FACTORS AFFECTING MEDICATION USE
IN INDIGENOUS AND NON-INDIGENOUS OLDER ADULTS

A Thesis Submitted to the Charles Darwin University in fulfillment for the Award
of Masters by Research

by

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Declaration

I hereby declare that the work herein, now submitted as a thesis for the degree of Master by research of the Charles Darwin University, is the result of my own investigations, and all references to ideas and work of other researchers have been specifically acknowledged.

I hereby certify that the work embodied in this thesis has not already been accepted in substance for any degree, and is not being currently submitted in candidature for any other degree.

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Abstract

According to the World Health Organisation (WHO), 50% of patients suffering from chronic disease in developed countries do not take their medications regularly. Medication adherence ranges from 26% to 60% in persons aged 60 years or older. In Australia, patient non-adherence contributes to up to 50% of medication-related hospital admissions and in most cases it was considered preventable. Not surprisingly, older people use the most medicines because they generally have a greater disease burden. An increased number of medications can lead to non-adherence in the elderly with a related increased risk of morbidity and mortality.

Indigenous people suffer from higher rates of infectious and chronic diseases than non-Indigenous people. Medication adherence is important and a significant issue for Indigenous Australians because they report higher morbidity and mortality than non-Indigenous populations in Australia due to their higher disease burden. The issue remains complicated because of poor understanding and different perceptions about disease, treatment, and Western medications amongst Indigenous people. Medication non-adherence appears to be more prevalent in Aboriginal people than non-Indigenous people and this is confirmed by the small number of studies that have shown poor and unsafe medication use and medication non-adherence among Aboriginal people. Issues of quality use of medication still need to be addressed.
Recruitment of the participants: Non-Indigenous participants were recruited from an urban retirement village, a private nursing service and an independent housing estate. A total of 39 urban non-Indigenous people participated in the study. Indigenous participants were recruited from six remote communities and an urban health centre. A total of 26 remote Indigenous and 27 urban Indigenous people participated in this study.

Method: A structured questionnaire using the Brief Medication Questionnaire (BMQ) and Belief about Medicines Questionnaire (BMQ-specific) was used to interview participants.

Results: The rate of hospitalization increased more rapidly with age in the Indigenous participants than in non-Indigenous participants ($P = 0.002$). Remote Indigenous participants took significantly fewer medications than urban Indigenous and non-Indigenous participants. According to the BMQ, urban Indigenous and remote Indigenous participants reported significantly higher potential for non-adherence than non-Indigenous participants ($P = <0.0001$).

Conclusion: Elderly persons living in any community have problems with their medications. This study strongly suggests that there is an urgent need for education programs and remote area pharmacists to assist Indigenous people with their medications.
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1. Introduction
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1.1. Terminology

Compliance, concordance, persistence and adherence are different terms used in the literature to describe medication taking behaviour of patients. The interpretation of these definitions is often confusing and conflicting. It is important to understand each term.

'Compliance' is used to denote 'the extent to which a person’s behaviour complies with that of the medical or health service' [1]. This term has fallen out of favour because 'compliance' has been seen to attribute blame to the patient if they are non-compliant [2, 3]. Compliance may imply a one-way relationship in which the healthcare provider gives directions with little or no input from the patient [4]. Furthermore, the term compliance recommends that patients acquiesce to, yield to or obey physicians' directions and it gives conformity to medical or medically defined aims only [5]. The theory of compliance is often viewed as being the sole responsibility of the patient. Reasons such as, how complicated, unreasonable or expensive medications may be for the patients are not taken into consideration [4]. However, it may be the healthcare provider who does not comply with the life style, health habits or economic means of the patient [6].
‘Adherence’ is a term defined by the World Health Organization (WHO) as ‘the extent to which a person’s behaviour- taking medication, following a diet and/or executing lifestyle changes, corresponds with agreed recommendation from a healthcare provider’ [7]. The term adherence characterizes patients as self-governing, intelligent and autonomous persons who can take more active and voluntary roles in defining and pursuing goals for their medical treatment [5]. Additionally, medication adherence emphasizes two-way communication between the patient and healthcare provider, which is essential for optimal adherence. Adherence is intended to be a non-judgmental term, and a statement of fact rather than blame of the prescriber, patient or treatment [6]. The question as to why patients do not adhere to medication implies broad social and personal issues rather than the medical goals implied by ‘compliance’ [5].

According to the literature adherence is further classified into four categories.

**Primary:** when the patient does not get the prescription filled or fails to attend an appointment.

**Secondary:** when the treatment is not taken as prescribed.

**Intentional:** when the patient rejects diagnosis or treatment.

**Unintentional:** may be due to a range of factors, but not planned, e.g. the patient would have taken the medication but they ran out, forgot to take it, etc. [8].
‘Concordance’ is a term used predominantly in the United Kingdom. It is defined as, ‘A complex idea relating to the patient/prescriber relationship and the degree to which the prescription represents a shared decision, in which beliefs and preferences of the patients have been taken into consideration [9]. It recognizes the need for doctors, pharmacists and patients to work together to reach agreement, and that patient and doctor may have opposing views [9]. It represents a way in which patients can assume responsibility and contribute to decisions on healthcare, in relation to prescribed medications [3]. Concordance is a synonym for adherence [4, 6]

‘Persistence’ is another term used by many researchers and appears more frequently in the literature of medication adherence and adds the dimension of time to the analysis. It represents the time over which a patient continues to fill a prescription or the time from the initial filling of the prescription until the patient discontinues refilling a prescription [10]. It is defined by Carmer et al. as ‘the duration of time from initiation to discontinuation of therapy’ [11]. According to the definition, persistence is counted as a continuous variable in terms of the number of days for which therapy is available. Persistence can be reported as a dichotomous variable measured for a predefined time period, with patients considered being persistent or non-persistent [11].

Due to the negative connotations implied by the term compliance many researchers suggested substituting the term compliance with adherence [2, 4]. In this study the term adherence is used because the aim of this study is to report problems faced by the patients with their prescribed medications, their knowledge of medications and their beliefs about the prescribed medications.
1.2. General Introduction

According to the World Health Organisation (WHO), 50% of patients suffering from chronic disease in developed countries do not take their medications regularly and in developing countries adherence is much lower [7]. Medication adherence ranges from 26% to 60% in persons aged 60 years or older [4, 12, 13]. In developed countries almost 50% to 60% of patients leave their General Practitioners (GPs) forgetting what they have been told to do or having misunderstood the directions given by the GP [8, 14]. Medication non-adherence is a widely known concern for all healthcare professionals. Additionally, in Australia, patient non-adherence contributes to up to 50% of medication-related hospital admissions and in most cases these were considered preventable [15].

Underuse of medications includes primary non-adherence, unintentional non-adherence, skipping doses, splitting pills, and stopping using a medication sooner than instructed by healthcare providers [16]. Overuse of medications includes taking more doses than prescribed. In some cases this may be due to some elderly people who are suffering from acute illness, thinking that if they take more doses than prescribed, they will speed up their recovery [16].

Not surprisingly older people use the most medicines because they generally have a greater disease burden. A study reported 71% of people aged 65 years or over regularly take at least one prescription medication and 10% take five or more medications [17]. An increased number of medications leads to non-adherence in the elderly with a related
increased risk of morbidity and mortality [15]. A study based on pill count method in the elderly aged 65 years and over discharged from the hospital and taking three or more medications, found that almost 31% of the participants were under-adherent and 18% were over-adherent with one of their prescribed medications [18].

In addition, medication non-adherence is a serious problem for those who take more medications, live alone, are confused, or have poor vision, are depressed, have cognitive impairments, or increased sensitivity towards the drug effects [12, 16, 18, 19]. Medication adherence is particularly important for the patient diagnosed with chronic conditions. Medication non-adherence occurs among elderly people who have a variety of diseases and has been reported to range from 14% to 77%, depending upon the method of measurement [20]. A study by Wilson et al. reported that non-adherence increased linearly for all types of non-adherence as the number of chronic conditions increased [21].

Many medications have special administration criteria, which increase the medication regimen complexity and result in medication non-adherence among the elderly [22, 23]. Poor management of medications is often found among elderly people; as a result a high incidence of medication errors occurs among the elderly [12]. Hulka et al. categorised errors associated with medication taking behaviour into four groups:
- Omissions (lapses in medication taking),
- Commissions (taking medications outside the required regimen),
- Scheduling non-compliance (not adhering to the prescribed regimen), and
- Scheduling misconceptions (problems understanding the drug regimen)[24].

Gaining an understanding of disease or condition is often important in order for the patient to adhere to their treatment. A study in patients with congestive heart failure, conducted in the USA, investigated medication non-adherence in patients aged from 34 years to 89 years. The study considered 35 to 56 years as a reference; the 57 to 64 year old age group had an increased risk of non-adherence 18 times that of younger age group. In contrast, the 65 to 72 year old age group and the 73 to 89 year old age group had a twofold and threefold increased risk of non-adherence, respectively compared with the 35 to 56 year old age group. The reason that the younger age group had a greater risk of medication non-adherence was explained by the author that, this is the age range when patients may not understand the seriousness of the diseases and the necessity of the treatment required [25]. On the contrary, Park et al. reported in their study, old-old adults were at higher risk of non-adherence than young-old adults reflecting more varied daily routines [26].

Indigenous people are suffering from higher rates of infectious and chronic diseases than non-Indigenous people. Medication adherence is important and a significant issue for Indigenous Australians because they report higher morbidity and mortality than non-Indigenous populations in Australia due to their higher disease burden. It remains
complicated by poor understanding and different perception about disease, treatment and Western medications amongst Indigenous people. As with non-Indigenous people, 'concordance' rather than compliance has been suggested as a better concept for enhancing Aboriginal health outcomes [27]. Many researchers have discussed criteria for improving Indigenous health [28-31]; however, the issue of medication adherence in Australian Indigenous communities is not discussed by many researchers or recognised as an unresolved topic [31].

Traditional remedies (bush medications) used by Indigenous people for many generations, conflict with Western medication. The belief in traditional remedy might reduce Aboriginal peoples' belief in taking medications without symptoms, for example, antihypertensive and hypoglycemic medications [32, 33]. Medication non-adherence appears to be more prevalent in Aboriginal people than non-Indigenous people and this is confirmed by the small number of studies that have shown poor and unsafe medication use and medication non-adherence among Aboriginal people [32, 33]. Issues surrounding the quality use of medication still need to be addressed [34]. Quality use of medications by Indigenous people is influenced by drug and alcohol misuse, cost, racial discrimination, non-adherence, feelings about the value of medications, and unwanted side effects [32].
1.3. Health of Indigenous People: Indigenous vs Non-Indigenous

The state of Indigenous health remains appalling, and Aboriginal people suffer worse outcomes than any other sub-population in Australia [29]. Life expectancy is 20 years less, and mortality rates are between two to four times that of the non-Indigenous people [29, 35]. Ill health is very widely reported among the Indigenous Australians, supported by data from the Northern Territory showing that the disease burden is 4.1 times more in the age group 35 to 54 years than for non-Indigenous Australians [36].

The 2004-2005 National Aboriginal and Torres Islander Health Survey, which was conducted by the Australian Bureau of Statistics in remote and non-remote areas throughout Australia, reported on the health conditions of the Aboriginal people [37]. According to the survey, the self-assessed health status of Indigenous people aged 15 to 24 years reporting fair or poor health was 9%, compared to 50% for people aged 55 years and over. After adjusting for differences in age structure between the Indigenous and non-Indigenous populations, Indigenous people were almost twice as likely as non-Indigenous people to report their health as fair or poor. Furthermore, Indigenous people were 1.3 times more likely to have been hospitalized than non-Indigenous people, with 31% of Aboriginal people aged 55 years and older hospitalized in the previous year. In addition, more than one long-term condition was reported in a greater number of Indigenous people, for all groups aged 25 to 54 years, whereas in both populations older people reported similar rates [37]. In 2004-05 Indigenous people were 1.6 times more likely to report asthma as a long-term health condition than non-Indigenous people.
Within the Indigenous population, asthma was reported twice as often in non-remote areas (17%) as in remote areas (9%) [37]. Overall Indigenous populations were 1.3 times more likely than non-Indigenous to report heart and/or circulatory diseases [37]. The occurrence of end stage renal diseases (ESRD) in Indigenous populations is about 20 times higher than in other Australians and has been doubling every five years in northern and central Australia [38].

Social factors such as dispossession, dislocation and discrimination, disadvantages in education, housing, income and employment, and physical environmental factors are responsible for the lack of access to good quality healthcare, which leads to the poor health status of Indigenous people [33]. In comparison to Indigenous mortality rates in New Zealand, Canada and America, Indigenous Australians have a higher mortality rate and are not improving as well [39, 40]. Mortality rates in Indigenous Australians are 1.9 times that of New Zealand Maoris, and 2.4 times that of the US Indigenous populations [40]. Indigenous people have poorer health status, living conditions and social and economic conditions than other Australians. The high morbidity in Indigenous Australians is due to infectious diseases related to overcrowding, poor living and environmental conditions [41]. Almost 70% of the deaths among Indigenous Australians are due to cardiovascular disorders (26%), respiratory conditions (16%), injury and poisoning (15%), and diabetes (10%) [40]. In spite of a higher disease burden, Indigenous Australians spend less on medications, shown by the PBS statistics, which highlighted that PBS spending in Indigenous population is lower than in non-Indigenous populations [34].
Some suggestions were also given by the Aboriginal healthcare workers (AHWs) in the study by Hamrosi *et al.*, for improving issues related to prescribing in Indigenous populations [29]:

- The development and availability of shorter, easier to read consumer medication information (CMI) with pictograms for people with low literacy level. The development and availability of Aboriginal-specific CMI with easily understandable terms and conditions.
- The utilization of AHWs in pharmacies to coordinate health education programs, improve access, and educate the Aboriginal community about the pharmacy services and role of the pharmacist.
- Cultural awareness training directed by AWHs for pharmacists and pharmacy staff to give a better understanding of the culture, history and health issues.
- Seminars run by pharmacists to provide AHWs with health and medicines information for delivery to the community. This facilitates better communication between AHWs and pharmacists.
1.4. Extent and Consequences of Medication Non-adherence

The effectiveness of drug treatment depends on two factors; the efficacy of the drug prescribed and the adherence to the drug regimen by the patient [4]. Poor adherence has been found to be a the common cause of treatment failure, with evidence to show that patients who adhere to treatment advice have better health outcomes than those who do not adhere, even when taking a placebo [42].

Non-adherence can result in a poorly managed disease state for patients, which may in turn affect the patient’s quality of life. According to self-reported assessment of adherence, non-adherent subjects reported an increased risk of health problems, adverse drug reactions, emergency department visits, and inpatient department visits [43]. A systematic review of drug-related hospital admissions in Australia found that 2% to 4% of all hospital admissions and up to 30% for older people are medication-related [44].

A study by Yee et al. which involved a retrospective electronic chart review for 2169 patients who visited the emergency department during the second week of each month in 2003, reported that 19% of hospital admissions in the elderly were due to non-adherence [45]. In another study, interviews with elderly patients admitted to the acute care department, revealed that medication non-adherence in older people is a common cause for hospital admissions [12]. After being discharged from the hospital those elderly people who reported as being non-adherent, were more likely to be rehospitalized [46, 47].
Hypertension is considered a serious health problem in the elderly and non-adherence to any hypertensive medications can also result in progression of the disease. Hypertension is a leading cause of congestive heart failure, stroke and renal failure in the elderly [48-50]. Monane et al. found that 77% of the participants aged 65 years and older taking antihypertensive medications were non-adherent with their medications according to the pharmacy records [50]. Additionally, non-adherence to captopril was significantly related to an increased number of adverse drug events such as recurrent acute myocardial infarction, unstable angina, or arrhythmias [51]. Similarly, it has been reported that people with hypertension who do not adhere to β-blockers are four to five times more likely to have complications from coronary artery disease [3].

Ho et al. recently reported on the effect of discontinuing one or more cardio-protective medications within a month and survival for a year, in patients suffering from myocardial infarction after discharge from the hospital. Almost 70% of patients were discharged with aspirin, a β-blockers and a statin. Of these 66.3% continued taking all three medications, 12% discontinued all medications, 3.7% discontinued two medications and 18% discontinued the use of one medication. Patients who continued all three medications had a higher one year survival rate - 97.8% compared to 88.5% of those who discontinued all of their medications. Moreover, mortality was low in the patients who continued at least one of the medications - 96.4% [52]. Indeed, medication adherence was associated with a lower all cause of mortality compared to non-adherence among patients with diabetes and heart disease [52-54]. A study revealed that 58% of those elderly who were non-adherent with their prescribed cardiac medications and
bronchodilators resulted in therapeutic failure [55]. Granger et al. reported that adherence to candesartan also reduced mortality in chronic heart failure and increased efficacy of the treatment in the elderly [56].

A study conducted in Western Australia of elderly women reported that calcium supplementation decreased risk of fracture in 57% of women. However, non-adherence to the calcium was the biggest barrier and increased risk of fracture in elderly women [57].

Lau et al. measured the relationship between anti-hyperglycaemic non-adherence and risk of subsequent hospitalization in elderly people within a year. They reported participants who were non-adherent in the year 2000 were 2.5 times more likely to be hospitalized in 2001 [58]. In 2001, 28.9% of participants were non-adherent to diabetic medications, while 18.8% and 26.9% were non-adherent to antihypertensive and lipid modifying medications, respectively [58].

Asthma is a major concern in the elderly, with the risk of dying from asthma increasing with increased age. The majority of deaths in Australia in which asthma is listed as the underlying cause (62%) are in elderly people aged 65 years or older [59]. A study by Hartert et al. reported that lower adherence with asthmatic medications was responsible for increased morbidity in elderly [60].

It has been shown by previous studies that medication adherence remains a complicated issue in the treatment of epilepsy [61, 62]. Cramer et al. reported that dose omission was
associated with longer use of seizure medication and there was a clear correlation between missed medication doses and seizures [61].

The cost of medication non-adherence is estimated to be $US 100 billion annually in the United States [3, 63]. Non-adherence can result in hospitalisation, re-hospitalisation, nursing home and residential care admissions, all of which increases healthcare costs [4, 21, 64]. Non-adherence can be costly from an economic viewpoint because a poorly managed disease may require additional drug therapy or hospitalization for the patient [3].

Balkrishnan et al. reported a strong association between anti-hyperglycaemic medication non-adherence and increased healthcare costs in the elderly with type 2 diabetes [64]. Wilson et al. reported that patients switched to less expensive medications or stopped taking their medications without confirming with their GP [21]. A past study evaluated 315 adults aged 65 years or older and reported approximately 12% of hospital admissions at a cost of $US 77,289 were because of medication non-adherence [12].
1.5. Barriers and Factors Associated with Medication Non-adherence

1.5.1. Complexity of Medication Regimen

Various definitions of polypharmacy have been given by different authors. Veehof et al., defined it as a medical treatment that includes five or more drugs [65]. It has been also defined as either the concomitant use of multiple drugs or administration of more drugs than are clinically indicated [66]. Logically, polypharmacy develops when a patient is diagnosed with multiple disease or conditions. Despite the imprecise description, the definition accepted by all authors is that polypharmacy occurs due to multiple medications used by the patient [15]. Polypharmacy can lead to medication mismanagement and confusion and has been shown to contribute to poor outcomes in the elderly [67, 68].

In addition to polypharmacy, complexity of the regimens is considered to be a significant reason for medication non-adherence [69]. Previous researchers reported that the use of three or more drugs and the frequency of prescribed medications in the elderly were associated with self-reported non-adherence [46, 70, 71]. Even with one medicine, non-adherence increases with increased dosing frequency. Paes et al. reported medication adherence was approximately 99%, 83% and 65% with once daily, twice daily and three times daily dosing schedules respectively [72]. Simplifying dosing schedules of medications is important to increase adherence, and Figure 1 shows that a decrease in adherence is associated with increasing frequency of doses.
A comparison study was conducted in the United States, the United Kingdom (UK) and France to find the effect of dosing frequency on adherence and persistence with bisphosphonate therapy in postmenopausal women [74]. The women were divided into two groups: those whose prescription was a weekly regimen of alendronate 70 mg or residronate 35 mg and those initiated on a daily regimen of alendronate 5 or 10 mg or risedronate 5mg. The daily regimen was prescribed more frequently than the weekly regimen in the United States, whereas the weekly doses were more commonly prescribed in the UK and France. Medication Possession Ratio measured the rate of adherence with bisphosphonate treatment; it was 61% in the US, 74% in the UK, and
58% in France. Women on weekly regimens in all three countries had a higher level of adherence than women on daily regimens and it was 69% vs 58%, 76% vs 64%, and 59% vs 53% in US, UK and France respectively [74].

Indigenous people have reportedly stopped taking their medications if they feel good, without seeking medical advice [29]. Aboriginal people also reported problems in knowing what to do if one dose was missed for example directions such as ‘take one tablet twice a day’ was misinterpreted by many people, resulting in two tablets being taken together [29]. Similar to many non-Indigenous people, Aboriginal people often recognize the medications by their color and shape, and it becomes more confusing for them when another brand of medication is prescribed without explanation of the changes [29].
1.5.2. Relationships with the Healthcare Providers

1.5.2.1 Doctor-Patient Relationship, Communications about Medications and Number of Prescribers

A good relationship between the prescriber and the older person is vital to achieve adherence. Communication that lacks enthusiasm, that provides too much or too little information, that does not provide an opportunity for questions or does not seek assurance that the patient understands, can lead to non-adherence [16, 75]. For example, a study investigating the non-adherence to glaucoma medications identified the communication gap between patients and their doctor as a reason for underuse of medications in addition to forgetfulness, and side effects from medication [76]. Unnecessary prescribing and problems in communication between prescribers (misunderstanding) lead to non-adherence in the elderly [70, 77, 78]. Doctors may not know that older people are not adhering to their medicines, as there is often major discrepancy between what doctors' say and what patients actually do, and this may lead to undesired outcomes [70]. For example, the clinician, assuming the medication is being taken, may increase the dose or add extra medications in an attempt to get the desired therapeutic response. Consequently, if the medicines are then taken, there will be an increased likelihood of adverse effects [70].
A good relationship between the physician and patient is important when prescribing a new medication. Poor counseling of newly prescribed medication and any changes made to the old medications, for example when and how to take it, leads to confusion and results in patients failing to take medications as directed [78, 79]. A cross-sectional study of 348 participants which included patients aged 75 years collected information on all drugs from subjects during a home visit [70]. Seventy-one percent of the drugs not mentioned by the General Practitioner (GP) were stated by participants to have been prescribed by the GP [70]. Another study of 220 elderly participants aged 60 years or older reported that 36% of total participants were non-adherent with their medications. Of this 36%, 84.2% of participants were non-adherent due to a poor relationship with their physician [80]. According to the study intentional non-adherence was cause for poor adherence or non-adherence, which was associated with a poor relationship between patient and physician [80].

The problem becomes more serious in elderly patients with multiple disease conditions being treated by multiple healthcare providers. Past studies reported an association between the number of physicians regularly seen by the patient and hospitalization due to non-adherence in those elderly aged 65 years or older [12, 47]. Wilson et al. reported in a study of community dwelling elderly aged 65 years and older, that 41% of the elderly mentioned taking five or more prescription medications, and more than half had two or more prescribing physicians. Thirty-two percent overall and 24% of those with three or more chronic conditions reported they had not told their doctor about all their different medicines in the last 12 months. Of those reporting skipping doses or stopping a medication because of side effects or perceived non-efficacy, 27% had not talked with
a physician about it. Of those reporting cost-related non-adherence, 39% had not talked with a physician about it [21].

1.5.2.2. Importance of Aboriginal Healthcare Workers (AHWs), Relationship between Healthcare Provider and Aboriginal People

Lack of staff training in intercultural communication and lack of shared knowledge and understanding are other barriers to adherence. Employment of Aboriginal healthcare workers provides a bridge, which fills the gap between Indigenous culture and language barriers to assist in developing fruitful outcomes. The role of AHWs is important in assisting the pharmacist and doctor to deliver health messages to Indigenous communities. Moreover, a close relationship between the patient and the health service provider is associated with treatment adherence in Indigenous people [28, 31].

A study by Si et al. reported that employing healthcare workers was associated with improvements in diabetes care in remote communities of the Northern Territory [81]. Adherence to delivery of diabetes services increased gradually with increasing numbers of AHWs per 1000 residents. Aboriginal residents in health centers with 10 or more AHWs per 1000 residents received more guideline-scheduled services than those in health centres with fewer than five AHWs per 1000 residents. Aboriginal people attending health centres with more nurses and AHWs per head of population were more likely to receive more clinical examinations and laboratory investigations [81].

Non-adherence to medications is often used inappropriately to defend poor practice standards [38]; however, development of trust and development of a culturally safe
environment and relationships rules are considered a key factor in dealing with Aboriginal people [29, 82]. A study of 10 Aboriginal women reported their experience of medications in urban South Australia. A lack of sufficient time provided by the doctors, brief consultation, and lack of initiation by the doctor in asking questions were responsible for the low degree of confidence by Aboriginal people in asking questions, seeking clarification of information and poor knowledge and skills in managing medications [83]. In the case of Indigenous people, finding more suitable methods to deliver a key message about medications may increase medication adherence [31].
1.5.3. Belief about Medications and Health

1.5.3.1. Belief Barriers

Some people do not want to blindly follow the treatment directions, even though they are given by the physician; instead, they tend to evaluate whether the advice makes any sense according to their understanding and belief about the illness [84]. Medication adherence is achieved when healthcare providers work together to get the best outcome for the patient and discuss treatment goals with patients. Healthcare providers need to facilitate individual patients' understanding of the prescribed medication regimen and determine the extent to which such factors may influence non-adherence, by ascertaining patients’ personal beliefs regarding medication taking and their illness [13].

Patients' beliefs about their medications are strongly associated with non-adherence and intention to take medications [85-87]. Modern medical concepts and techniques may be in conflict with cultural values from traditional societies [88]. Garay-Sevilla et al. examined the association of the belief in medications with the treatment adherence and socio-economical level in Mexican patients suffering from type 2 diabetes and concluded that belief in conventional treatment was strongly associated with medication adherence [88].

Neame et al. reported the association between high levels of concern with rheumatoid arthritis medications and medication non-adherence in the elderly [89]. Almost three quarters of the participants believed in the necessity of their anti-rheumatic arthritis
medications for maintaining health. Approximately 50% of participants were concerned about adverse consequences of taking their medications. Almost 80% were concerned about long-term effect of medications and becoming dependent upon medication was a belief held by nearly 60% of the participants [89]. Patients’ beliefs about medications and their received treatment also influences medication adherence in elderly patients with cognitive impairment [90].

Jenkins et al. reported in their study that 25% of patients showed belief barriers to prescribed medications, for example ‘medication not working well’, or having one or more concerns about the prescribed medications, and 18% of participants were non-adherent to their prescribed medications [87]. George et al. reported factors associated with medication non-adherence in elderly patients with a mean age of 71 years and with chronic obstructive pulmonary disease. Differences in knowledge about the illness and the treatment, faith and satisfaction with the treatment, and intentional and unintentional deviation from the recommended treatment were detected in the adherent and less adherent patients. Patients’ beliefs, experiences, and behaviours with regard to treatment and diseases were predictors of medication adherence [77].
1.5.3.2. Cultural Issues and Belief Barriers in Indigenous Australians

As with non-Indigenous people, ‘concordance’ rather than compliance has been suggested as a better concept for enhancing Aboriginal health outcomes [27]. This proposes a shared understanding of the treatment goals. The gap between the culture of Western medicines and Aboriginal culture should not be narrowed by the extinction of Indigenous beliefs but by developing and applying principles of shared knowledge and practices [27].

Healthcare for Australia’s Indigenous people has moved away from traditional methods to mainstream Westernized sick-care [91]. However, Aboriginal peoples’ view toward health is quite different: social responsibilities and obligations take preference over health in their culture, and they may be more interested in an explanation of the cause of illness than its actual identification and treatment. In some cases supernatural intervention and sorcery may be seen as a main cause of serious illness [91]. Sorcery manipulates a person’s behavior resulting in morbidity and mortality. It is carried out in secrecy and is responsible for illness and death of one member of the family followed by the illness and death of others [91]. Medication adherence is affected by lack of family support and belief that Western medications are not part of the culture. A study in Aboriginal people, conducted to investigate non-adherence with rheumatic fever prophylaxis, identified belief barriers among the Indigenous people [28]. The belief that disease is not chronic, poor understanding of disease, lack of family support, not taking responsibility for health and lack of trust in efficacy of the treatment [28] and lack of faith in Western medications were considered as contributing factors to non-adherence
and poor health outcomes [92]. Aboriginal peoples’ perceptions that Western medication causes addiction or can make a person’s condition worse, and fear that Western medications may actually kill the person rather than curing them, have been reported as cultural barriers in the management of pain [82]. Elderly Indigenous people living in remote areas generally have problems with access to mainstream specialized services. Moreover, elderly Indigenous people are not willing to go to the hospitals because of the negative connotations, incompatibility of Western medication with their culture, and lack of understanding about the disease and benefits of treatment [29, 91].
1.5.4. Cognitive Functions

1.5.4.1. Forgetfulness and Cognitive Impairment

Forgetting to take medications is the most commonly reported reason for underuse of medications in the elderly [12, 23]. A study was conducted in the USA to measure self-reported medication non-adherence in adults aged 65 years or older (mean age 76.6 years) admitted to the hospital [12]. About 40% of the participants reported forgetfulness as their main cause of the non-adherence [12]. Conn et al. studied medication management in community dwelling older adults aged 65 years to 101 years. Forgetting to take medication was reported by 60% of participants and commonly responsible for the non-adherence [23]. Similarly, another study of 119 older adults reported forgetting to take medications as a most common reason of medication non-adherence, cited by approximately 16% of the participants [46].

About 50% of patients over the age of 85 have some form of cognitive impairment. This may cause them to forget whether they have taken doses of medication each day. These may cause overuse or underuse of essential medications [66]. Poor cognition has been associated with non-adherence and over adherence in those elderly aged 65 years or older [18, 47, 93].

Many researchers have used the Mini Mental State Examination (MMSE) to report the association between cognitive impairment and non-adherence [46, 70, 80]. Barat et al. (2001) reported that elderly people with MMSE scores less than 24 were associated with
higher risk of medication non-adherence due to forgetfulness [70]. Likewise, Okuno et al. cited MMSE scores ≤ 23 as independent predictors of non-adherence due to forgetfulness in the elderly aged 60 and older [80].

1.5.4.2. Depression

Depressed patients have been shown to be more non-adherent than non-depressed patients [94]. Cramer et al. reported that mean rates of adherence to antipsychotics and antidepressants were 58% and 65% respectively [95]. A study reported an association between hypoglycaemic medication non-adherence and depression. Pharmacy refill data showed that, on average, depressed patients were non-adherent to oral hypoglycaemic medications 80 days in the prior year compared with 62 days for non-depressed patients, and the average percent of non-adherent days was 24.5% in depressed patients compared with 18.5% in non-depressed patients. It has also been shown that depressed patients are more non-adherent with antihypertensive and lipid lowering medications when compared with non-depressed patients with diabetes [96].

In a study of 496 elderly patients aged 65 years and older in north-eastern United States, Wang et al. reported the portion of days covered by antihypertensive medications [97]. Almost 72% of the patients did not have enough antihypertensive medication to cover 50% of the study year. Another 28% of the patients had enough medicines to cover 50% to 79% of the study year, and less than one third were covered for >=80% of the study year. An increase in depression symptoms was significantly associated with lower medication adherence [97].
A year-long prospective study was conducted on 319 homecare older adults aged 65 years or older selected from urban and rural settings in Canada. The study demonstrated that about 20% of all subjects were receiving one or more inappropriate medications and according to self-reported assessment of adherence, 38.6% of subjects were non-adherent. Non-adherence was associated with depression as well as impaired vision, and high complexity of the regimen [43]. Similarly, Carney et al. used an unobtrusive electronic monitoring device to assess adherence to a twice daily regimen of low-dose aspirin in people, aged 65 and older, with coronary heart disease and with or without diagnosed depression. Medication was assessed for three weeks and non-adherence ranged from 31% in non-depressed elderly to 55% in the depressed elderly [19].
1.5.5. Literacy, Health Literacy and Knowledge of Prescribed Medications

Poor literacy and low education level are also associated with over-adherence of medications [18, 80]. Nichols-English et al. demonstrated that lower literacy is a factor affecting medication adherence [98]. Older patients face difficulties because their reading abilities are more likely to be affected by their cognition, vision and hearing status. With inadequate health literacy they face problems accessing healthcare services, following instructions from GPs and taking medication as prescribed. In addition, patients with inadequate health literacy are more likely to be hospitalised than patients with adequate literacy skills [99]. Lack of knowledge about the treatment and medications has been considered as a potential contributor to non-adherence. Cline et al. reported the relationship of non-adherence and lack of knowledge of prescribed medications in elderly patients with heart failure [75].

A study of 1892 English-speaking and 767 Spanish-speaking patients in the USA reported that a high proportion of patients were unable to read and understand basic written medical instructions. Of 2659 patients, 42% were unable to understand information for taking medication on an empty stomach, one quarter of them were unable to understand information regarding when a next appointment is scheduled, and 59.5% could not understand a standard informed consent document. A total of 35% of the English-speaking participants and 61.5% of the Spanish-speaking participants’ had inadequate functional health literacy. The incidence of inadequate functional health literacy was significantly higher for elderly than younger participants [100].
Poor health literacy, language problems and poor understanding of Western medications are barriers remaining to medication use and adherence in Indigenous communities [29, 30, 92]. Aboriginal people have difficulty understanding medications and their dosing schedules, for example, what to take, when to take it and how often to take it [29]. These types of confusion along with a lack of biomedical knowledge can lead to non-adherence in Aboriginal people [28-30]. Moreover, the use of medically-oriented complex language by healthcare providers can lead to misunderstanding [29]. Indigenous people can be too shy or too proud to ask for assistance with their understanding of medication [29] and say ‘yes’ or ‘yo’ to everything that is asked of them, pretending that they understand everything that was said and as a means to leave or finish the conversation, which often leads to miscommunication [92]. Not surprisingly, these types of confusion are also faced by non-Indigenous people [99]. Furthermore, Indigenous people cannot understand the complicated, medically oriented confusing language of the CMI because of poor English understanding and therefore, may not ask for a CMI to read the information about given medications [29]. Some medications have special administration criteria, for example, to take with food or with breakfast, and Indigenous people get confused easily with the directions. A common misconception is that all medications should be taken with food. The outcome is that Indigenous people would not take medications because they did not have anything to eat. For example, an Indigenous person may be told to take their medicines at breakfast time and therefore believe that medicines should not be taken at all if breakfast is not eaten [31].
1.5.6. Cost

There has been little research done on the financial cost of non-adherence. The cost of the medications was considered a reason for medication non-adherence which lead to hospitalization in elderly patients [47]. Cost is a significant cause of underuse in some older people on limited fixed incomes making decisions about which drugs they can afford. Due to the cost, medications are not considered a priority by the Indigenous Australians. Their day-to-day living expenses can take precedence over the medications [29]. Due to the rise in the price of medications, some elderly people on fixed incomes may use medications more than prescribed, thinking or assuming that symptoms will disappear sooner, resulting in a net reduction in cost of the prescribed medications [16].

In the US, the use of statins, β-blockers and nitrates in community dwelling elderly adults with coronary heart disease or a history of myocardial infarction, aged 66 years or older, is much less in those who have to pay for their prescriptions ‘out-of-pocket’ than those with medical insurance covering their drug costs [101]. Cost is the biggest barrier to receiving proper health services in Indigenous Australians [34].

A study of those elderly aged 65 years and older in eight states of the USA reported that a significant portion of people, particularly those with low incomes, often take less medication than prescribed. For example, 22% of subjects indicated that they had not filled prescriptions one or more times in the past year because of the cost of the medications, and 23% of subjects skipped doses of their medications to make them last longer [102].
1.5.7. Lack of Transport

About 90,000 Aboriginal and Torres Strait Islanders live in remote communities in Australia, and during certain times of year, many of these are inaccessible by road during the wet season [103]. According to the ABS in 2006, 31% of Indigenous people in Australia lived in major cities. The remaining Indigenous population was evenly distributed across inner regional (22%), outer regional (23%), and remote/very remote Australia combined (24%). In the Northern Territory, 81% of the Indigenous population lived in remote/very remote areas [104]. Lack of access to medically-related services and medications and infrequency of transport lead to non-adherence among the Aboriginal population [29]. The problems of access to services because of lack of money and transport, and limited access to specialist services have been reported as major health service issues in Indigenous people [33, 105].
1.6. Methods for Improving Adherence

Medication adherence is often difficult to measure. Table 1 shows methods for measuring adherence and their advantages and disadvantages [73].

Table: 1 Methods of Measuring adherence (Adapted from Osterberg and Blaschke)[73]

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directly observed therapy</td>
<td>Accurate</td>
<td>Patients can hide tablet in their mouth and discard them; impractical for routine use</td>
</tr>
<tr>
<td>Measurement of the level of</td>
<td>Objective</td>
<td>Variation in metabolism and white-coat adherence can give a false impression of adherence; expensive</td>
</tr>
<tr>
<td>medication or metabolite in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>blood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement of the</td>
<td>Objective</td>
<td>May require expensive assays and collection of biological fluids</td>
</tr>
<tr>
<td>biological marker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient questionnaires; patient self-report</td>
<td>Simple; inexpensive; the most useful method in the clinical setting</td>
<td>Susceptible to error with increases in time between visits; results are easily distorted by the patient</td>
</tr>
<tr>
<td>Pill counts</td>
<td>Objective, relatively easy to perform (if in the patients home)</td>
<td>Data easily altered by the patient (e.g. pill dumping)</td>
</tr>
<tr>
<td>Rates of prescription refills</td>
<td>Objective; easy to obtain data and perform analysis</td>
<td>A prescription refill is not equivalent to ingestion of medication; requires regular use of one pharmacy</td>
</tr>
<tr>
<td>Method</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Assessment of patients clinical response</td>
<td>Simple; generally easy to perform</td>
<td>Factors other than medication adherence can affect clinical response</td>
</tr>
<tr>
<td>Electronic medication monitors</td>
<td>Precise; results are easily quantified; tracks pattern of taking medication</td>
<td>Expensive; requires return visits and downloading data from medication vials</td>
</tr>
<tr>
<td>Patient diaries</td>
<td>Help to correct for poor recall</td>
<td>Easily altered by the patient</td>
</tr>
<tr>
<td>Questionnaire for caregiver or teacher/parent</td>
<td>Simple, objective</td>
<td>Susceptible to distortion</td>
</tr>
</tbody>
</table>

Many studies have suggested that medication adherence could be improved by [22, 70, 76, 106]:

- Reducing the complexity of the medication regimen.
- Educating the patients about their medications and understanding patients' needs regarding prescribed medications.
- Allowing patients to discuss their views about their prescribed medications.
- Acknowledging patients' quality of life and providing them with medications that cause lesser side effects.
- Provide a sufficient amount of time to discuss therapeutic options, dosing techniques, side effects and other issues with prescribed medications.
- Always enquiring about side effects or any difficulties faced with medication taking.
- Providing patient standard education, a medication schedule and verbal instruction have been found to be effective in increasing adherence rates in the elderly.

A recent systematic review by George et al. on interventions to improve medications taking in elderly patients prescribed medications concluded that, there is still a need for strategies to enhance medication adherence in elderly [107]. It is important to note that it is unlikely that a single strategy will enhance adherence and healthcare providers must implement multiple strategies [107, 108].
Table 2: Interventions to enhance medication taking in elderly (Adapted from George Johnson et al.)[107]

<table>
<thead>
<tr>
<th>Study</th>
<th>Country and settings</th>
<th>Description of study</th>
<th>Intervention(s)</th>
<th>Control</th>
<th>Adherence measures and definitions</th>
<th>Significant effect on adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernsten et al. (2001)</td>
<td>Seven European Countries; 190 community pharmacies</td>
<td>Community dwelling elderly; Intervention group (n = 1290)</td>
<td>Individualized medication education by pharmacist; adherence aid (e.g. reminder charts)</td>
<td>Usual care routine community pharmacy services</td>
<td>Self-reported adherence</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control group (n = 1164)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grymonpre et al. (2001)</td>
<td>Canada community based inter-disciplinary health clinic</td>
<td>Community dwelling elderly; Intervention group (n = 69)</td>
<td>Individualized patient education by pharmacist at clinic at pt’s home</td>
<td>Detailed home medication history interview by trained staff or volunteers and review by a pharmacist who also answered any immediate concerns</td>
<td>Prescription claim data; mean % drugs for which claims were made 1-yr pre-intervention and 1-yr post intervention</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control group (n = 66)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanlon et al. (1996)</td>
<td>USA; general medicines clinic at a Veterans Affairs Medical Center</td>
<td>Community dwelling elderly; Intervention group (n = 105)</td>
<td>Pharmacist medication review with oral and written recommendations to physician</td>
<td>Review of pts’ medications by a clinic nurse before physician consult, and review of medications modified the consult</td>
<td>Self-report during telephone interview by a pharmacist blinded to group assignment</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control group (n = 103)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

36
<table>
<thead>
<tr>
<th>Study</th>
<th>Country and settings</th>
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<th>Intervention(s)</th>
<th>Control</th>
<th>Adherence measures and definitions</th>
<th>Significant effect on adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawe and Higgins (1990)</td>
<td>Australia tertiary care hospital</td>
<td>Pts discharged from hospital Intervention group (n = 149) control Group (n = 119)</td>
<td>Group education by pharmacist</td>
<td>General health education program led by a nurse educator without any discussion of medications</td>
<td>Self-report of % regular medications taken as prescribed during an interview conducted in pts’ home by nurse blinded to group assignment</td>
<td>Yes</td>
</tr>
<tr>
<td>Volume et al. (2001)</td>
<td>USA; 12 community pharmacies</td>
<td>Community dwelling elderly pts Intervention group (n = 159) control Group (n = 204)</td>
<td>Individualized medication education by pharmacist</td>
<td>Traditional dispensing oriented care</td>
<td>Self-reported adherence using Morisky scale during a telephone survey</td>
<td>No</td>
</tr>
<tr>
<td>Nazareth et al. (2001)</td>
<td>UK, 3 acute care general hospitals and one long stay hospital</td>
<td>Elderly discharged from the hospital Intervention group (n = 181) control Group (n = 181)</td>
<td>Individualized medication education by pharmacist</td>
<td>Usual care, Discharge letter to the GP with diagnosis, investigations and current medications</td>
<td>Self-reported adherence</td>
<td>No</td>
</tr>
<tr>
<td>Lee et al. (2006)</td>
<td>USA</td>
<td>Community dwelling elderly pts Intervention group (n = 83) control Group (n = 76)</td>
<td>Individualized medication education by a pharmacist, medication supplied in blister-packs</td>
<td>Usual care, medication provided in standard pill bottles</td>
<td>Pill count</td>
<td>Yes</td>
</tr>
<tr>
<td>Sturgess et al. (2003)</td>
<td>UK, 10 community pharmacies</td>
<td>Community dwelling elderly pts Intervention group (n = 110) control Group (n = 81)</td>
<td>Individualized medication education by pharmacist; adherence aid (e.g. reminder charts)</td>
<td>Usual care, routine community pharmacy services</td>
<td>Self-reported adherence</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The benefits of pharmacist interventions to improve medication adherence in the elderly, have been proven by many researchers. Also, improved communication between patient and pharmacist can increase patient adherence [3]. The following are examples of interventions that have been studied to increase medication adherence in the elderly.

1. Lowe et al. determined the effect of medication review and education programs in the elderly. Patients who were 65 years or older and taking three or more drugs were recruited into the study. A total of one hundred and sixty-one patients was recruited, 77 in the intervention and 84 in the control group. The mean age of patients was 77.5 years [109]. The pharmacist visited each group three times at their homes. During the first visit the investigator interviewed them about their medicines using a structured questionnaire. The investigator asked patients what medicines they actually took, and their understanding of the purpose of each medication. No further questions were asked of the control group. The investigator rationalized medication of the intervention group with their doctor, aiming to reduce dose frequencies and discontinue unnecessary medication. The pharmacist also discussed packaging difficulties with the patient’s usual pharmacist. The pharmacist delivered a one month supply of medication to both groups from their pharmacies at the second visit. The pharmacist discussed medication regimens with intervention patients and explained any changes, and discussed correct ways to take their medication and the purpose of medication. Both groups were visited three weeks after the second visit to the intervention group. The pharmacist counted all medication and repeated the questionnaire. Adherence was measured by tablet count and patient report. Adherence was 91% in the intervention group compared to 79.5% in the control group ($P = <0.0001$). Moreover, knowledge of medication increased from 58% to
88% on the third visit in the intervention group compared to 67% to 70% in the control group [109].

2. According to the Federal study of Adherence to Medications in the Elderly (FAME) conducted in the USA, a pharmacy care program helps elderly patients to manage their medications. One study was conducted on 200 community based patients age 65 years or older taking at least four chronic medications [110]. The FAME study, which was conducted from June 2004 to August 2006, consisted of three phases. The average age of the studied patients was 78 years. First of all, 200 patients entered a two-month run-in phase that provided a baseline for medication adherence using pill counts, expressed as the percentages of pills taken relative to the number of pills that should have been taken. Mean baseline adherence at completion of run-in phase was 61%. Of these patients, 174 then entered a six-month intervention phase that included standardized medication education, regular follow up by pharmacists and all medication dispensed in time-specified blister packs. Following the intervention phase, 159 patients were randomized to continue the pharmacy care program (n=83) or return to their usual care (n=76) for an additional six months. The patients took an average of nine different chronic daily medications. After six months of the intervention, medication adherence increased to 96.9% with significant improvements in systolic blood pressure and LDL-C. Six months after randomization, the persistence of medication adherence decreased to 69% among those patients assigned to the usual care group, whereas it was sustained at 95.5 %, in the intervention group [110].
3. A randomised controlled study conducted in Australia by Naunton et al. in which those elderly aged 60 years or older discharged from the hospital, were divided into control or intervention groups. Patients in the intervention group were visited at home by a pharmacist five days after discharge. The pharmacist educated patients allocated to the intervention group on their medications, encouraged adherence, and assessed drug-related problems. Patients in the control group who were discharged from hospital with an identical comprehensive review were visited by a pharmacist 90 days after discharge. The intervention group patients were revisited at home 90 days after a discharge to evaluate the outcome made on day five. Unplanned readmission to hospital during the 90 days following discharge was 17% higher in the control group than the intervention group ($P = 0.05$). In the intervention group adherence improved significantly more than in the control group after 90 days ($P = 0.0001$) [111].

4. A recent study reported that the introduction of a systematic treatment program to Aboriginal communities was associated with improvement in blood pressure and stabilization of renal function in the active treatment group. There was also, importantly, a decrease in the rate of renal failure and natural deaths [112, 113]. The study was conducted at a Tiwi Island community (Northern Territory) of Aboriginal people with hypertension, diabetics with micro or macro albuminuria. The study enrolled 267 adults with a mean follow up of 3.39 years in the treatment group and 327 adults in the historical control group. The mean age of Indigenous participants in the treatment group was 43.4 years and in the historical control group was 41.7 years. The intervention involved a standardized treatment plus partial education by a healthcare provider. There was a dramatic reduction in blood pressure in the
treatment group, which was sustained through three years of the treatment. Rates of all causes of natural deaths were reduced significantly by an estimated 50%; renal deaths were reduced by 57% in the treatment group compared with control group. Non-renal deaths reduced by 46%, there was a 49% reduction in deaths due to a cardiovascular disease and a 61% reduction in non-renal and non-cardiovascular deaths [113].

![Figure 2: Natural death and End Stage Renal Disease in Tiwi adults [113]](image)

Figure 2 shows that numbers of natural deaths and of the people starting dialysis in the entire Tiwi community started to fall soon after the treatment program commenced. Consequently, when the intensity of the program declined, the adherence to medicines fell and this resulted in increased blood pressure, renal function deterioration, and a marked increase in the death rate (Figure 3a and Figure 4).
3b)[112]. This study provided significant evidence that persistence with prescribed therapy is critical to gain positive health outcomes.

a. Renal Deaths

![Renal Deaths Graph](image)

Figure 3a: Renal deaths in treatment cohort between 1997/1998 and 2002/2003 [112]

b. Non-Renal Deaths

![Non-Renal Deaths Graph](image)

Figure 3b: Non-renal deaths in treatment cohort between 1997/1998 and 2002/2003 [112]
It has been also suggested that medication adherence can be increased by using unit-of-use packaging [114, 115]. This consists of plastic blisters on a card divided into four columns for times of the day and rows for seven days and the individual compartments represent dosage time for example breakfast, lunch, dinner, and bedtime. The packs are filled once weekly by a pharmacist, and they are heat or cold sealed in packing.
2. Objectives
2. Study Objectives

Adherence is generally considered to be low in elderly adults. Furthermore, there are no specific studies reporting use of medications in elderly Aboriginal Australians. The main objective of this study is to examine the difference between non-Indigenous urban dwelling elderly people, Indigenous urban dwelling elderly people, and Indigenous elderly people living in remote communities in terms of their:

1. Medication adherence to the prescribed medications,
2. Knowledge of their medications and dosing schedule, and
3. Health beliefs regarding their prescribed medications.
3. Methods
3. Methods

Ethical approval was obtained from the Charles Darwin University (CDU) Human Research Ethics Committee [Reference: H06065].

3.1. Inclusion Criteria

For non-Indigenous people, elderly was defined as being greater than 65 years of age. For the Indigenous populations, elderly was defined as being greater than 55 years of age. This is an accepted definition due to the higher morbidity and shorter life span of the Indigenous population [116]. Non-Indigenous participants were included in this study if they were aged 65 years or older while Indigenous participants were included if they were aged 50 years or more. Indigenous participants less than 55 years were recruited in this study because there are few Indigenous people aged 55 years or older in remote communities and those over 50 years are considered to be elderly by their community.

Participants who were suffering from Alzheimer’s disease/dementia or not able to speak English (specifically in the non-Indigenous participants) were excluded. Indigenous participants in general had poor English, however; they were included in this study because the AHWs assisted the researcher. Participants who required assistance with their medications or who were administered medication by family members or nurses were excluded.
3.2. Recruitment of Participants

3.2.1. Non-Indigenous Participants

The study was conducted at an urban retirement village, a private nursing service (participants who were not getting help from nurses or carers for administration of medication, although they were visited by nurses for health assessments), and an independent housing estate. For the urban retirement village a letter was written to the manager to obtain permission to contact their residents. When permission was obtained, each resident was contacted via a letter describing the project and requesting their consent to call them to make an appointment for an interview. Letters were sent to 30 mail boxes at the retirement village, with an information sheet (Appendix A) enclosed. Residents who were willing to take part in the study contacted the researchers via phone, and arrangements were then made for a time to conduct the interview. From the 30 houses, eight residents were willing to participate in the study. Participants signed the consent form (Appendix A) when the researcher met them to conduct the interview.

To recruit participants from the nursing service, a letter was sent to the manager of the nursing service requesting a meeting about the project. The researchers scheduled a meeting with the manager to explain the project in detail. The researcher then visited the clients with the nurses when the nurses attended to their clients on their regular rounds. Nurses introduced the researcher to their residents, and after the researcher explained the project to them, the residents were asked for signed consent prior to participating in the study. From the 25 nursing service clients, 19 responded positively.
The letter describing the project was sent to the chairman of an independent housing estate. The researchers were then contacted by phone and were invited to a gathering of residents at an independent housing estate where information regarding the project was discussed with the residents. Residents who were willing to participate in the study invited the researcher to their houses for a detailed interview. They were asked to sign the consent form (Appendix A) before the interview commenced. Twelve participants agreed to participate in the study, four others refused and ten residents were unable to speak English.

To see the information sheet and consent form for this study please refer to Appendix A.
3.2.2. Recruitment of Indigenous Participants

3.2.2.1 Remote Indigenous Communities

The Indigenous communities were remote and isolated. This study recruited participants from one of the healthcare and disability services at Nhulunbuy (Gove), 750 kilometres east of Darwin. The healthcare centre provides services and support to 18 homelands, and is responsible for providing healthcare services to all homelands and local Indigenous people. These services are provided by one full-time enrolled General Practitioner (GP) and three full-time registered nurses (RN), one of them providing services as a midwife for Aboriginal women.

The researcher sent information about the project to Healthcare and Disability Services (NT Government). After getting permission from them, the researchers went to Gove with a nurse and doctor, to investigate remote community health care settings during July 2007. The small ‘dry’ community of Yilpara, about 40 minutes south of Gove was visited by plane. A specific health unit has been built to examine the patients. There is no specific time for clients to visit the clinic. Whenever they feel free, they visit. The researcher had a discussion with a few patients about their medications and found that many of them use ‘bush medicine’ to overcome the side effects (headache, stomach pain) of Western medicines. They also strongly believe in bush medications for treatment of flu and skin diseases.
At the beginning of November 2007, interviews were conducted at the Indigenous communities. The six remote Indigenous communities (RC 1, RC 2, RC 3, RC 4, RC 5, and RC 6) were visited by the researcher with a nurse and/or doctor, who were responsible for regular health check ups. The AHWs look after the clinic and provide primary healthcare services to the rest of the community members. Nurses and doctors introduced the researcher to the Aboriginal healthcare workers, and explained the project to one of the healthcare workers from each of the communities in brief. Aboriginal healthcare workers from each of the communities identified people who were over age 50 years and acted as an interpreter to assist the researcher.

RC 1 is situated 206 kilometres from Gove (45 minutes from Gove by plane) and there are approximately 85 Indigenous inhabitants live there. RC 2 is situated 143 kilometres from Gove and comprises about 40 to 50 Indigenous people. It took almost 2.5 hours to reach by four-wheel drive. RC 3 is a small ‘dry’ (alcohol was prohibited) community, situated 134 kilometres from Gove, with a population of approximately 80 inhabitants. RC 4 and RC 5 are other minor communities with approximately 30 and 40 Indigenous inhabitants, respectively. Because there was no clinic in RC 4 and RC 5, the nurse had to set up the clinic under a tree. RC 6 is another larger Indigenous community with approximately 1000 Indigenous inhabitants, located 18 kilometres south of Gove. From these communities, a total of 26 Indigenous participants were interviewed after giving informed consent.
3.2.2.2. Urban Indigenous Settings

Urban Indigenous participants' interviews were conducted at a community-managed organization, which provides comprehensive primary healthcare services. The project was explained to the manager of the healthcare service provider and permission was obtained from them. The Aboriginal people who were visiting the doctors, healthcare workers, or the nurse were introduced to the researcher after they had finished their appointments. The project was explained to the Aboriginal patients and 27 patients consented to participate in the study.
3.3. Development of the Questionnaire

3.3.1. Pilot study

An initial questionnaire was developed and approved by CDU ethics committee. A pilot study was conducted to evaluate the usefulness of the questionnaire in the current elderly setting. Twenty-two people, who live in an urban retirement village in Darwin, were contacted by phone after getting permission from the manager and invited to take part in the study. Thirteen residents agreed to participate and were interviewed. All appeared to be 100% adherent and to follow their dosage schedules regularly. As this was unlikely in this population, it appeared there were methodological problems with the original questionnaire. Following the pilot study, the new survey instrument was developed using previously validated instruments to determine factors affecting medication use in the elderly and their beliefs about prescribed medications.

3.3.2. Development of the Final Questionnaire

The final survey instrument incorporated two structured and previously validated questionnaires, the Brief Medication Questionnaire (BMQ) [117] and the Beliefs about Medicines Questionnaire (BMQ-specific) [118]. The BMQ is a self-report tool for screening adherence and barriers to adherence, and information about participants’ understanding of medication. The BMQ includes a 5-item Regimen Screen that identifies how patients took each medication in the past week, a 2-item Belief Screen that asks about drug effects and bothersome features, and a 2-item
Recall Screen which was designed to identify potential difficulties remembering dosing schedules [117](Appendix B).

To assess in detail participants' belief about medications prescribed for personal use the Belief about Medication Questionnaire was used (BMQ-specific) [118]. For each specific belief in the BMQ-specific, respondents marked their degree of agreement on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree and 5 = strongly agree) [118]. Because of the smaller number of the participants responses of the participants for the each question for strongly disagree and disagree, and strongly agree and agree were merged together and reported as a percentage. The BMQ-specific questionnaire is located in Appendix C.

The survey instrument also included items to obtain demographic data including age, how many pharmacies were used to get prescriptions filled, and how many doctors the participants actually visited. The survey questionnaire is given on Appendix D.
3.3.3. Data Collection and Coding

The participants were interviewed face-to-face and the researcher recorded the response. The participants were asked to show all their prescribed medications and all medications that did not require a prescription (Over-the-counter or OTC). For each medication, the name of the medication, direction for use, how many times per day and dosage were recorded. The participants’ knowledge of the purpose of the medication, perceived efficacy of the medication and whether medication was managed by himself or herself or by someone else (nurse, family member or using unit-dosing packages) was also assessed using the questionnaire. Those who had help with medications were excluded from the study. However, many of the Indigenous participants were unable to understand English or the questionnaires were too complicated for them to answer. In these cases, information was collected through a combination of group discussions (with AHWs, family members, nurses and doctors as well as the participant), semi-structured interviews using the questionnaires, and informal conversations with the Aboriginal participants and healthcare workers.

The participant’s knowledge of the purpose of prescribed medication was categorized as yes or no. This was decided by showing the participants’ each medication and asking ‘What was the use of this drug’ or ‘Why was this drug prescribed’. Knowledge of medications of participants who were using unit-of-use dosing packs was determined by showing them individual medications in their unit-dosing packs. If the participant correctly identified the purpose of the prescribed drug (for example: ramipril was for heart problems), this was categorized as a yes and considered as good knowledge of prescribed medications. If they failed to answer or
needed help that was considered a no. Knowledge of dosing schedule was also determined by asking participants to report how many times they have to take their medications. If participants failed to answer or stated a different dose than that given on the label, this was categorized as having no knowledge of dosing schedule, unless they clarified their different dose; for example, ‘I was taking two tablets to control my blood pressure but now I take one tablet because my BP was too low’. Participants were also asked if they had been hospitalized in the previous six months.

Scoring procedures for each of the BMQ screens were conducted in accordance with procedures used by Svarstad et al. to measure potential for non-adherence, and belief barriers [117]. The study by Svarstad et al. asked the question ‘How hard to remember to take all the pills’ (Question 10c of the questionnaire used for this research) to measure recall barriers of the participants. If participants’ responded ‘very hard’ or ‘somewhat hard’ to the question, this was considered as a positive response for forgetfulness. In addition the question ‘Do you ever forget or choose not to take medication?’ (Question 6 of the questionnaire used for this research) was asked to report the reasons why participants may choose not to take their medication. If participants responded positively (stated yes) or stated reasons for choosing not to take their medications, this was considered as a positive response for forgetfulness. The responses from both of the previously mentioned questions were merged together and considered as indicative of non-adherence due to forgetfulness. The reasons given by the participants for choosing not to take their medications were also recorded.
Svarstad *et al.* asked two questions to report on belief barriers of the participants: ‘How well did this medication work for you?’ (‘Well’, ‘Okay’ and ‘Not well’), and ‘Do any of your medications bother you?’. If participants stated that the medication was working not well or okay, and reported bothersome features of prescribed medications, this was considered a positive screen for belief-barriers [117]. Bothersome features of the individual medication mentioned by the participants were reported. Participants’ beliefs about individual medications were recorded. To see the scoring procedure given by Svarstad *et al.* please refer to Appendix A.
3.4. Analysis

Analysis of Covariance (ANCOVA) was used to compare the number of medications among the three groups of individuals (remote Indigenous, non-Indigenous and urban Indigenous). As the number of medications might be related to age, age group was used as a covariate. The Tukey’s post hoc test was used to determine whether there were any significant differences in terms of prescribed number of medications among the three groups. Logistic regression was used to compare the three groups in terms of the proportions of participants hospitalized in different age groups. The program Statistica version 8 was used for this analysis. Frequency distribution was employed to analyze the categorical data. Knowledge of prescribed medications and dosing schedules, potential non-adherence and beliefs about medications were compared between non-Indigenous, remote Indigenous and urban Indigenous participants using the chi-square test. The collected data was entered into a data table in StatView® version 5.0.1 developed by SAS Institute Inc. A $P$-value of less than 0.05 was defined as statistically significant.
4. Results
4. Results

4.1. Participants’ Demographic Information and Responses to the Brief Medication Questionnaire (BMQ)

A total of 92 participants took part in this study, including 39 non-Indigenous participants, 27 Indigenous participants from urban settings, and 26 Indigenous participants from remote areas. Table 3 shows the participants’ demographics. The numbers of males and females in each group was approximately the same ($P = 0.84$). Participants from remote Indigenous areas were visited by the nurse or the doctors for their regular health assessments, but, they visited Gove District Hospital and Darwin Hospital for treatment of chronic diseases such as ESRD.
Table 3: Participants’ demographics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Remote Indigenous</th>
<th>Urban Indigenous</th>
<th>Non-Indigenous Indigenous</th>
<th>Chi square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 26 (%)</td>
<td>N = 27 (%)</td>
<td>N = 39 (%)</td>
<td>P Value</td>
</tr>
<tr>
<td>Age Groups</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-54</td>
<td>5</td>
<td>5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>13</td>
<td>12</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td>8</td>
<td>7</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>75-84</td>
<td>-</td>
<td>3</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>≥ 85</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Gender (Male)</td>
<td>12 (46)</td>
<td>12 (44)</td>
<td>20 (51)</td>
<td>0.84</td>
</tr>
<tr>
<td>More than one Doctor</td>
<td>#</td>
<td>8 (30)</td>
<td>24 (61.5)</td>
<td></td>
</tr>
<tr>
<td>More than one Pharmacy</td>
<td>x</td>
<td>x</td>
<td>9 (23)</td>
<td></td>
</tr>
<tr>
<td>Unit-of-use packs</td>
<td>18 (69)</td>
<td>13 (48)</td>
<td>5 (13)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Bush Medicines</td>
<td>15 (58)</td>
<td>8 (30)</td>
<td>N/A</td>
<td>0.03</td>
</tr>
<tr>
<td>OTC medications</td>
<td>N/A</td>
<td>N/A</td>
<td>19 (49)</td>
<td></td>
</tr>
<tr>
<td>On Asthma Puffers</td>
<td>5 (19)</td>
<td>6 (22)</td>
<td>6 (15)</td>
<td>0.77</td>
</tr>
</tbody>
</table>

# Data not available.

x Medications delivered by healthcare providers.

Remote Indigenous group reported a range of medical conditions associated with the aging, poor living conditions, and overcrowding. Specifically they reported leprosy, influenza, rheumatic heart disease, gonorrhoeae, and skin diseases. Approximately 70% of remote Indigenous and 50% of urban Indigenous participants were using unit-of-use packs compared to 13% of non-Indigenous participants. Use of unit-of-use packs were significantly higher in Indigenous participants than non-Indigenous participants (P = <0.0001). Use of the bush medications was significantly higher in remote Indigenous than urban Indigenous participants (P = 0.03). Some of them also
replaced Western medicines with bush medication for coughing, skin infections, and throat infection. Approximately 30% of urban Indigenous participants were visiting more than one doctor. Of the non-Indigenous participants 62% were visiting more than one doctor and 23% were using more than one pharmacy (Table 3).

Analysis of covariance (ANCOVA) was used to compare the number of medications among the three groups of individuals. According to ANCOVA, the number of medications was not related to age (Table 4a; \( P = 0.74 \)) but did differ among the three groups (Table 4a; \( P = 0.004 \)). Tukey's test indicated that urban Indigenous (mean = 5.85) and non-Indigenous (mean = 5.26) took similar numbers of medications but remote Indigenous (mean = 3.58) significantly took fewer.
Table 4: Number of medications taken reported by the participants

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Indigenous</td>
<td>39</td>
<td>5.25</td>
<td>2.66</td>
</tr>
<tr>
<td>Remote Indigenous</td>
<td>26</td>
<td>3.57</td>
<td>1.90</td>
</tr>
<tr>
<td>Urban Indigenous</td>
<td>27</td>
<td>5.85</td>
<td>2.44</td>
</tr>
</tbody>
</table>

Table 4a: Analysis of Co-variance (ANCOVA)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>Degree of Freedom</th>
<th>MS</th>
<th>F</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>145.65</td>
<td>1</td>
<td>145.65</td>
<td>24.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Between Age groups</td>
<td>0.6014</td>
<td>1</td>
<td>0.60</td>
<td>0.10</td>
<td>0.74</td>
</tr>
<tr>
<td>Within Groups</td>
<td>67.36</td>
<td>2</td>
<td>33.68</td>
<td>5.76</td>
<td>0.004</td>
</tr>
<tr>
<td>Total</td>
<td>514.58</td>
<td>88</td>
<td>5.84</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SS Sum of square, MS Mean of square
Table 5: Remote Indigenous, urban Indigenous and non-Indigenous participants’ adherence characteristics according to the BMQ [117]

<table>
<thead>
<tr>
<th>Participants’ Characteristics</th>
<th>Remote Indigenous N=26 (%)</th>
<th>Urban Indigenous N=27 (%)</th>
<th>Non-Indigenous N=39 (%)</th>
<th>Chi Square P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization in last 6 months, Yes</td>
<td>14 (54)</td>
<td>16 (59)</td>
<td>14 (36)</td>
<td>0.002 a</td>
</tr>
<tr>
<td>Knowledge of medications, Yes</td>
<td>7 (27) a</td>
<td>7 (26) a</td>
<td>31 (79.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Knowledge of dosing schedule, Yes</td>
<td>3 (11.5) a,b</td>
<td>9 (33) a,b</td>
<td>32 (82)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Non-adherence due to forgetfulness</td>
<td>20 (77)</td>
<td>16 (59)</td>
<td>24 (61.5)</td>
<td>0.32</td>
</tr>
<tr>
<td>Potential for non-adherence according to the BMQ</td>
<td>26 (100)</td>
<td>27 (100)</td>
<td>21 (53.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Were not able to list medication in the initial response</td>
<td>26 (100)</td>
<td>27 (100)</td>
<td>10 (26)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Missed doses/ week</td>
<td>19 (73) a</td>
<td>17 (63) a</td>
<td>14 (36)</td>
<td>0.007</td>
</tr>
<tr>
<td>Reducing the prescribed doses</td>
<td>-</td>
<td>-</td>
<td>3 (8)</td>
<td>N/A</td>
</tr>
<tr>
<td>Taking extra doses than prescribed</td>
<td>-</td>
<td>-</td>
<td>4 (10)</td>
<td>N/A</td>
</tr>
<tr>
<td>Belief Barriers according to the BMQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How well does the medicine work for you? (Not Well)</td>
<td>15 (58)</td>
<td>16 (60)</td>
<td>25 (64)</td>
<td>0.85</td>
</tr>
<tr>
<td>Do any of your medications bother you in any way? (Yes)</td>
<td>10 (46) a</td>
<td>10 (37) a</td>
<td>25 (64)</td>
<td>0.04</td>
</tr>
<tr>
<td>Reported ≥ 1 belief barriers</td>
<td>20 (77)</td>
<td>17 (62)</td>
<td>30 (77)</td>
<td>0.39</td>
</tr>
</tbody>
</table>

* Included responses from Q.6 and Q.10c of study questionnaire (Appendix D)

a Determined using the method given in the BMQ (Svarstad et al., 1999) (Appendix B)
- Data not available
a No significant difference found between two groups
b P value 0.058 tending towards significance
^ Logistic regression P value
As the overall percentage hospitalized was similar in the two Indigenous groups (remote Indigenous = 54%; urban Indigenous = 59%), these groups were pooled to simplify the analysis. The analysis, therefore, compared the rates of hospitalization in Indigenous and non-Indigenous individuals in the five age groups (Table 3). In logistic regression, the starting model included terms for age group, and Indigenous status. The best fit model included age group and Indigenous status (Log-Likelihood = -57.863; G = 11.639, DF = 1, P = 0.003). The reason why age group and Indigenous status are included is evident in Figure 4. The rate of hospitalization increased much more rapidly with age in the Indigenous participants than in the non-Indigenous participants.

Figure 4: Rate of hospitalization in Indigenous and non-Indigenous participants
Approximately 80% of the non-Indigenous participants had good knowledge of their prescribed medications and dosing schedule. In comparison, Indigenous participants in both settings had significantly lower knowledge of prescribed medications and dosing schedule ($P=<0.0001$) (Table 5), and no significant difference was found between these two groups for knowledge of prescribed medications. Urban Indigenous participants had a better understanding of dosing schedules than remote Indigenous participants which came close to achieving statistical significance ($P = 0.058$).

Table 5 compares self reported non-adherence due to forgetfulness in three groups. Almost 77% of remote Indigenous participants reported that it was hard to remember to take pills or that they forgot to take pills, compared to 59% of urban Indigenous participants. Nearly two thirds (61.5%) of non-Indigenous participants mentioned that it was hard to remember to take medicines according to the BMQ, indicating that elderly people generally have problems with their medications. Non-Indigenous participants had a lower potential for non-adherence to medications than remote and urban Indigenous participants. According to the BMQ, urban Indigenous and remote Indigenous participants reported significantly higher potential for non-adherence than non-Indigenous participants ($P=< 0.0001$) (Table 5). Compared to non-Indigenous participants, Indigenous participants in both settings had a significantly higher number of missed doses ($P =0.007$) (Table 5) in the previous week before the interview. No significant difference was found between the two Indigenous groups.

Almost 73% of remote Indigenous participants missed doses in the last week before the interview compared to 63% of urban Indigenous participants and 54% of non-Indigenous participants. Twenty-six percent of the non-Indigenous participants were actually not able to list their medications with a spontaneous response, 8% of the
participants had reduced the dose, and 10% of the participants had taken extra doses than prescribed (Table 5). None of the urban Indigenous participants and remote Indigenous participants were able to list their medications in their initial response.

Table 5 also shows belief barriers reported by three groups when asked the questions ‘How well does the medicine work for you?’ and ‘Do any of your medications bother you in any way?’. Non-Indigenous participants reported significantly higher concerns in response to the question ‘Do any of your medications bother you?’ than remote Indigenous participants and urban Indigenous participants (Table 5). No significant difference was found between urban and remote Indigenous participants when the question ‘Do any of your medications bother you in any way?’ was asked. There was no significant difference found between the three groups in response to the question ‘How well does this medication work for you?’ \((P = 0.85)\), and approximately one third of participants from each of the settings reported medications were not working well (Table 5). Seventy-seven percent of remote Indigenous and non-Indigenous participants and 62% of urban Indigenous participants reported more than one belief barrier (Table 5).
Bothersome features of prescribed medications reported by non-Indigenous participants:

- ‘I have to go to the toilet three to four times and I cannot walk without walker’ (participant 32)
- ‘I am really concerned about my fluid tablets, I have to go to the toilet and being an old person it is so hard’ (participant 33)
- ‘Today I did not have my fluid tablets because I went out for lunch’ (participant 5)
- ‘I am on Jezil, my doctor said that once I start to take it I cannot stop it. One of the antibiotics (pristinomycin) holds infection from becoming worse but is not able to get rid of it’ (participant 14)
- ‘I am suffering from prostate cancer and taking Temaze, but it is not working well last night I woke with the pain. Sometimes I have to take five Temaze per day to get rid of the pain’ (participant 38)
- ‘My Seretide leaves my mouth very dry, and aspirin gives me bruises’ (participant 18)
- ‘I think my medications give me constipation and I have to take another medication to counteract that’ (participants 35, 6)
- ‘I am taking my insulin regularly but still my blood sugar level fluctuates, I am really stressed about this’ (participant 12)
- ‘My asthma puffer sometimes gives me ulcers all over the tongue’ (participant 13)
- ‘I feel like zombi after taking my medications’ (participant 15)
- 'I am having breathing problems and hospitalized frequently' (participant 13)

- 'Recently, my doctor told me to stop rosiglitazone and told me it could have given me a heart attack. I am really confused; doctor did not explain anything to me' (participant 12)

- 'My cholesterol is going down, still my doctor increased dose of Lipitor; I really do not know why my doctor did this. I am planning to reduce dose of Lipitor by myself and want to see what happens' (participant 4)

- 'My doctor prescribed ramipril and Lasix. And I think if I take two tablets together my blood pressure goes down more than normal. I think the doctor had no idea about this because she prescribed these two tablets at different times' (participant 5)
Bothersome features of the prescribed medications reported by the urban Indigenous participants:

- 'I have not taken my medicines today because I knew that one of my medications made me go to the toilet and I was coming to see the doctor’ (participant 23)

- ‘I do not like little orange (spironolactone) tablet because after taking it I need to go to the toilet’ (participant 1)

- ‘I like to take bush medicines instead of these Western medicines. Bush medication works well without side effects’ (participant 18)

- ‘I think my medications give me dizziness and headache all the time and I am not able to breathe properly’ (participant 12),

- ‘I am not happy with insulin, my sugar level is not good, and doctor stopped it and gave me another brand of insulin but still my sugar level is not good’ (participant 24),

- ‘My doctor gave me two medications for blood pressure. I am having doubts why am I taking these two tablets together. Could you please tell me should I stop one of these?’ (participant 24)

- ‘My prescribed medicines are making change in my liver and doctors are checking that’ (participant 20)

- ‘I am taking my medicines regularly but still I feel sick all the time, I think my medicines make me feel sick’ (participant 14)

- ‘I was really healthy before, and suddenly I have got heart problems. My medicines are new for me so, it is so hard to remember to take it. I am really having lots of family responsibility. Due to that, I always
keep forgetting to take medicines. I also forgot my cardiac appointment the other day' (participant 25)

- Another participant was not ready to start proposed insulin even though her blood sugar level was high and she gained 10 kilograms within the 3 months: ‘I do not want to start insulin’ (participant 1)
Table 6: Problems reported by urban Indigenous and non-Indigenous participants related to their medication

<table>
<thead>
<tr>
<th>Problems reported</th>
<th>Urban Indigenous participants</th>
<th>Non-Indigenous participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=27 (%)</td>
<td>N=39 (%)</td>
</tr>
<tr>
<td>Open/close the containers</td>
<td>8 (30)</td>
<td>15 (38)</td>
</tr>
<tr>
<td>Read print on the label</td>
<td>3 (11)</td>
<td>10 (26)</td>
</tr>
<tr>
<td>Remember to take all pills</td>
<td>16 (59)</td>
<td>24 (61.5)</td>
</tr>
<tr>
<td>Get refills on time</td>
<td>7 (26)</td>
<td>5 (13)</td>
</tr>
<tr>
<td>Take so many pills at the same time</td>
<td>7 (26)</td>
<td>-</td>
</tr>
</tbody>
</table>

- Percentages total more than 100 because participants chose more than one problem

About 38% of the non-Indigenous participants reported problems with opening or closing their medications containers. Fifteen percent of the participants reported having arthritis which made opening containers difficult. One patient reported, ‘I use a jar opener to pull the tablets out from the foil due to arthritis’. Almost 26% were not able to read the print on the label and a smaller proportion of the participants (13%) reported filling repeats as a problem (Table 6).

Remote Indigenous participants found it difficult to answer the questions due to poor English. None of them had problems in opening or closing medication containers, reading print on the label and getting refills on time because medications were delivered to them and majority had their medications supplied in unit-of-use packaging. However, engaging them in general conversation the researcher found many problems (Table 7). In contrast, 30% of urban Indigenous reported problems in opening or closing containers. A few of them were using unit-of-use packs and
mentioned that when they were trying to remove one dose from the pack, another dose also comes out. Eleven percent of the participants said print on the label was too small to read. Twenty-six percent reported that it was sometimes hard to collect their unit-of-use packs and repeats on time when they ran out of their medications. The remainder did not have any problem with collection of their medications. Almost 6% of the participants were having problems with taking so many medications at the same time.
Table 7: Remote Indigenous participants’ comments and problems reported by the researcher during the Interview

<table>
<thead>
<tr>
<th>NO</th>
<th>Comments and problems reported by the participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Participant: She knows she is suffering from arthritis and diabetes. She doesn’t know any of her medications. ‘Sometimes I get pain in stomach; I think it is due to medications’. She uses bush medications for tooth ache, cough, ear, and eye problems.</td>
</tr>
<tr>
<td>2</td>
<td>Participant: She doesn’t know much about medications. ‘I take medications because doctor told me to do so’. Uses bush medications for physical well-being.</td>
</tr>
<tr>
<td>3</td>
<td>Participant: ‘My legs were swollen and I think I am taking tablets because blood was not going in legs’. ‘Green tablets for blood and medications work well all the time’.</td>
</tr>
<tr>
<td>4</td>
<td>Participant: Can’t see properly. ‘I am having breathing problems and coughing a lot and sometimes feel dizzy.’ ‘I think heart problem’.</td>
</tr>
<tr>
<td>5</td>
<td>Participant: He lost his medications within a month. When the nurse asked him about his medications, he said ‘I think I am on sugar medicines and blood medications’. Uses bush medication for coughing. Hunting regularly.</td>
</tr>
<tr>
<td>6</td>
<td>Participant: ‘I cut myself and was hospitalized because of bleeding’. ‘I am taking warfarin tablets’, ‘I forgot to take my medicines when I was away from home’. ‘When I missed my dose I try to remember to take it next time. Very hard to remember take medicines’. ‘I do not like my puffer’. ‘Coughing a lot and sometimes become breathless as well’. Uses bush medications for coughing.</td>
</tr>
<tr>
<td>7</td>
<td>Participant: He stops antibiotics when he feels good. Forgets a lot. Sometimes uses bush medications.</td>
</tr>
<tr>
<td>8</td>
<td>Participant: ‘I know I am suffering from diabetes and heart problems’. No idea about medications. She thinks it’s good for her.</td>
</tr>
<tr>
<td>NO</td>
<td>Comments and problems reported by the participants</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------------------------------</td>
</tr>
</tbody>
</table>
| 9  | Participant: ‘I am having breathing problem’. ‘I think I need check up’.  
No idea about her medicine and why is she taking it.  
Hard to remember to take tablets.  
Sometimes uses bush medications. |
| 10 | Participant: She knows about heart problem.  
‘I feel stomach pain’. She uses bush medications. Hard to remember to take pills. |
| 11 | Participant: ‘I am hunting a lot and due to that often forget to take medicines’.  
‘When I feel dizzy I take medicines’.  
‘Kidneys are leaking’. Bush medicines for headache. |
| 12 | Participant: ‘Kidneys are leaking’.  
‘I forget sometimes due to hunting a lot’. Bush medicines for headache, coughing.  
‘Feel good after taking medicine’. |
| 13 | Participant: ‘I think I am having heart problems’. Had an operation. No idea for what. No idea about his medications. |
| 14 | Participant: No idea about her age. ‘I am coughing a lot’. ‘I think I am suffering from high blood pressure’. She uses bush medicines when she is hunting. For example, Bank bark leaves for coughing. Young leaves of young bark for scabies and skin problems. |
Paper bark for good health. |
| 16 | Participant: Arthritis and hypertension.  
‘I forget to take pills’. ‘I think medicines gave headaches’. ‘I take panadol’. She missed her medicines from last two to three weeks. |
| 17 | Participant: She knows she is on hypertension tablets (two white tablets)  
Rarely forgets. Uses bush medications for headache. |
<p>| 18 | Participant: She takes antibiotics when coughing a lot. She knows about heart problem. She told me if she doesn’t take her medications she is going to die. |</p>
<table>
<thead>
<tr>
<th>NO</th>
<th>Comments and problems reported by the participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Participant: 'I do not have any idea about medicines'. 'I think suffering from high blood'. 'I feel good taking medicines'.</td>
</tr>
<tr>
<td>20</td>
<td>Participant: 'My kidneys are leaking and doctors are checking my heart as well'. No idea about medications. Pandanus flowers for good health. Nambara for cold, cough and flu. Raw leaves to stop bleeding.</td>
</tr>
<tr>
<td>21</td>
<td>Participant: Eye operation due to welding. Did not have any idea what happened. 'I am ok without my medications'. He is on ramipril but he didn’t have that with him. He lost it.</td>
</tr>
<tr>
<td>22</td>
<td>Participant: Diarrhoea, diabetes. 'Sore hands, eyes. Sometimes vomiting no idea why'.</td>
</tr>
<tr>
<td>23</td>
<td>Participant: She lost her medications 15 days ago. 'Sore eyes, can’t see properly'. 'I feel dizzy all the time and coughing a lot during the night'.</td>
</tr>
<tr>
<td>24</td>
<td>Participant: 'I forget sometimes. If I feel dizzy, I take them'. He thinks his medicines keep his kidneys well.</td>
</tr>
<tr>
<td>25</td>
<td>Participant: No idea about medications. He uses bush medications for coughing, and headache.</td>
</tr>
</tbody>
</table>
4.2. Participants' Responses to the Belief about Medication Questionnaire- specific (BMQ-specific)[118]

Figure 5a shows responses of non-Indigenous participants to questions on belief about medications. Most non-Indigenous participants answered ‘strongly agree’ or ‘agree’, to the questions ‘my health at present depends on my medicines’ (95%), ‘my medicines protect me from becoming worse’ (87%), and ‘my health in future will depend on my medicines’ (85%). Two other beliefs held by almost 72% of the non-Indigenous participants were ‘my life would be impossible without my medicines’, and ‘without my medicines I would be very ill’. However, negative beliefs were held by a proportion of participants namely, ‘having to take medication worries me’ (28%), ‘I sometimes worried about becoming too dependent on my medicines’ (49%), and ‘my medicines disrupt my life’ (23%). Eighty percent of participants ‘strongly disagree’ or ‘disagree’ with the belief ‘my medications are a mystery to me’.
Figure 5a: Beliefs about prescribed medication in non-Indigenous participants
Figure 5b: Beliefs about prescribed medication in remote Indigenous participants
Figure 5c: Beliefs about prescribed medication in urban Indigenous participants
Figure 5b shows responses when questions about belief about medications were asked of the remote Indigenous participants. They were not able to answer all the questions; however, when the researcher rephrased the questions with the assistance of the interpreter, 46% of participants either ‘strongly agree’ or ‘agree’ that ‘my health at present depends on my medicines’. Almost 39% either strongly agreed or agreed with the belief ‘without my medicines I would be ill’, and 35% of them held the belief that ‘my medicines protect me from becoming worse’. In contrast, some of the participants either ‘strongly disagree’ or ‘disagree’ with the questions, ‘I am sometimes worried about long-term effects of my medicines’ (27%), ‘my medicines are mystery to me’ (19%), ‘having to take medicines worries me’ (11%), and ‘my medicines disrupt my life’ (8%). More than half of participants were uncertain about all of the belief questions.

Figure 5c shows responses when urban Indigenous were questioned about their beliefs about medications. The understanding of English was better among urban Indigenous participants than among remote Indigenous participants. Almost 74% of urban Indigenous participants either ‘strongly agree’ or ‘agree’ to the beliefs ‘my health at present depends on my medicines’, and ‘my medicines protect me from becoming worse’. The following beliefs were held by a majority of participants, namely, ‘my health in future will depend on my medicines’ (67%), ‘without my medicines I would be very ill’ (63%), and ‘my life would be impossible without my medicines’ (52%). Moreover, 63% of urban Indigenous participants either strongly disagreed or disagreed with the two negative beliefs ‘having to take medicines worries me’, and ‘my medicines disrupt my life’.
5. Discussion

The present study shows that elderly people generally have problems with their prescribed medications. Remote Indigenous and urban Indigenous participants had poor understanding of their prescribed medications compared to non-Indigenous participants. Non-adherence with prescribed medications is common in elderly people living in any community.

First of all, high rates of hospitalization were reported in remote Indigenous and urban Indigenous participants compared to non-Indigenous participants. Approximately 55% of Indigenous participants from remote and urban settings had been hospitalized compared to 36% of non-Indigenous participants, in the last six months. It is clear from the data that remote and urban Indigenous participants reported higher rates of hospitalization at a younger age than non-Indigenous participants. The results clearly show that Indigenous people start to report diseases at a younger age than non-Indigenous people. A study by Zhao et al. in the Northern Territory reported that Indigenous Australians have a higher disease burden than the non-Indigenous population for all age groups [36].

Approximately 80% of the non-Indigenous participants had good knowledge of prescribed medications and dosing schedules. This finding is consistent with a previous study, which found 72% of the participants reported the purpose of medication correctly and 75% of the participants reported dosing schedule correctly [119]. Approximately 20% of Indigenous participants in both of the settings had much less knowledge of prescribed medications. Knowledge of medication dosing
schedules was almost three times higher in urban Indigenous than among remote Indigenous participants. Hamrosi et al. reported in their findings that Aboriginal people always experience confusion with prescribed medications and did not know what to do if one dose was missed [29]. This study found that remote Indigenous participants were prescribed with a significantly lower number of medications than urban and non-Indigenous participants. Previous studies suggested that Indigenous people have problems with understanding of medications and their storage due to lower education, overcrowding, and harsh environmental conditions [29, 38]. Due to all these problems Murray suggested simplifying dosage regimens for Indigenous people, which may decrease the problems of non-adherence in Indigenous populations [38]. This recommendation should be applied to all medication users, particularly elderly people living in any community.

A study by Hoy et al. reported that education can increase adherence, which resulted in decreased cardiovascular and renal deaths in the Indigenous population [113]. In this study non-Indigenous participants reported higher knowledge of prescribed medications and dosing schedules. But over a quarter of the participants were unable to list the name of their prescribed medications and 61.5% of the non-Indigenous participants reported non-adherence due to forgetfulness. In a study of elderly patients with clinically stable heart failure discharged from the hospital it was found that 45% of the participants were not able to list the name of their medications and 50% were unable to recall the dose of their medication [75]. The difference in results may be because Cline et al. used different methods to evaluate knowledge [75]. Secondly, the participants included in their study were only taking heart failure medications while this study included participants who were taking any medication.
According to the findings of this study, Indigenous participants' in both remote and urban settings showed poor adherence to medications compared to non-Indigenous participants. Anecdotal evidence showed that Indigenous participants were more likely to miss doses, and that non-adherence to medications is much more prevalent in Indigenous people than other populations in Australia [29, 31]. More remote Indigenous subjects reported non-adherence due to forgetfulness than urban Indigenous participants. In this study however, approximately the same percent of non-Indigenous and urban Indigenous reported troubles in remembering to take prescribed medications. This could be because non-Indigenous participants in this study were older than urban Indigenous participants and may have problems with recall.

Indigenous participants in both of the settings reported significantly higher potential for non-adherence compared to non-Indigenous participants. Indigenous participants in both of the settings also had a significantly higher number of missed doses than non-Indigenous participants. Reasons given for not taking medications by remote Indigenous participants included hunting, visiting family, being away from the community, visiting friends, not being able to find medications, using bush medications instead, not feeling well and/or side effects, and not carrying their medications with them due to lack of importance of medications. Urban Indigenous participants reported forgetfulness, feeling sick, confusion about medications and lack of importance as reasons for missed doses. Kowanko et al. reported in their study that cost of medications, non-adherence, feelings about medications and side effects of medications, were factors associated with mismanagement of medications in Indigenous people with mental disorders [33]. Many previous researchers reported
that use of particular packing for example blister packs, unit-of-use can increase adherence in the elderly [38, 114]. In this research however, more Indigenous participants were using unit-of-use packs yet they were found to be more non-adherent than non-Indigenous participants. This suggests that providing unit-of-use packs may have limited impact on medication adherence. Healthcare providers need to look for better options. For example, Indigenous people could be provided with waist carry pouches or travelling bags to carry their medications or unit-of-use packs with them. Indigenous participants in both of the settings reported that medications were not working well but again for medications to work well they have to follow their treatment regimen regularly. Some remote Indigenous participants missed their medications for weeks and then restarted taking their medications. For example one of the Indigenous participants (Participant 6, Table 7) stated that she was on warfarin tablets and she often forgets to take medications. It is risky to restart warfarin after missing a number of doses. If somebody misses warfarin doses regularly how would they manage to achieve appropriate anticoagulant effects? Indigenous participants reported missing doses often and it may be unsafe to restart medications after taking drug holidays. Possibly, restarting medications after a break is the reason many remote Indigenous participants reported that their medication caused dizziness.

Remote Indigenous participants use bush medications more frequently than urban participants. This may be due to easy access to Western medications in urban areas. Many previous studies reported dislike of Western medicines by the Indigenous people [29, 82, 91]. Remote Indigenous participants reported Pandanus flowers and paper bark (Melaleuca) for good health. The use of these bush medicines by Indigenous people is well documented in the literature. In this study they reported
using bank bark leaves for coughing, scabies and other skin problems. This could be the acacias, because the leaves, branchlets or bark of acacia is used as poultices, washes, tonics or inhalations by people living in the Northern Territory [120]. Indigenous people believe the cause of illness is more important than treating illness. They prefer to categorize the causes of illness and have traditional remedies (bush medications) for the treatment [91]. Past studies also reported that lack of insight into illness, lack of biomedical knowledge, cultural distance, beliefs, lack of access, side effects, and poor understanding of the treatment are issues related to poor medication management and health outcomes in Indigenous populations in Australia [28-30, 34, 83, 91].

Problems with the prescribed diuretics, frusemide or spironolactone were one of the main reasons for intentionally missing medications, reported by 13% of non-Indigenous and 7% of urban Indigenous participants. Rogers et al. also reported problems with diuretics as a reason for omitting medication [121]. Other studies have reported the dislike of prescribed diuretics (fursemide or spironolactone) by the participants [12, 70]. van der Wal et al. found that use of diuretics was one of the belief barriers reported by the participants and associated with waking up at night to go to the toilet and problems leaving home [122]. Twenty-three percent of non-Indigenous participants reported side effects as a bothersome feature of the medications and Simonson et al. have reported that most elderly people do not like to take medications due to perceived side effects [123]. This finding was consistent with results of Malhotra et al., who reported in their study that 20% of the elderly were non-adherent to their medications due to the side effects [47]. Okuno et al. reported in their study, that concern about taking drugs and choosing not to take
medications results in medication non-adherence [80]. Byrne et al. reported in their study that lower levels of concern with medication were associated with higher levels of adherence in the elderly [85]. Another problem reported by participants was confusion with their medications or not being able to properly understand the directions given by the doctors. The reluctance on behalf of patients to discuss this with healthcare providers revealed that the pharmacists and GPs were unaware of the problems experienced by the patients. Jenkins et al. reported that patients’ high expectation from the doctors, and misunderstanding between doctors and patient were responsible for non-adherence in the elderly [87]. Many studies have revealed this kind of problem to be responsible for medication non-adherence [70, 77].

In this research 13% of non-Indigenous participants and 26% of urban Indigenous participants reported having refill problems. A past study reported a higher percent (40%) of participants as having refill problems leading to non-adherence in the elderly [124]. The number was higher than the present study, possibly because the aforementioned study examined factors associated with medication refill adherence in cardiovascular-related diseases and used different methods [124].

Thirty-eight percent of non-Indigenous and 30% of urban Indigenous reported problems opening containers. This result is consistent with Atkin et al. who reported in their study that approximately 38% were not able to open one or more containers of their preadmission treatment medications [125]. Nikolaus et al. found that inability to open containers correlated with cognitive impairment, poor vision and manual dexterity [46].
Much previous research has reported that medication packaging could enhance medication adherence in the elderly [114, 126, 127].
5. Discussion
5.1. Limitations of the study

As with all research, when interpreting the data, certain limitations of the study must be considered. In this study, Indigenous participants were younger than non-Indigenous participants. Within the Indigenous population, only three participants were aged greater than 75 years and data from the age group 85 years or older are completely missing. There were no people aged more than 75 years at remote communities. Even though Indigenous participants were included from an urban healthcare centre, the researcher was not able to recruit old-old Indigenous participants. This can be explained by the shorter lifespan and higher mortality rates in Indigenous people. A study reported that the mean age of death for Indigenous Australians was 58 and 48 years for residents of homelands and centralized communities, respectively [128]. Also, the difference in age groups between Indigenous and non-Indigenous can be explained by the ABS, which reported that in the Northern Territory, 75% of recorded Indigenous male deaths and 65% of Indigenous female deaths occurred before the age of 65 years compared with 26% and 16%, respectively, of deaths of non-Indigenous males and females. For all age groups below 65 years, the age-specific death rates for persons identified as Indigenous is at least twice those for other Australians. The difference is five times more in age group 35–44 and 45–54 years for Indigenous Australians than non-Indigenous Australians [35].

A further limitation of this study was recruitment of participants in both of the settings. Recruitment of participants from the retirement village was done by delivering letters to their mail box with an enclosed information sheet. So, it was
difficult to attract people to take part in the study. The researcher wrote letters three times to 30 houses in that setting and only eight people were prepared to take part.

Another limitation of this research was flying to the communities and recruitment of Indigenous participants. Indigenous participants were remote and isolated and some communities are only accessible by plane during the wet season [103]. The researcher started recruiting participants in the beginning of November (wet season). Flying to the different communities was not easy, sometimes due to poor weather as pilots cannot fly until the weather improves. Occasionally flights were cancelled or delayed due to the poor weather. Some communities were accessed by the road, but it takes 2.5 to three hours to travel there by four-wheel drive vehicle. A second problem was that after flying to the community, the healthcare worker directed the researcher to persons who were aged less than 50 years because for Indigenous people 40 years is considered to be old. In addition some older people were visiting other Aboriginal communities (friends and relatives) which limited participants’ recruitment. Regarding the urban Indigenous participants who were visiting the doctor, some of them were not ready to talk or discuss their medications because of their poor health.

Another limitation of the study was that the questionnaires used for this research have been previously validated in specific groups of non-Indigenous populations. So, it was hard to implement these questionnaires in the Indigenous population. Indigenous participants were not able to understand the questions due to their limited English. Healthcare workers assisted the researcher to translate the questions, but the researcher used informal conversation to note actual medication-related problems
faced by the participants. This may have biased the results. According to the BMQ participants who are not able to list names of their prescribed medications show potential for non-adherence, which may not always be true. This research compares the medication-related problems between remote, urban Indigenous, and urban non-Indigenous participants, and further study evaluating the same in non-Indigenous participants living in remote settings would be valuable.
5.2. Future Research

This study focused on elderly non-Indigenous participants living independently, accessed by nurse, and living in a retirement complex. The other population for this research was Indigenous people living in remote and urban areas. This study compared medication adherence in non-Indigenous and Indigenous participants, and simultaneously compared medication adherence between remote Indigenous and urban Indigenous participants. This study makes a contribution in relation to understanding the factors affecting medication use in the elderly in non-Indigenous and Indigenous participants and their beliefs about their prescribed medications. For future studies which investigate these factors, using a larger population sample would be beneficial.

It was difficult to compare results because they only overlap between Indigenous and non-Indigenous participants in the age group 65 to 74 years. The numbers of participants in each group were very few in this study. Therefore, further study investigating the medication use and beliefs between younger non-Indigenous and Indigenous participants would be beneficial for comparison of potential difference in factors that affect medications use between such groups.

Future research providing a validated questionnaire among Indigenous communities would be helpful to conduct further study providing data on adherence of medication in Indigenous communities.
5.3. Conclusion

In conclusion, every elderly person living in any community has problems with their medications. The rate of hospitalization was higher in Indigenous participants and reported at early age compared to non-Indigenous participants. In comparison, Indigenous participants’ knowledge of medication was poorer compared to non-Indigenous participants. Indigenous participants reported a positive screen for non-adherence at a higher rate than non-Indigenous participants’ in this research. After the considering results, the study reveals that there is urgent need for remote area pharmacists to assist Indigenous people with their medications.

It is clear from these results that Indigenous patients are in need of education and assistance to improve their knowledge and use of medications. An increase in number of pharmacist working with AHWs and Indigenous patients may result in improved health outcomes through better medication use although this will require further research. There are needs for AHWs to help with the development of simple pictograms showing Indigenous participants’ importance of medications and their side effects. This study indicated that it is important to improve the literacy and health literacy of Indigenous people in order to optimize the quality use of medicines and improve adherence to medications. This will requires further research to determine the value of the pharmacist.
6. References
6. References


48] Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, Jr., et al. Seventh report of the Joint National Committee on prevention, detection,


7. Appendices
7. Appendices

7.1. Appendix A

INFORMATION SHEET

PROJECT: FACTORS AFFECTING MEDICATION USE IN OLDER ADULTS

CHIEF INVESTIGATOR: Associate Professor Roger Rumble

ASSOCIATE INVESTIGATOR: Dr. Mark Naunton, Ms. Hemangi Surti

RESEARCHERS: 

PURPOSE OF THE STUDY: The purpose of this study is to find out how people with different illnesses are actually managing their medications. Most people with chronic and acute illness have many medicines to take at different times during the day. Many people find it hard to always remember their medicines and this can increase with increased age. Some people get busy and forget to carry their medications with them. Others decide to not take their medications to avoid adverse drug reactions or they may not want to take medicines everyday.

To do this, I need to ask you few questions about your health and medications that you are taking. Your answers will help me to understand how people are managing their medications.

BENEFITS OF THE STUDY: By understanding how people manage their medications and the reasons why some doses of medications might be missed, we can examine the importance of the missed doses and, if necessary, go on to study some ways of helping people achieve the best results from their medications.

WHAT WOULD BE EXPECTED OF YOU? If you decide to take part in this research, we will ask you a few questions about the medicines you take.

Do not worry about telling us that you do not take all your medications. Please answer honestly; you will not be judged based on your responses.

DISCOMFORTS/ RISKS: There are no specific risks associated with this study.

CONFIDENTIALITY The researchers will keep full confidentiality of your name, medicines and medical conditions. Your name and identifying material will not appear in any report of our findings. We will not inform your doctor, pharmacist, nurse and family members.

YOUR PARTICIPATION: We would be grateful if you did participate in this study but you are free to refuse to participate. Even if you do decide to participate, you may withdraw from the research at any time.

RESULTS OF THE STUDY If you want some feedback on the results of this little study, we will be happy to provide a short report.
If you have any questions about the project, please contact the chief researcher, Assoc. Prof. Roger Rumble on ph: 8946 6127 or Dr. Mark Naunton on ph: 8946 6563

If there is an emergency or if you have any concerns before commencing, during, or after the completion of the project, you are invited to contact the Executive Officer of the Charles Darwin University Human Research Ethics Committee on 08 8946 6498 or by email: christine.edward@cdu.edu.au. The Executive Officer can pass on any concerns to appropriate officers within the University.
CONSENT FORM

I, ........................................................................... of
..........................................................................................

..........................................................................................

Hereby consent, to participate in a study, "Factors Affecting Medication Use in Older Adults", to be undertaken by Prof. Roger Rumble, Dr. Mark Naunton, and Hemangi Surti of Charles Darwin University,

What is the purpose of this research? Most people with chronic and acute illness have many medicines to take at different times during the day. Many people find it hard to always remember their medicines and this tends to increase with increased age. Some people get busy and forget to carry their medications with them. Others decide to not take their medications to avoid adverse drug reactions or they may not want to take medicines everyday. Therefore, the purpose of this study is to find out how people with different illnesses are actually managing their medications.

To do this, I need to ask you few questions about your health and medications that you are taking. Your answers will help me to understand how older people are managing their medications.

I acknowledge that:

- The aims, methods, and anticipated benefits, and possible risks of the study, have been explained to me by Hemangi Surti, Roger Rumble or Mark Naunton.
- I voluntarily and freely give my consent to my participation in such study.
- My questionnaire will be coded and my name and address will be kept separately from it
- Any information that I provide will not be released in an identified form
- Aggregated results will be used for research purposes and may be reported in scientific and academic journals
- Individual results will not be released to any person except at my request and on my authorisation
- I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease, and any information obtained will be returned to me or destroyed at my request.

Signature: ...................................................... Date: ......................................
7.2. Appendix B

The Brief Medication Questionnaire and Scoring Procedure

SAMPLE ITEMS FROM BRIEF MEDICATION QUESTIONNAIRE (**)

1. Please list below all of the medications you took in the PAST WEEK. For each medication you list, please answer each of the questions in the box below.

<table>
<thead>
<tr>
<th>In the past week:</th>
<th>a. Medication name and strength</th>
<th>b. How many days did you take it?</th>
<th>c. How many times per day did you take it?</th>
<th>d. How many pills did you take each time?</th>
<th>e. How many times did you miss taking a pill?</th>
<th>f. For what reason were you taking it?</th>
<th>g. How well does the medicine work for you?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = well</td>
<td>2 = okay</td>
</tr>
</tbody>
</table>
Appendix B Continued

2. Do any of your medications bother you in any way? YES____ NO____
   
a. If YES, please name the medication and check below how much it bothers you.

<table>
<thead>
<tr>
<th>Medication name</th>
<th>A lot</th>
<th>Some</th>
<th>A little</th>
<th>Never</th>
<th>In what way did it bother you?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Below is a list of problems that people sometimes have with their medicines. Please check how hard it is for you to do each of the following:

   **Very hard** | **Somewhat hard** | **Not hard at all** | **COMMENT**
   | (Which medicine) |

   a. Open or close the medication bottle
   b. Read the print on the bottle
   c. Remember to take all the pills
   d. Get your refills in time
   e. Take too many pills at the same time

(**) The original copyrighted instrument is available from the first author.

SCORING PROCEDURES FOR BMQ SCREENS

<table>
<thead>
<tr>
<th>Screen</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regimen Screen (Questions 1a-1e)</td>
<td></td>
</tr>
<tr>
<td>Did R fail to list the prescribed drug in the initial (spontaneous) report?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R stop or interrupt therapy due to a late refill or other reason?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R report any missed days or doses?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R reduce or cut down the prescribed amount per dose?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R report &quot;don't know&quot; in response to any question?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R refuse to answer any questions?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>NOTE: Score of ≥1 indicates positive screen for potential nonadherence.</td>
<td></td>
</tr>
<tr>
<td>Belief Screen (Questions 1g and 2-2a)</td>
<td></td>
</tr>
<tr>
<td>Did R report &quot;not well&quot; or &quot;don't know&quot; in response to Q 1g?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R name the prescribed drug as a drug that bothers him/her?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>NOTE: Score of ≥1 indicates positive screen for belief barriers</td>
<td></td>
</tr>
<tr>
<td>Recall Screen (Questions 1c and 3c)</td>
<td></td>
</tr>
<tr>
<td>Did R receive a multiple dose regimen (2 or more times/day)?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>Did R report &quot;very hard&quot; or &quot;somewhat hard&quot; in response to Q 3c?</td>
<td>1= yes 0= no</td>
</tr>
<tr>
<td>NOTE: Score of ≥1 indicates positive screen for recall barriers</td>
<td></td>
</tr>
</tbody>
</table>

R= respondent
7.3. Appendix C

Belief about Medicines Questionnaire (BMQ-Specific)

- We would like to ask you about your personal views about medicines prescribed for you.
- These are statements other people have made about their medicines.
- Please indicate the extent to which you agree or disagree with them by ticking the appropriate box.
- There is no right or wrong answers. We are interested in your personal views.

Rated: strongly agree, agree, uncertain, disagree, and strongly disagree

1. My health, at present, depends on my medicines
2. Having to take medicines worries me
3. My life would be impossible without my medicines
4. Without my medicines I would be very ill
5. I sometimes worry about long-term effects of my medicines
6. My medicines are a mystery to me
7. My health in the future will depends on my medicines
8. My medicines disrupt my life
9. I sometimes worry about becoming too dependent on my medicines
10. My medicines protect me from becoming worse

Note:

To elicit beliefs about individual components of the treatment regimen the reference statement should refer to the medicine by name e.g. Your views about aspirin
prescribed for you Additionally items can refer to a named illness e.g. Your views about medicines prescribed for your asthma.
STUDY TITLE: FACTORS AFFECTING MEDICATION USE IN OLDER ADULTS (Questions will be asked in a structured interview with the questionnaire form being completed by the researcher)

Participant Number: Date:

Setting:
- O Community
- O Residential care
- O Retirement complex
- O Aboriginal community

Questions answered by:
- O Older adult participant
- O Caregiver of participant
- O Other (specify) ______

Q.1. Can I ask which age group you fit into?
- O 55-64
- O 65-74
- O 75-84
- O ≥85

Q.2. Have you been hospitalized in the last 6 months?
- O Yes
- O No

Q.2.a How often? ______________

Q.2.b If yes, can you tell me the reason?

Q.3. Does more than one doctor prescribe medicines for you?
- O Yes
- O No
Q.3.a. If yes, how many?

Q.4. Do you get prescription filled at more than one pharmacy?

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>

Q.5. Do you know what medicines you are taking?

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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>

Q.6. Do you ever forget or choose not to take your medication?

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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>

Q.6.a. Are you happy to show me your current medicines?

<p>| | |</p>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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</table>
Q.7. Please list below all of the medications you took in the LAST WEEK. For each medication, please answer each of the questions,

<table>
<thead>
<tr>
<th>Medication name and strength</th>
<th>How many days did you take it?</th>
<th>Knowledge about prescribed medication Y/N</th>
<th>How many times per day do you take it?</th>
<th>How many pills do you take each time?</th>
<th>Knowledge about dosing schedule Y/N</th>
<th>For what reason are you taking it?</th>
<th>How well does the medicine work for you? a=well b=okay c=not well</th>
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</tbody>
</table>
Q.8. Why you may miss taking your medications and how often have you done so? Please tell me from the list below,

Please select one box for each question. Never Rarely Sometimes Often

1. Were away from home?
2. Were busy?
3. Forgot?
4. Had too many pills to take?
5. Wanted to avoid side effects?
6. Had change in daily routine?
7. Felt like the drug was harmful?
8. Felt sick or ill?
9. Ran out of pills?
10. Had problem taking pills at specified times (with or without meal, with water)
11. Felt Better?
Q.9. Do any of your medications bother you in any way?

- [ ] Yes
- [ ] No

Q.9.a. If yes, please name the medication and please tell me how much it bothers you?

<table>
<thead>
<tr>
<th>Medication name</th>
<th>How much did it bother you?</th>
<th>Can you describe it in more detail?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A lot</td>
<td></td>
</tr>
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<td></td>
<td>Some</td>
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<tr>
<td></td>
<td>A little</td>
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</tbody>
</table>
Q.10. Below is a list of problems that people sometimes have with their medicines. Please tell me how hard it is for you to do each of following.

<table>
<thead>
<tr>
<th>Problems</th>
<th>Very hard</th>
<th>Somewhat hard</th>
<th>Not hard at all</th>
<th>Which medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Open or close the container</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>b. Read the print on the bottle</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>c. Remember to take all the pills</td>
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<td></td>
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<tr>
<td>d. Get your refills in time</td>
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<tr>
<td>e. Take so many pills at the same time</td>
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</table>
Belief about Medicines Questionnaire

- We would like to ask you about your personal views about medicines prescribed for you.
- These are statements other people have made about their medicines.
- Please indicate the extent to which you agree or disagree.
- We are interested in your personal views. There are no right or wrong answers.

S/agree Agree Uncertain Disagree S/disagree

1. My health, at present, depends on my medicines
2. Having to take medicines worries me
3. My life would be impossible without my medicines
4. Without my medicines I would be very ill
5. I sometimes worry about long-term effects of my medicines
6. My medicines are a mystery to me
7. My health in the future will depend on my medicines
8. My medicines disrupt my life
9. I sometimes worry about becoming too dependent on my medicines
10. My medicines protect me from becoming worse