg23 (NDOH, 2018a)</b> <b>D13, pg23 (NDOH, 2018a)</b>
<b>History taking, managing, and reporting adverse events</b> - proper antimicrobial use and allergy history.	Pharmacist  Pharmacist	<i>"Accurate antimicrobial use and allergy history"</i>  <i>"Adverse events"</i>	<b>D13, pg23 (NDOH, 2018a)</b> <b>D13, pg23 (NDOH, 2018a)</b>

<p><b>Medication availability and reconciliation</b> - Ensuring medications are available timeously for administration. Detecting medication errors and taking appropriate action to revert and correct them</p>	<p>Pharmacist Pharmacist</p>	<p><i>"Ensuring medications are available timeously for administration."</i>  <i>"Medication reconciliation"</i></p>	<p><b>D13, pg24 (NDOH, 2018a)</b> <b>D13, pg23 (NDOH, 2018a)</b></p>
<p><b>Patient education</b> – providing information on antimicrobial use and resistance. Importance of medication adherence</p>	<p>Pharmacist</p>	<p><i>"Patient education"</i></p>	<p><b>D13, pg24 (NDOH, 2018a)</b></p>
<p><b>Regular chart review</b> – conducting regular and daily chart reviews to ensure timely administration of antibiotics and optimal use of antibiotics.</p>	<p>Pharmacist</p>	<p><i>"Regular chart reviews and feedback by pharmacist"</i></p>	<p><b>D13, pg32 (NDOH, 2018a)</b></p>
<p><b>Therapeutic drug monitoring</b> - monitoring outcomes of therapy</p>	<p>Pharmacist</p>	<p><i>"Therapeutic drug monitoring if indicated."</i></p>	<p><b>D13, pg23 (NDOH, 2018a)</b></p>

**SPECIAL PROGRAMMES: MDR-TB CARE**

<p><b>Drug storage, monitoring and availability</b></p> <ul style="list-style-type: none"> <li>• <b>Constant and continuous supply of drugs</b> – ensure availability of second-line anti-TB and ancillary drugs. Dispatch drugs for patients who have been discharged to local clinics or hospitals</li> </ul>	<p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"Ensure availability of second-line anti-TB and ancillary drugs."</i></p> <p><i>"Dispatch drugs for patients who have been discharged to the local clinic or hospital."</i></p>	<p><b>D18, pg21 (NDOH, 2012a)</b></p> <p><b>D18, pg21 (NDOH, 2012a)</b></p>
<ul style="list-style-type: none"> <li>• <b>Drug storage and monitoring</b> – ensure proper storage of the drugs (right conditions away from the sun) and monitoring drug stock levels.</li> </ul>	<p>Pharmacist</p> <p>Pharmacist</p>	<p><i>"Ensure correct storage of the drugs."</i></p> <p><i>"Monitor drug stock levels."</i></p>	<p><b>D18, pg21 (NDOH, 2012a)</b></p> <p><b>D18, pg21 (NDOH, 2012a)</b></p>
<p><b>Pharmacovigilance</b></p> <ul style="list-style-type: none"> <li>• <b>Reporting adverse events</b> - recording and reporting adverse drug reactions and events</li> </ul>	<p>Pharmacist</p>	<p><i>"All HCWs, including doctors, dentists, pharmacists, nurses and other health professionals are encouraged to report all suspected adverse reactions to medicines (including vaccines, X-ray contrast media, traditional and herbal remedies), especially when the reaction is not in the package insert, potentially serious or clinically significant."</i></p>	<p><b>D18, pg129 (NDOH, 2012a)</b></p>
<p><b>SPECIAL PROGRAMMES: ART AND CHRONIC CONDITIONS</b></p>			





		<i>relevant health professionals so that they may live well and healthy into old age.</i>	
<b>Central Chronic Medicine Dispensing and Distribution:</b> activating stable patients on CCMDD, dispensing the 1st supply of medicine to patients and co-operating with CCMDD providers concerning Pick up Points (PuP) for patient medication. Following up on patients who don't collect their CCMDD parcels and de-activating them when the need arises.	Pharmacist	<i>"Pharmacist or Pharmacy Assistant is responsible for pre-packing Treatment for clubs or medication can be dispensed and distributed via the CCMDD Programme."</i>	<b>D14, pg90 (NDOH, 2016)</b>
	Pharmacist	<i>"The patient shall receive their first supply of prescription from the facility and shall be counselled."</i>	<b>D14, pg95 (NDOH, 2016)</b>
	Pharmacist	<i>"The PuP shall notify CCMDD service provider of all patients who did not collect their medicines within 2 days after the scheduled pick-up date."</i>	<b>D14, pg95 (NDOH, 2016)</b>
	Pharmacist	<i>"Patients can be de-activated from the CCMDD programme by facilities if untraceable after 30 days..."</i>	<b>D14, pg96 (NDOH, 2016)</b>



	<p><b>Pharmacology</b></p> <p><b><u>Extent</u></b> <b>Adherence in the elderly</b></p>	<p><i>“Okay, so a lot of what is in that module is the patient care aspect of pharmacy practice.” (P3, 07:21)</i></p> <p><i>“course which is in pharmacy practice” (P4, 06:50)</i></p> <p><i>“I do the healthcare on ethics” (P5, 01:45)</i></p> <p><i>“HIV module,” (P5, 01:45)</i></p> <p><i>“Pharm care modules” (P5, 01:45)</i></p> <p><i>“chronic management of disease states for each disease state,” (P6, 04:02)</i></p> <p><i>“Um, I’m going to say yes, but in my module, so I run the specialised pharmacy module” (P7, 06:39)</i></p> <p><i>“but I think they might also just touch on it in pharmacology as well.” (P1, 11:16)</i></p> <p><i>“pharmacology” (P5, 03:15)</i></p> <p><i>“And there the students are taught specifically about medication adherence in the context of elderly patients” (P6, 04:02)</i></p> <p><i>“And it’s presented as a seminar session by one of the students, and they have a task that they have to actually develop an adherence aid for patients.” (P6, 04:02)</i></p>
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	<p><b>Patient initiated therapy</b></p> <p><b>Patient journey</b></p> <p><b>Pharmaceutical care</b></p>	<p><i>“And then they also go into how to measure nonadherence. So, the various ways looking at, you know, maybe blood blood samples, using pharmacy data in terms of, you know, when is a patient coming back for a refill, maybe pill counts, and then other surrogate markers for certain medicines. So that's more clinical and then yeah and also urine levels. So, they also look at like how to measure nonadherence clinically, and then they also look at how to actually calculate adherence. So, this is like the mathematics and the percentages.” (P2, 13:06)</i></p> <p><i>“And in that we speak about the MAS scale or the medication adherence report scale. Students are briefly taught on how to calculate adherence” (P3, 08:23)</i></p> <p><i>“But yeah, we build onto it in terms of first teaching, patient information, I mean, communication, then we talk about patient-initiated therapy and then finally adherence.” (P4, 07:14)</i></p> <p><i>“We would introduce the students to it when we first teach them about the patient journey.” (P6, 04:02)</i></p> <p><i>“we're looking at a patient centred approach in terms of how we, we interact with patients as pharmacists.” (P2,11:03)</i></p> <p><i>“But what I also want to highlight, as I said, something is implied in terms of adherence, what we do highlight or emphasise when we talk about pharmaceutical care is that everything that we talk about in terms of pharmaceutical care, essentially culminates in your patient being adherent.” (P2, 11:03)</i></p> <p><i>“So, it's almost the test, isn't it, it's almost like you've, you've put something into practice, and the only way we can test if we're not the only way, but one of the ways we can test whether or not patients are, you know, if we are actually providing not just</i></p>
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	<p><b>Role of the pharmacist</b></p>	<p><i>they look at the consequences of non-adherence and then on the patient, and then they also look at the consequences on the health system” (P2, 13:07)</i></p> <p><i>“We also cover types of non-adherence or non-adherence being primary and secondary.” (P3, 08:23)</i></p> <p><i>“And then they look at the role of the pharmacist in terms of adherence. You know, looking at the information that can be provided by a pharmacist, and there they really start to borrow from a few theories.” (P2, 14:31)</i></p> <p><i>“It's part of a module which is focused on the seven-star aspects of pharmacist as a caregiver and pharmacist as a communicator” (P3, 07:21)</i></p> <p><i>“then the focus on the pharmacist’s role in adherence counselling and then we focus on behaviour change” (P3, 08:23)</i></p> <p><i>“But we do definitely do medication adherence in terms of, I do the law, I also talk about the dispensing phases. So, when I'm talking about the phase three, so that is the counselling and what entails in counselling” (P5, 00:53)</i></p> <p><i>“Yes, certainly in first year, when we present initially the role of the pharmacist. It's actually something I teach, and I place huge emphasis on at the end of the day, we have to ensure the patient takes the medicine and the role of medication adherence is and the pharmacists’ role in ensuring that is conveyed to the student.” (P6, 16:03)</i></p>
<p><b>Effectiveness of methods used</b></p>	<p><b>Effective</b></p>	<p><i>“I think they were for the level of um, given the level of lectures that were given the amount of information that were given to them, they seem to engage well, and I think it was effective. I would base my effectiveness really on an assessment, the assessments that they had and questions that were related to adherence, most seemed to be able to</i></p>

	Somewhat effect	<p><i>answer them quite well. There were some of them were applied questions, they were able to answer them quite well. So, in that regard, I would say that they were effective.” (P1, 20:55)</i></p> <p><i>“I think so because the thing is, basically, the important thing is that they need to know what I mean, they need to know the difference between adherence and compliance, and then you will assist them on that as well.” (P5, 03:15)</i></p> <p><i>“So like I said, so for me, I'm comfortable that they do have sufficient knowledge on medication adherence.” (P5, 07:12)</i></p> <p><i>“I would say it's quite effective for this specific tutorial, it's in a lecture format” (P7, 08:17)</i></p> <p><i>“But I mean, why I will say there is some degree of effectiveness, I suppose one way we can, we can assess that is we have an exit oral exam as part of final your programme in pharmacy practice. And obviously, when we when we do examine students on that” (P2, 18:31)</i></p> <p><i>“Well, it depends on how you measure effectiveness, I suppose. If you measure effectiveness in terms of how your students are practising the theory that they learn that's one thing, I won't be able to answer that because I'm not sure that they are” (P3, 12:38)</i></p> <p><i>“Effectiveness in terms of how they score the test and exams, we are sitting with a very peculiar code at the moment of students who have been learning online and our students are struggling in general with teaching with learning methodologies, teaching learning methodologies. So, I am not sure how to answer that question” (P3, 12:56)</i></p>
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	<p><b>Following instructions</b></p> <p><b>Instructions with agreement</b></p> <p><b>Intentional adherence</b></p>	<p><i>“Yeah, so as I said, it encompasses quite a number of aspects, which I don't necessarily know that we capture very well in the way that we teach.” (P2, 09:13)</i></p> <p><i>“Or maybe not the way we teach, but the way that as healthcare practitioners, we, we think about adherence.” (P2, 09:30)</i></p> <p><i>“patient should be able to conform, firstly, to instructions that are given by the healthcare professional” (P1, 06:42)</i></p> <p><i>“following things like diet, exercise instructions, which they're provided to by healthcare professionals.” (P4, 05:58)</i></p> <p><i>“my understanding of it is that a patient should be able to conform, firstly, to instructions that are given by the healthcare professional after they have agreed with the healthcare professional about taking certain medication.” (P1, 06:42)</i></p> <p><i>“after they've agreed on taking a certain course of action. So, for me, adherence means that a patient is able to conform to the instructions and persist with taking the medication that they have been given or instructed to take by a healthcare professional after they have reached an agreement with that healthcare professional to do so.” (P1, 06:42)</i></p> <p><i>“And the patient then would not adhere to that this might be intentional, so they choose not to take it as they were told.” (P6, 02:11)</i></p>
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	<p><b>Non-intentional adherence</b></p> <p><b>Person's or patient behaviour</b></p>	<p><i>"So, for example, if we agreed that they would take it three times a day at 8am, at 2pm, and 8pm at night. And the patient then chooses to take that 6am and 12pm and then at 10 at night, changing the dosing interval" (P6, 02:11)</i></p> <p><i>"so, the patient doesn't quite understand how to use a metered dose inhaler, even though I as a pharmacist might have explained it to them" (P6, 02:11)</i></p> <p><i>"so, it's an extent to which a person's behaviour is a person's behaviour towards taking their medication and you know, following things like diet, exercise instructions, which they're provided to by healthcare professionals." (P4, 05:58)</i></p> <p><i>"adherence would be sticking to the regimen." (P6, 02:11)</i></p>
<p><b>Methods used to teach Medication adherence</b></p>	<p><b>Assignments</b></p> <p><b>Case scenario's</b></p>	<p><i>"we do have assignments, where students have to go out and speak to somebody about illness or speak to them about some aspect of their wellbeing" (P6, 11:44)</i></p> <p><i>"So, they use that, they would then try and apply the knowledge that they would have learnt on a particular case study or a particular scenario" (P1, 19:31)</i></p> <p><i>"we would use examples and case scenarios and things to further consolidate those principles." (P2, 17:32)</i></p> <p><i>"and then one or two case studies." (P4, 08:37)</i></p> <p><i>"When it comes to measuring adherence, I use two case studies" (P4, 08:37)</i></p> <p><i>"And then you start giving them the scenario." (P5, 03:15)</i></p>









		<p><i>“But it's always an under arching or overarching theme in all our teachings” (P3, 06:29)</i></p> <p><i>“So basically all your other divisions marry into the practice.” (P5, 03:15)</i></p> <p><i>“It's covered in multiple places. We would introduce the students to it when we first teach them about the patient journey.” (P6, 04:02)</i></p> <p><i>“So yes, in various ways, it's taught throughout the curriculum.” (P6, 04:02)</i></p>
<p><b>Standalone or part of other topics</b></p>	<p><b>Part of other topics</b></p>	<p><i>“it was taught as part of another course” (P1, 13:05)</i></p> <p><i>“But in other courses, it's not a standalone, a subject on its own. In my course, I took it as part of the communication course, although I had dedicated lectures that were specific to adherence.” (P1, 13:05)</i></p> <p><i>“It's not a standalone module.” (P3, 10:41)</i></p> <p><i>“Yeah, I don't think it's I don't think one will have sufficient content and credits to have it as a standalone module. But it can be a standalone topic within a module.” (P5, 01:45)</i></p> <p><i>“But I don't think it's going to bear enough credits to do so many lectures on just talking on a standalone and adherence medication.” (P5, 01:45)</i></p> <p><i>“It's taught as part of other subjects.” (P6, 06:25)</i></p> <p><i>“but it did have its own dedicated number of lectures where I just spoke about adherence only” (P1, 13:05)</i></p>





	<p><b>Quiz Tutorial</b></p> <p><b>Practical</b></p> <p><b>Report</b></p> <p><b>Test</b></p>	<p><i>“And normally, we will do a quiz or tutorial as well, to do some formative learning” (P3, 17:51)</i></p> <p><i>“And normally, we will do a quiz or tutorial as well, to do some formative learning” (P3, 17:51)</i></p> <p><i>“And yeah, the fourth-year elective, obviously, there's the practical aspect. And that gets marked, they have to actually create an adherence device for an elderly person.” (P6, 15:24)</i></p> <p><i>“And then the research methodologies, obviously, the report that they submit gets assessed.” (P6, 15:24)</i></p> <p><i>“So assessment was via a test” (P1, 27:32)</i></p> <p><i>“So it will generally be tests and exams,” (P2, 22:27)</i></p> <p><i>“So prior to COVID, and lockdown, we used to have two class tests, and a formal exam, and adherence was covered in those class tests and in the formal exam.” (P3, 17:51)</i></p> <p><i>“But what counts is the test and then the final exam, that's all included.” (P4, 13:58)</i></p> <p><i>“Yeah, so they so we have tests, and we have final exams.” (P5, 09:33)</i></p>
<p><b>Student level of interest and engagement</b></p>	<p><b>Affected by COVID-19</b></p>	<p><i>“Yes, they catch the recording at a later stage. And I'm not sure if this is, what our students typically do is, I mean, we speak to the screen and you have a live meeting, like we are doing now, students don't want to share their voices.” (P3, 16:47)</i></p> <p><i>“So yeah, engagement is poor, but that's not an adherence issue. I think it's a general online hybrid teaching and learning thing.” (P3, 17:10)</i></p>

	<p><b>Always interested</b></p> <p><b>Fully engaged</b></p> <p><b>Keen</b></p> <p><b>Poor</b></p>	<p><i>“Well you know, let's be honest with COVID it was very difficult to judge because you're talking to a screen, but when in a face to face I have, I have the maximum engagement of students because I believe in interactiveness.” (P5, 08:39)</i></p> <p><i>“I think students are always interested. You know, I think, particularly when you teach it from a kind of perspective of asking students if they'd ever had medicines before, how adherent they were, what nonadherence means, I think they do engage in it” (P6, 14:13)</i></p> <p><i>“Look, I do think students engage with it and enjoy it, because it's very relatable, it's very practical.” (P2, 21:24)</i></p> <p><i>“Discussion is always encouraged. And lack of participation is always discouraged. But because it is such a relatable topic, I found the year that I taught it, which actually was we were still in class. It was, students were very, very engaging.” (P3, 15:48)</i></p> <p><i>“And so I teach my students in, some are didactic but mostly interactive. So I'm always asking them questions, I'm always thinking scenarios, and they need to give me answers. So it's a very, it's a very interactive session. Yes. And so my students are fully engaged in my lectures” (P5, 08:39)</i></p> <p><i>“They seemed keen, but like I said, it was part of another course that I had been teaching” (P1, 26:13)</i></p> <p><i>“Um, I wouldn't say it's that great because it can definitely be better.” (P7, 10:29)</i></p> <p><i>“But we, we speak about this all the time, in terms of student engagement with online material being so poor, and even if we have a discussion forum, or, you know, an online lecture, students don't like to attend.” (P3, 13:58)</i></p>
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	<p><b>Somewhat interested</b></p>	<p><i>"The attendance gets quite low." (P3, 16:44)</i></p> <p><i>"So yeah, engagement is poor, but that's not an adherence issue. I think it's a general online hybrid teaching and learning thing." (P3, 17:10)</i></p> <p><i>"There was interest, there was engagement, but I think that there is room for improvement, but they could be more engaged and more interested than they were, in this case." (P1, 26:13)</i></p>
<p><b>Student understanding on the topic</b></p>	<p><b>Student somehow understands</b></p>	<p><i>"So for the content that was provided to them, I think they understood the subject. But I cannot speak on whether they understand how to apply it in real life at the moment, because I've not had any assessments that are structured in that way to actually check their understanding" (P1, 24:24)</i></p> <p><i>"As I said, I find it very difficult to answer I, for one am not necessarily um I don't necessarily use, you know, passing a test or an exam as necessarily understanding the topic because for me, adherence is such a practical hands-on topic." (P2, 20:09)</i></p> <p><i>"So, I do think they understand the theory, if that's what you're asking. Yes. But as I said, how that translates into practice is something that may be a little bit difficult for us to assess, you know, at that level on campus, but maybe for experiential learning" (P2, 20:09)</i></p> <p><i>"I would think they are by the end of it, they have Yes, some understanding of what it entails" (P4, 11:15)</i></p> <p><i>"And then yeah, you take them from the basics, so they might understand it. And they are given an opportunity to ask questions if they don't, and then they get tested in the exams."</i></p>

	<p><b>Student understands</b></p>	<p><i>So you know, if they're not answering it, then maybe they didn't understand it, but that won't be the majority of the students.” (P5, 08:12)</i></p> <p><i>“I think they do. Like I said, the only means to check whether they understand the topic is usually assessments. So from the assessments that were given, it seems that they understood the topic, understood the topic well. When asked if they understood, they mentioned that they did.” (P1, 24:24)</i></p> <p><i>“Their body language during lectures seemed to reflect that they did, but ultimately, the only way to actually check if they did is through assessment, and so far, I think they've understood what was given to them.” (P1, 24:24)</i></p> <p><i>“and if we go by performance in tests, I do think there is an understanding of the theory yes.” (P2, 21:03)</i></p> <p><i>“Yes, I think they do.” (P3, 14:18)</i></p> <p><i>“So it's an easy concept to understand. And it's relatable. Because many, most of us have been through the process of having to take medication every day. And we provide as many examples as possible to make it relatable to the student experience.” (P3, 15:02)</i></p> <p><i>“So in terms of the test, and the work that they have to do for the test, and how they score, there is some understanding in that also, like I said, I use mainly the tutorials which I have during the course to actually gauge how they are getting along. So I mean, you always have those who don't perform well, but the majority do above average, and they are able to grasp the concepts. So in that case, yes, I come to the conclusion that they do understand the content that I teach, and they understand the concept.” (P4, 11:37)</i></p> <p><i>“I think they do. I think, I don't know whether they understand the importance of it.” (P6, 11:44)</i></p>
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	<p><b>Students don't understand</b></p>	<p><i>"Um no, I wouldn't say that. No, I don't think so."</i> (P7, 09:22)</p> <p><i>"So every year after my module runs, we do a report back on the module, so the students give feedback. And when I go through that feedback, and the students do say that this adherence tutorial is quite complicated,"</i> (P7, 09:33)</p>
<p><b>Time spent teaching</b></p>	<p><b>Number of lecture's spent</b></p>	<p><i>"So currently, for this year I have spent, it wasn't a lot of time. I think I had about three or four lectures on adherence."</i> (P1, 14:20)</p> <p><i>"I just had three, three or four lectures on that"</i> (P1, 14:20)</p> <p><i>"In third year as I said, I think it's about three lectures"</i> (P2, 16:12)</p> <p><i>"And then in first year, I would have to get back to you on that. I'm not sure again, I don't teach the first years"</i> (P2, 16:12)</p> <p><i>"And I would say it's about seven or eight lectures on pharmaceutical care, which then encompass adherence."</i> (P2, 16:42)</p> <p><i>"I'd say a series of maybe four lectures if I am to give an estimate"</i> (P3, 11:29)</p> <p><i>"So the topic alone has about five lectures"</i> (P4, 08:07)</p> <p><i>"And those are 45 minutes long. There is also two hours of self-study which the students have."</i> (P4, 08:15)</p> <p><i>"So depending on my lectures to if it's like 90 minutes, or it's 120 minutes, yeah."</i> (P5, 02:55)</p>



		<p><i>"I think so because the thing is, basically, the important thing is that they need to know what I mean, they need to know the difference between adherence and compliance, and then you will assist them on that as well." (P5, 03:15)</i></p> <p><i>"So I'm not sure what no one can do, and if they know the strategies, that that you use in order to promote adherence, so that that should be sufficient," (P5, 03:15)</i></p> <p><i>"I'm comfortable that they do have sufficient knowledge on medication adherence." (P5, 07:12)</i></p>
<p><b>Ways of improving teaching methods</b></p>	<p><b>Adherence as a subject</b></p> <p><b>Assessments counting for marks</b></p> <p><b>Assignments</b></p> <p><b>Practical project</b></p>	<p><i>"It's an interesting question that you now raise I, I've often thought for a long time, I'd love to. I would love to actually teach it here and as a subject." (P6, 09:46)</i></p> <p><i>"Yes, I'd like to improve my methods, mainly by giving assessments more assessments, because there's a saying, "assessment drives learning". So the more they engage with different types of assessments, not necessarily high stakes assessments that count for a large number of marks, but low stakes assessments where they just need to see how far they've gone." (P1, 22:02)</i></p> <p><i>"So in terms of trying to just improve, I would actually make this count towards maybe a final mark, whatever tutorials we might have, instead of them just getting examined on a portion of it during a test or the final exam. I would rather also make sure that the smaller tutorials we have in between and the case studies I give them actually count a certain percentage towards the final mark, that way we get better engagement." (P4, 10:07)</i></p> <p><i>"And I think, you know, as an assignment that actually looks at medication adherence, it would be good" (P6, 11:44)</i></p>

	<p><b>Practical teaching and patient tracking</b></p>	<p><i>“And I think that would be an area where I could improve if I could get them into a facility or get them into a place where they can actually calculate or assess adherence and come up with interventions to help real patients who are struggling with adherence, I think that would be of great value to them” (P1, 22:02)</i></p> <p><i>“I would love to get the students to do a practical project where they are given, for example, a vitamin tablet, and they have to take that vitamin tablet in an adherent manner, so and then for them to reflect and report on this specific problem with adherence.” (P6, 09:46)</i></p> <p><i>“And part of my reasoning for providing those projects is to develop and improve the student's understanding of the factors that contribute to or hinder medication adherence. And I think to introduce that as some kind of compulsory or not, but standard for all students, a project of that sort of nature, would also be very helpful to hear it from patients.” (P6, 09:46)</i></p> <p><i>“And if they are practical that they can actually engage in, for example, if they can actually go into a facility and do the calculations, for example, for adherence, to check how adherent patients are, or have like real life, interactions where they assess adherence, or try and improve adherence over a prolonged period of time.” (P1, 22:02)</i></p> <p><i>“I think we would have to almost track them when they're practising, but also, maybe speak to our clinical counterparts to find out if, you know for experiential learning, when our students go out to facilities and interact with patients, maybe then you can ask them of their aspects of adherence that are maybe inculcated into what they're doing and how students are faring with that” (P2, 19:21)</i></p> <p><i>“Um, you know, in an ideal world, it would be wonderful if time and the system of education could allow us to teach adherence practically and track patients. But our current circumstances are not are not well laid out, to choose to, you know, to dispense</i></p>
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		<i>the medication by a student and track how that patient takes the medication over a long period of time.” (P3, 12:56)</i>
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