

Adherence to the Medicine Code List in Primary Health Care Military Clinics in Gauteng

A dissertation submitted by

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DECLARATION

I, Susanna G Engelbrecht, hereby declare that the work on which this study is based is original, except where acknowledgements indicate otherwise.

This dissertation is submitted for the degree Master of Science in Medicine (Pharmacy) at the University of Limpopo, Medunsa Campus. Neither the whole work nor any part of it has been submitted before for any degree or examination at this or any other university.

Signed.....on the.....day of

TABLE OF CONTENTS

| | |
|--|-------------|
| DECLARATION..... | i |
| ACKNOWLEDGEMENTS | iv |
| LIST OF TABLES..... | v |
| LIST OF FIGURES..... | vi |
| LIST OF APPENDICES | vii |
| GLOSSARY..... | viii |
| LIST OF ABBREVIATIONS | x |
| ABSTRACT..... | xi |
| CHAPTER 1: INTRODUCTION | 1 |
| 1.1 INTRODUCTION | 1 |
| 1.2 GLOBAL PERSPECTIVE..... | 1 |
| 1.3 SOUTH AFRICAN PERSPECTIVE..... | 2 |
| 1.4 SOUTH AFRICAN MILITARY HEALTH SERVICES PERSPECTIVE .. | 2 |
| 1.5 THE STUDY PROBLEM..... | 2 |
| 1.6 THE AIM OF THE STUDY | 4 |
| 1.7 THE OBJECTIVES OF THE STUDY | 4 |
| 1.8 THE IMPORTANCE OF THE STUDY..... | 4 |
| 1.9 SUMMARY | 5 |
| CHAPTER 2: LITERATURE REVIEW | 6 |
| 2.1 INTRODUCTION | 6 |
| 2.2 DEVELOPMENT OF FORMULARIES | 6 |
| 2.3 ADVANTAGES OF FORMULARIES | 9 |
| 2.4 FORMULARY DISADVANTAGES..... | 9 |
| 2.5 IMPLEMENTATION OF FORMULARIES | 10 |
| 2.6 THE USE OF FORMULARIES IN SOUTH AFRICA..... | 14 |
| 2.7 SUMMARY | 15 |
| CHAPTER 3: METHODOLOGY | 16 |
| 3.1 INTRODUCTION | 16 |
| 3.2 STUDY DESIGN | 16 |
| 3.3 STUDY SITES | 16 |
| 3.4 STUDY PERIOD..... | 17 |
| 3.5 SAMPLE | 17 |
| 3.6 DATA COLLECTION INSTRUMENTS..... | 21 |

| | | |
|--|--|-----------|
| 3.7 | DATA COLLECTION PROCEDURES..... | 22 |
| 3.8 | DATA ENTRY AND ANALYSIS..... | 23 |
| 3.9 | RELIABILITY AND VALIDITY OF THE DATA..... | 24 |
| 3.10 | ETHICAL CONSIDERATIONS..... | 24 |
| 3.11 | SUMMARY | 25 |
| CHAPTER 4: RESULTS | | 26 |
| 4.1 | INTRODUCTION | 26 |
| 4.2 | PRESCRIPTIONS ANALYSED..... | 27 |
| 4.3 | NUMBER OF ITEMS PER PRESCRIPTION..... | 28 |
| 4.4 | ADHERENCE TO MMCL | 30 |
| 4.5 | NON-ADHERENT ITEMS TO THE MMCL | 36 |
| 4.6 | PRESCRIBERS' PERCEPTIONS ON THE USE OF THE MMCL | 39 |
| 4.7 | PRESCRIBERS' REASONS FOR NON-ADHERENCE TO THE MMCL | 41 |
| 4.8 | PRESCRIBERS' SUGGESTIONS FOR IMPROVEMENT OF ADHERENCE TO THE MMCL..... | 43 |
| 4.9 | SUMMARY | 45 |
| CHAPTER 5: DISCUSSION OF RESULTS AND LIMITATIONS OF THE STUDY | | 46 |
| 5.1 | INTRODUCTION | 46 |
| 5.2 | PRESCRIPTIONS ANALYSED..... | 46 |
| 5.3 | AVERAGE NUMBER OF ITEMS PER PRESCRIPTION | 47 |
| 5.4 | ADHERENCE TO THE MILITARY MEDICINE CODE LIST | 48 |
| 5.5 | ITEMS RESPONSIBLE FOR NON-ADHERENT PRESCRIBING..... | 51 |
| 5.6 | INDICATORS FOR NON-ADHERENCE TO THE MMCL AND SUGGESTIONS FOR IMPROVEMENT OF ADHERENCE | 52 |
| 5.7 | LIMITATIONS OF THE STUDY | 56 |
| 5.8 | SUMMARY | 57 |
| CHAPTER 6: CONCLUSION AND RECOMMENDATIONS | | 58 |
| 6.1 | INTRODUCTION | 58 |
| 6.2 | CONCLUSION..... | 58 |
| 6.3 | RECOMMENDATIONS | 59 |
| REFERENCES..... | | 60 |
| APPENDICES | | 66 |

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LIST OF TABLES

| | | |
|-------------|--|----|
| Table 3.1: | Study sites included in the study..... | 17 |
| Table 3.2: | Sampling frame and calculated sample size | 19 |
| Table 3.3: | Responses to questionnaire..... | 21 |
| Table 4.1: | Total number of prescriptions analysed | 27 |
| Table 4.2: | Proportions of prescriptions written by nurses and doctors, by type of dispensing facility..... | 28 |
| Table 4.3: | Average number of items per prescription per clinic..... | 29 |
| Table 4.4: | Average number of items per prescription by prescriber type | 29 |
| Table 4.5: | Average number of items per prescription by facility type..... | 30 |
| Table 4.6: | Average number of items per prescription by location of facility | 30 |
| Table 4.7: | Total number of adherent prescriptions..... | 31 |
| Table 4.8: | Total number of adherent items | 32 |
| Table 4.9: | Total number of adherent prescriptions by prescriber type..... | 33 |
| Table 4.10: | Total number of adherent items (by prescriber type)..... | 33 |
| Table 4.11: | Total number of adherent prescriptions by facility type | 33 |
| Table 4.12: | Total number of adherent items by facility type..... | 34 |
| Table 4.13: | Total number of adherent prescriptions by region | 34 |
| Table 4.14: | Total number of adherent items by region | 35 |
| Table 4.15: | Non-adherent items grouped by therapeutic class | 36 |
| Table 4.16: | Details of non-adherent items prescribed | 37 |
| Table 4.17: | Specific items prescribed in non-adherence by nurses..... | 39 |
| Table 4.18: | Statement responses to questionnaire..... | 40 |
| Table 4.19: | Possible reasons given for non-adherence to the MMCL | 41 |
| Table 5.1: | Percentage adherent prescriptions and items by type of prescriber, facility and clinic location | 49 |

LIST OF FIGURES

| | |
|---|----|
| Figure 1.1: The Military Medicine Code List (MMCL) 2008 | 3 |
| Figure 5.1: Percentage of prescriptions written by doctors and nurses | 46 |
| Figure 5.2: Average number of items per prescription | 47 |

LIST OF APPENDICES

| | |
|---|----|
| Appendix 1: Data collection sheet..... | 66 |
| Appendix 2: Prescription check sheet..... | 68 |
| Appendix 3: Anonymous questionnaire | 69 |
| Appendix 4: ‘Questionnaire completed’ attendance form..... | 70 |
| Appendix 5: Medunsa Research and Ethics Committee Clearance Certificate | 71 |
| Appendix 6: Permission from the Military Service..... | 72 |

GLOSSARY

Dispensary

A dispensing point staffed by an indirectly supervised post-basic pharmacists' assistant. Visited monthly by a pharmacist.

Essential drugs

Essential drugs are those that satisfy the needs of the majority of the population. They should therefore be available at all times, in adequate amounts and in the appropriate dosage forms.

Essential drugs concept

A limited range of carefully selected essential medicines leads to better health care, better drug management and lower costs.

Formulary

A medicine formulary is a code list detailing medicines available to prescribers for a particular institution.

Pharmacy

A dispensing point staffed by a pharmacist, the pharmacist and the premises being registered with the South African Pharmacy Council.

Post-basic pharmacists' assistant

A person registered as such at the South African Pharmacy Council. May dispense re-packaged medicine or patient ready packs according to protocols and standard operating procedures. Is indirectly supervised by a pharmacist that visits the dispensary on a monthly basis.

Standard treatment guidelines

Standard treatment guidelines list the preferred drug and non-drug treatments for commonly occurring conditions and health problems experienced by people in a specific health system.

LIST OF ABBREVIATIONS

| | |
|-------|--|
| AHFS | American Hospital Formulary Service |
| DOH | Department of Health |
| EDL | Essential Drugs List |
| EDP | Essential Drugs Programme |
| EML | Essential Medicine List |
| ICIUM | International Conference on Improving the Use of Medicines |
| INRUD | International Network for the Rational Use of Drugs |
| MIMS | Monthly Index of Medical Specialities |
| MMCL | Military Medicine Code List |
| NDP | National Drug Policy |
| NEDLC | National Essential Drug List Committee |
| PHC | Primary Health Care |
| SA | South Africa |
| SAMF | South African Medicines Formulary |
| SAMHS | South African Military Health Service |
| SANDF | South African National Defence Force |
| STG | Standard Treatment Guidelines |
| UMHS | University of Michigan Health System |
| WHO | World Health Organization |

ABSTRACT

According to the World Health Organisation, there should be an essential medicines list in every functioning health care system in the world. The Department of Health of South Africa published its first Essential Drugs List for Primary Health Care in 1996 and for paediatric and hospital use in 1998. The South African Defence Force published its Military Medicine Code List (MMCL) in 2002. Since the implementation of the code list in the military service, no research study has been undertaken to determine adherence to the code list by prescribers or to determine indicators for possible non-adherence to the MMCL.

The main aim of the study was to evaluate prescribing adherence to the MMCL list by doctors and nurses in the Primary Health Care military clinics in Gauteng. Further objectives were to establish indicators for non-adherence and provide suggestions to improve adherence, to determine to which drugs non-adherence was directed and to determine the average number of items prescribed per prescription.

A cross-sectional, mainly quantitative, descriptive study was conducted at 14 military PHC dispensing points in Gauteng. Data were collected retrospectively from 838 prescriptions, of which 348 were written by doctors and 490 by nurses. A questionnaire was used to collect data prospectively from seven doctors and 34 nurses on their perceptions of the use of the MMCL.

The prescriptions were analysed for adherence to the stipulations of the MMCL. Proportions of adherent prescriptions and items were compared between prescriber type (doctors and nurses), facility type (pharmacies and dispensaries) and facility location (Northern Region, close to 1 Military Hospital and Southern Region), using the Chi-square test. Non-adherent items were tabulated and grouped. Data from the questionnaires were analysed descriptively. Indicators for possible non-adherence and suggestions for improvement of adherence were listed and grouped.

The average number of items per prescription was 3.4. Overall, 89.9% of prescriptions (n=838) and 96.4% of items (n=2832) were adherent to the MMCL.

More prescriptions written by doctors (96,8%) were adherent, compared to nurses (84,9%; $P<0.001$). Only a few items were responsible for non-adherence. Non-adherent items specifically for nurses included corticoid nasal sprays, azithromycin, meloxicam and ispagula husks. Adherence of prescriptions dispensed in dispensaries (no pharmacist) (93.0%) was higher compared to pharmacies (87.0%; $P<0.004$). Prescriptions from facilities in the South of Gauteng (96.5%) were more adherent than those near 1 Military Hospital (North) (87.7%; $P<0.001$). Reasons for non-adherence included staff shortages, implementation and availability of the MMCL, absence of standard treatment guidelines (STGs) in the MMCL and delayed referrals to specialist departments.

Suggestions for improvement of adherence to the MMCL included better implementation and distribution of the code list, addressing staff shortages, including Standard Treatment Guidelines (STGs) in the code list and improving the referral system from clinics to hospitals.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Medicines are beneficial to all human beings when used correctly and all human beings should be able to access the necessary medicines when needed. This is a basic human right and the Patients' Rights Charter of the Department of Health (DOH) of South Africa states that every patient has the right of access to health care, which includes access to medicines (DOH, 1996a).

1.2 GLOBAL PERSPECTIVE

The World Health Organization (WHO) introduced the concept of essential medicines as a limited range of carefully selected medicines that lead to better health care, better drug management and lower costs. The WHO essential medicine list was a global concept that could be applied in any country, in private and in public sectors and at different levels of the health care system (WHO, 2002).

The implementation of the concept of essential medicines was intended to be flexible and adaptable to different situations. The choice of which medicines were essential remained a National Drug Policy (NDP) responsibility as it helped to set priorities to all aspects of the pharmaceutical system (WHO, 2002).

According to the WHO there should be an essential medicines list in every functioning health care system in every country. By the end of 1999, 156 countries had official essential medicines lists of which 127 had been updated by 2002 (WHO, 2002).

The essential medicines lists also serve to guide procurement and supply of medicines in the public sector as no health system can afford to supply all medicines that are available on the market (WHO, 2002).

1.3 SOUTH AFRICAN PERSPECTIVE

The constitution of the Republic of South Africa, Act no 108 Of 1996, guaranteed access to health care services for all South Africans.

Emanating from this was the National Health Policy for South Africa. Elements from the National Health Policy were carried forward in the National Drug Policy (NDP), which was published in 1996 (DOH, 1996b). The goal of the policy was to fully develop the potential that medicines had, to improve the health status within the available resources in the country.

A means to implement the NDP was the development and implementation of an Essential Drugs Programme (EDP). The DOH of South Africa first published Standard Treatment Guidelines (STGs) and Essential Drugs Lists (EDLs) for Primary Health Care (PHC) in 1996 (DOH,1996c). Separate formularies were developed for hospital and paediatric use. These were published in 1998 (DOH 1998a; DOH 1998b). The PHC formulary was revised and published in 1998, 2003 and again in 2008 (DOH, 1998c, DOH, 2003a, DOH, 2008).

1.4 SOUTH AFRICAN MILITARY HEALTH SERVICES PERSPECTIVE

Prior to 2001 there was essentially an open medication use system in the South African National Defence Force (SANDF). The Surgeon General then instructed that a national Military Medicine Code List (MMCL) be drawn up. A professional team was appointed and the first MMCL was published in 2002 (SAMHS Medicine Codification and Therapeutics Committee, 2002). The MMCL applied to all prescribing health care professionals in the SANDF.

1.5 THE STUDY PROBLEM

1.5.1 Current Situation

A Military Medicine Code List (MMCL) was developed and implemented in 2002. The code list is a combined list for both the hospital and the PHC sectors with items that can

freely be prescribed by nurses indicated by an asterisk. Headings in the code list indicate restrictions on items at hospital level for doctors.

The Medicine Codification and Therapeutics Committee meet twice a year to update and amend the MMCL. The committee consists of specialists (usually heads of departments) and pharmacists of the three military hospitals in South Africa. A doctor, pharmacist and nurse also represent the primary sector.

1.5.2 Reason for this study

Since the implementation of the MMCL in 2002, no research study has been undertaken to determine adherence to the code list by prescribers, or to determine indicators for possible non-adherence to the MMCL.

The reason for conducting this study was to determine whether or not there is adherence to the code list by prescribing doctors and nurses in the PHC military clinics in Gauteng. The study attempted to determine to which drugs non-adherence is directed, to establish indicators for non-adherence and to provide suggestions to improve adherence to the MMCL. The latest edition of the MMCL is shown in Figure 1.1 (SAMHS, 2008).

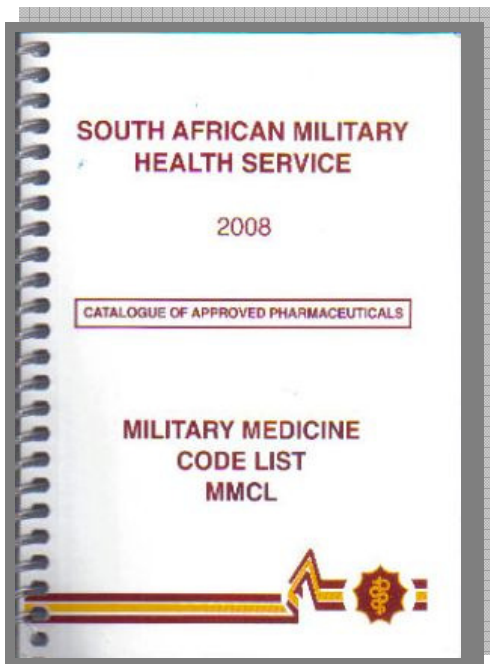


Figure 1.1: The Military Medicine Code List (MMCL) 2008

1.5.3 Implications of non-adherent prescribing

Non-adherence by prescribers to the MMCL has financial implications. Ford (2004) stated that globally, health care providers are under pressure to curb the rapid escalation of health care costs. Pharmaco-economics and medicine formularies are a means to reduce these costs by allowing efficient use of available resources. According to Wade and colleagues (1996), cost minimalisation is usually the reason for the use of formularies as well as the promotion of rational prescribing.

1.6 THE AIM OF THE STUDY

The aim of this study was to evaluate prescribing adherence to the MMCL by military doctors and nurses in the PHC military clinics in Gauteng, South Africa.

1.7 THE OBJECTIVES OF THE STUDY

The objectives of the study were to

- determine the number of items prescribed per prescription;
- assess adherence to the MMCL by military doctors and nurses;
- establish whether non-adherence is restricted to certain items only; and to
- establish indicators for non-adherence and provide suggestions for improvement of adherence to the MMCL.

1.8 THE IMPORTANCE OF THE STUDY

This will be the first study to investigate prescribers' adherence to the MMCL. The study will show whether prescribing doctors and nurses in the PHC military clinics in Gauteng adhere to the MMCL. It will indicate whether the MMCL has been accepted by the prescribing community as well as their sentiments towards it. Potential problem items for certain prescribers will be highlighted. Possible reasons for non-adherence as well as suggestions to improve adherence will be noted.

The ideal situation would be for the MMCL to be very widely accepted and used by all prescribers, as this would lead to more cost-effective use of health resources. This study will produce a voice from one of the larger military prescribing areas in the country and the MMCL committee can take cognisance of the results and possibly implement more effective measures that will ensure adherence.

1.9 SUMMARY

In this chapter the scope of the study was defined and background information to the study problem was given. The aim of the study was identified and the objectives of the study were clearly outlined. The chapter ended with a brief discussion on the importance of the study. A literature review on the study topic is presented in Chapter 2.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter the literature survey conducted on the research topic, is presented. The chapter starts with a discussion on the development of formularies and continues to discuss advantages and disadvantages of formularies. This is followed by a discussion on the implementation of formularies, which includes an outline of indicators for measuring drug use as well as the role of interventions in formulary implementation. The chapter is concluded with a discussion of the use of formularies in South Africa.

2.2 DEVELOPMENT OF FORMULARIES

Hospital formularies, or medicine code lists, have been in existence for many years. In the United States, at the University of Michigan Health System (UMHS), the formulary has a long history. The first formulary of the university hospital was authored in 1934 by UMHS's chief pharmacist of that time, Harvey A.K. Whitney Sr. In 1954, The Hospital Formulary for Selected Drugs, an expanded version of previous editions, was written by Donald E. Francke and later became the basis of today's American Hospital Formulary Service (AHFS) Drug Information text (McCreddie *et al.*, 2002).

The WHO introduced the concept of essential medicines as a limited range of carefully selected medicines that lead to better health care, better drug management and lower costs. They defined essential medicines, in 1975, as those that satisfy the priority health care needs of the population and stated that they should be available at all times, in the proper dosage forms, to all segments of the population (Dukes & O'Connor, 1997).

The first WHO model list of essential medicines was published in 1977 and has been updated every two years since then. It contained approximately 200 active substances (Hogerzeil, 2003). Other countries followed this concept. The National Essential Drugs Programme of Indonesia was first adopted in 1979, immediately after the introduction of the essential drugs concept of the WHO (Laing & Santoso, 1997).

Section 701 of the National Defence Authorisations Act for the fiscal year 2000 directed the Department of Defence of the United States to establish an effective, efficient and integrated pharmacy benefits programme. According to legislation, the pharmacy benefits programme had to include a single, uniform formulary to govern military health system beneficiaries' access to pharmaceuticals (Tanielian *et al.*, 2003).

The first edition of the WHO model formulary, based on the model list of essential medicines, was published in 2002 and was intended to serve as a resource for countries in developing their own formularies (Tisocki *et al.*, 2004). It was essential that locally relevant information be incorporated into national formularies. Tisocki and co-workers (2004) developed a locally focussed manual to complement the WHO model formulary in designing appropriate, country specific formularies.

The NDP of South Africa, published by the DOH in January 1996, made provision for the development of an EDP that included an EDL and STGs (DOH, 1996b). A National Essential Drugs List Committee (NEDLC) appointed by the Minister of Health, was responsible for drawing up and revising the national list of essential drugs. The first STGs and EDL for PHC in South Africa were published in 1996 (DOH, 1996c). Separate formularies for hospital and paediatric use were published in 1998 (DOH, 1998a; DOH, 1998b). The PHC formulary was revised and published in 2003 and again in 2008 (DOH, 1998c; DOH, 2003a; DOH, 2008).

In the United Kingdom, in 1999, Duerden and Walley called for a joint formulary for primary and secondary care. Separate budgets had existed for primary and secondary care and patient transition between the two sectors was problematical. There were divisions in managing prescribing between primary and secondary care. They felt that joint formularies would improve overall care and raise awareness of the need to consider overall costs within a unified national health service.

Concerning the need for separate or joint primary and hospital formularies, Kasje and colleagues (2004), in the Netherlands, stated that joint drug formularies and treatment guidelines had been developed to reduce problems arising at the interface between primary and secondary care. They found that most hospital specialists relied for their prescribing on international guidelines and agreements within their own department,

while general practitioners in the primary sector, relied more on national and regional guidelines. General practitioners were more supportive than specialists of the initiative to develop joint treatment guidelines.

Regarding STGs, Furniss (2000) stated that there was a general move towards the production of treatment guidelines, with the argument that drugs should be considered within the overall management of a disease process.

The WHO model list of essential medicines aims to identify cost-effective medicines for priority conditions, together with the reasons for their inclusion, linked to evidence based clinical guidelines and with special emphasis on public health aspects and considerations of value for money (WHO, 2002).

Treatment guidelines are disease oriented and reflect a consensus on the treatments of first choice for a range of medical conditions. A medicines formulary is drug oriented. If linked, STGs and EDLs form powerful tools to promote the rational use of drugs (Foreshaw, 1997). These two usually go hand in hand. Treatment guidelines exist for different levels of health care. In South Africa separate standard treatment guidelines and essential drug lists are available for primary health care, hospital and paediatric care (DOH, 2006a; DOH, 2006b; DOH, 2008).

Electronic formularies have been investigated and are freely available in most countries. The WHO supports their model list of essential medicines by a web-based Essential Medicines Library as a user-friendly entry point into the mass of information produced by the various WHO departments (Hogerzeil *et al.*, 2004).

A study done by the Advanced Concepts Institute, in Philadelphia, United States of America found that both predominantly e-prescribers and traditional prescribers showed high levels of formulary compliance of 83.2% and 82.8% respectively. They also found that there was no difference in generic drug utilisation rates between e-prescribers and traditional prescribers (Ross *et al.*, 2005).

Mccreadie and colleagues (2002) stated that electronic formularies attempt to improve on the problems encountered with printed versions and increase access for clinicians.

2.3 ADVANTAGES OF FORMULARIES

There are several advantages to the use of formularies. Formularies are compiled to inform prescribers within a particular institution of the medicines available to their patients. Cost minimalisation is usually the reason for formularies as well as the promotion of rational prescribing. Traditionally, formulary systems have also been used to control drug costs (Wade *et al.*, 1996).

A further advantage of a formulary is that prescribers develop an intimate knowledge of a limited range of medicines that leads to enhanced monitoring of drug therapy and improved patient care (Furniss, 2000).

Formularies assist in managing and budgeting for pharmaceuticals. According to Dippenaar and colleagues (2005) it was essential to manage and budget for PHC in order to deliver a sustainable, accessible and quality health care service to the population. Their study established the cost per prescription at the Heidedal Community Health Centre and the National District Hospital in Bloemfontein. They found that the cost per prescription at PHC level was not high but that the number of patients that needed treatment was enormous. Primary health care was actually very expensive and good quality control was necessary.

The Department of Health's PHC package for South Africa (2000) states that medicines and supplies in the primary sector should always be available as per the EDLs and that they should always be in stock. The EDLs therefore serve as a guide to pharmaceutical procurement sections in the public sector.

In many countries, especially those with highly developed health systems, hospitals develop their own formularies. The advantage is that the formulary can be tailored to fit the particular requirements of the hospital and to reflect departmental consensus on first choice treatments from the national list of essential drugs (Foreshaw & Hogerzeil, 1997).

2.4 FORMULARY DISADVANTAGES

The use of formularies also has certain disadvantages. According to Kwan (2005), hospital formularies restricted evidence based practice. He reported that they very often

had a limited number of drugs from each class and the choice of drugs included in the list was not determined by evidence but by cost per tablet.

According to Furniss (2000), the cheapest drug in a class may not always be the drug of choice, which could be a disadvantage.

Hogerzeil and co-workers (2004) pointed out that the procedures for updating the WHO Model List of Essential Medicines were often consensus based and not evidence based (Hogerzeil *et al.*, 2004). Between 2000 and 2002 the process of updating the WHO Model List was strengthened through global consultation and since then a web-based Essential Medicines Library was developed, which included information such as the reasons for medicines inclusion in the Model List.

The South Africa National EDL was meant to serve as a medicines formulary for the public sector. The EDL however, does not cover all classes of drugs and therefore institutions offering tertiary and quaternary (high specialised treatment) healthcare, formulate their own formulary lists through a drugs and therapeutic committee. A doctor can only obtain drugs not appearing on the EDL or the hospital's formulary following a written motivation (HSRC, 2006).

Medical aids also formulate their own formularies. This poses a problem for physicians in private practise, as they see patients from varying medical aids, each with its own formulary. Physicians therefore have to deal with many formularies when prescribing (Shrank *et al.*, 2004).

2.5 IMPLEMENTATION OF FORMULARIES

2.5.1 Indicators for measuring drug use

The International Network for the Rational Use of Drugs (INRUD) was formed in 1989 with the objective of undertaking multidisciplinary intervention research to promote the appropriate use of medicines in developing countries. Core groups from many countries in Africa and Asia participated in developing drug use indicators to investigate medicine use in primary care facilities (WHO, 1993). The drug use indicators were developed for

use as measures of performance in the following three general areas related to the rational use of drugs in primary care:

- Pharmaceutical prescribing practices by health providers
- Key elements of patient care, covering both clinical consultation and pharmaceutical dispensing
- Availability of facility specific factors which support rational use, such as key essential drugs and minimum pharmaceutical information

Only a small number of basic indicators were recommended for this purpose. These indicators are referred to as core indicators and are divided into the following three categories:

- Prescribing indicators
 - Average number of drugs per encounter
 - Percentage of drugs prescribed by generic name
 - Percentage of encounters with an anti-biotic prescribed
 - Percentage of encounters with an injection prescribed
 - Percentage of drugs prescribed from essential drug list or formulary
- Patient Care Indicators
 - Average consultation time
 - Average dispensing time
 - Percentage of drugs actually dispensed
 - Percentage of drugs adequately labelled
 - Patient's knowledge of correct dosage
- Facility Indicators
 - Availability of copy of essential drugs list or formulary
 - Availability of key drugs

These indicators have formed the basis for measuring medicine use in many studies conducted since its development. The WHO has created a database of more than 750 published and unpublished surveys of medicine use carried out in developing countries and countries with economies in transition, using these standard drug use indicators, since 1990 (Holloway, 2006).

2.5.2 Interventions and formularies

Since the development and implementation of medicine formularies, many drug use and intervention studies on the use and impact of formularies have been conducted. A review of all published studies of outpatients use of medicines presented at the first International Conference on Improving Use of Medicines (ICIUM) in Thailand in 1997, showed that interventions to improve use of medicines could be successful and that the impact varied by intervention type. Printed materials alone had little impact on improving practice. Greater effects on medicines use were associated with improved supervision, audit and feedback of practice, group process, and community case management. The effects of training were variable and often not sustained, probably due to differences in training quality and the absence of follow up after a time limited educational process (WHO, 2009).

Other researchers found that continuous intervention, review and feedback are required if a formulary is to continue to achieve its objectives (Freely, 1990). In Ireland it was found that if a hospital formulary was introduced alone with no active interventions such as feedback on prescribing habits, peer comparison and information on drugs, the formulary did not achieve its objectives. When intervention occurred, generic prescribing rose by 50%, inappropriate prescribing and overall use of third generation cephalosporins fell and compliance with the recommended list of drugs was good. When no interventions took place, previous gains were eroded and drug costs rose.

Managerial interventions in the form of self monitoring programmes on prescribing habits, in which prescribing patterns were compared and then fed back to the prescribers, showed positive results in different health centres in Indonesia. Poly pharmacy decreased, prescribing patterns improved and the average number of drugs per prescription decreased from 4.2 to 3.1 (Laing & Santoso, 1997b).

The importance of having a monitoring system in place was highlighted by the core organising team at the 2004 International Conference on Improving the Use of Medicines (ICIUM), in Thailand. After they reviewed all of the evidence presented at the conference, they reaffirmed the core recommendations and made three new recommendations. One of the three recommendations was that, to improve medicine use, countries should implement national medicine programmes that cover the private and public sectors and that these should include built-in monitoring systems (Holloway, 2006).

Managerial assessment was done at the Groningen University in the Netherlands, in a study to determine adherence to a regional formulary by general practitioners. If the drug prescribed was advised in the formulary, it was considered to be globally adherent. The results showed that global adherence varied from 76% to 89% (Kamps *et al.*, 2000).

A study was conducted in the Netherlands where hospital drug formulary (HDF) requests were compared with non-HDF requests. Patient, prescriber, drug and HDF characteristics were considered as possible indicators for non-adherence. It was found that non-adherence was characterised by newly marketed drugs, drugs that were part of the patient's pre-admission drug therapy, drugs with many fellow drugs within the drug group on the market and drugs originating from a drug group for which the HDF was highly restrictive (Fijn *et al.*, 2001).

Kasje (2004) found that an important barrier for specialists to using guidelines and formularies was that they did not perceive the need for these.

The availability of formularies to prescribers is also very important if they need to promote the rational use of medicines. The fact book summarising results from studies reported between 1990 and 2006 on medicine use in primary care in developing and transitional countries reported that the availability of an Essential Medicine List to prescribers was highly variable across the time periods ranging from about 40% to about 80% without a consistent pattern (WHO, 2009).

The availability of clinical guidelines to prescribers did not seem to improve over time. Between 2004 and 2006, only half of health care facilities were reported to have clinical

guidelines available during indicator surveys. Studies from South Asia suggested that clinical guidelines and Essential Medicine Lists (EMLs) were rarely accessible to prescribers in this region while they were more readily available in other parts of the world. In health care facilities in Africa and Latin America, EML were available in half of the health care facilities studied (WHO, 2009).

The most effective interventions in terms of largest positive effects on medicine use outcomes have combined multiple intervention components, especially those characterised by enhanced health worker supervision combined with provider and consumer education. Interventions that involve a group educational process for health workers also had consistently positive effects. National medicine policies, regulation and printed materials were interventions with limited evidence of impact (WHO, 2009).

Following the ICIUM 2004, there was still much concern about the continued inappropriate use of medicines and the failure to take action at a global level. These discussions resulted in the adoption of resolution WHA60.16 entitled “Progress in the resolution on rational use of medicines”, at the World Health Assembly in May 2007. The resolution calls for a crosscutting, sector wide policy approach to health systems to promote rational use of medicines.

2.6 THE USE OF FORMULARIES IN SOUTH AFRICA

The use of formularies at different levels of care, in the form of STGs and EDLs was implemented as part of the EDP in South Africa in 1996. Five years later the impact of the EDP at PHC level was measured (DOH, 2003b). A total number of 239 PHC facilities and district hospitals were surveyed and results were compared to baseline surveys, carried out in eight out of nine provinces between 1996 and 1998. The results showed that the EDP was widely implemented at PHC level. On average, 86% of drugs found on shelves were from the EDL. Ninety percent (90%) of medicines prescribed, were from the EDL, which was a substantial improvement from the baseline surveys (65%). National EDL and STG books were available in 90% of facilities, compared to 59% in the baseline surveys. On average, 82% of the basket of key drugs were available at facilities. The number of items prescribed per prescription was 2.2, compared to 2.5 in

the baseline survey. It was found that 90% of all prescribed items were in accordance with the EDL (DOH, 2003b).

The Human Sciences Research Council (HSRC, 2006) investigated the impact of South Africa's NDP on pharmaceuticals in South Africa ten years after implementation. The study was conducted at 15 public hospitals in the Western Cape and Limpopo between August and December 2005. In the Western Cape 92% of all drugs prescribed in public hospitals were from the EDL and in Limpopo 93.1%. The average number of items prescribed per prescription in public hospitals in the Western Cape was 3.0 and in Limpopo it was 3.4.

The main aim of this study was to investigate the use of a medicines formulary, known as the MMCL, by prescribers at PHC military clinics in Gauteng, South Africa.

2.7 SUMMARY

In this chapter, the literature pertaining to the study was discussed. It covered aspects such as the development, advantages, disadvantages and implementation of formularies. The chapter ended with a discussion of the use of medicine formularies in South Africa.

The methods used in this research project are presented in the following chapter.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This chapter describes the methodology used to determine adherence to the MMCL as well as to determine which items may be causing non-adherence to the list. It also describes the methods used to determine indicators for non-adherent prescribing by military doctors and nurses in the PHC military clinics in Gauteng.

The study design, study sites, sample, data collection instruments and procedures are discussed. The data analysis procedures are detailed, a description is provided of how the validity and reliability of the data were ensured, followed by an outline of the ethical considerations of the study.

3.2 STUDY DESIGN

The design of the study was cross-sectional, mainly quantitative and descriptive. Quantitative data were collected retrospectively from prescriptions. A questionnaire was used to collect data prospectively from doctors and nurses, using open and close-ended questions.

3.3 STUDY SITES

The study was conducted at all 14 dispensing points in the PHC military clinics in Gauteng, which included six pharmacies, managed by pharmacists and eight dispensaries, managed by qualified post-basic pharmacists' assistants. The study sites are shown in Table 3.1.

Table 3.1: Study sites included in the study

| Dispensing point | Pharmacies | Dispensaries |
|-------------------------|--|---|
| Managed by | Pharmacist | Post-basic pharmacists' assistant |
| Name of facility | Air Force Base Waterkloof Rietondale Wonderboom Armscor Doornkop Dunnotar | 68 Air School SA Air Force Gymnasium Army Gymnasium Heidelberg Murrayhill Dequaria SAMHS Academy Lenz Kempton Park |
| Sub-total | 6 | 8 |
| Total | 14 | |

3.4 STUDY PERIOD

The study was conducted over a period of 18 weeks. Data were collected between May 2009 and September 2009.

3.5 SAMPLE

3.5.1 Sampling frame

A sampling frame was compiled based on the State Information Technology Agency (SITA) statistical report, issued to the Gauteng Pharmacy Manager, who is the manager of all pharmacies and dispensaries in Gauteng, for the period January 2007 to May 2007. This report provided the average number of items dispensed per month for each of the 14 dispensing points included in the study (refer to Table 3.2).

3.5.2 Sample size

3.5.2.1 Prescriptions

The researcher calculated the average number of items dispensed at each dispensing point for the period January 2007 to May 2007. Overall, an average number of 53095

items (18000 prescriptions) were dispensed per month in the study area (refer to Table 3.2).

To calculate the size of the sample for each dispensing point, the number of items dispensed at each dispensing point, as a percentage of the total number of items dispensed, was calculated. This decimal percentage was then rounded to the nearest integer. The minimum meaningful number of prescriptions to be sampled at any one dispensing point was taken to be 20.

Table 3.2 shows that the dispensing point with the lowest number of items dispensed was Heidelberg, with a rounded percentage point calculated as two. This meant that two percentage points equalled twenty prescriptions and therefore one percentage point equalled ten prescriptions. Based on this calculation, the prescription sample size for each dispensing point was then calculated by multiplying each rounded percentage point by ten.

In total, 840 prescriptions were sampled and analysed (refer to Table 3.2).

Table 3.2: Sampling frame and calculated sample size

| Facility | AMHU GT number of items dispensed from January 2007 to May 2007 | | | | | | Sample calculation | |
|-------------------|--|--------------|--------------|--------------|--------------|--------------------|-----------------------|----------------|
| | Jan | Feb | March | April | May | Rounded Average | Rounded % | Sample Size |
| Waterkloof | 15190 | 14169 | 14728 | 13367 | 17655 | 15022 | 28 | 280 |
| Rietondale | 5050 | 4744 | 5235 | 5153 | 6449 | 5326 | 10 | 100 |
| SAMHS Academy | 3389 | 4483 | 4215 | 3780 | 4966 | 4167 | 8 | 80 |
| Wonderboom | 3605 | 3874 | 4118 | 3729 | 5051 | 4075 | 8 | 80 |
| Murrayhill | 3578 | 3339 | 4012 | 3506 | 3434 | 3574 | 7 | 70 |
| Dequaria | 3390 | 3271 | 2763 | 2557 | 4193 | 3235 | 6 | 60 |
| Lenz | 2847 | 3160 | 3203 | 2389 | 3470 | 3013 | 6 | 60 |
| Krygkor | 2405 | 2735 | 3108 | 2616 | 2951 | 2763 | 5 | 50 |
| Dunnotar | 2942 | 2620 | 2484 | 2509 | 3743 | 2860 | 5 | 50 |
| 68 Air School | 255 | 2602 | 2378 | 2610 | 3402 | 2249 | 4 | 40 |
| Doornkop | 2097 | 1760 | 1873 | 1897 | 2333 | 1992 | 4 | 40 |
| SAAF Gymnasium | 1933 | 2512 | 2026 | 446 | 4077 | 2199 | 4 | 40 |
| Kempton Park | 1494 | 1410 | 1497 | 1392 | 1815 | 1522 | 3 | 30 |
| Heidelberg | 910 | 1209 | 1425 | 1343 | 605 | 1098 | 2 | 20 |
| Total | 49085 | 51888 | 53065 | 47294 | 64144 | 53095 | 100 | 840 |

3.5.2.2 Questionnaire

Many of the doctors and nurses were on deployment at the time of the study. It was therefore decided that for completion of the questionnaire, a sample of >55% of the total number of prescribers in the Gauteng military area, would be meaningful. As there were 12 doctors' posts and 62 nurses' posts in the area in 2008, the sample size required for completion of the questionnaire was seven doctors and 34 nurses.

3.5.3 Inclusion and exclusion criteria

Prescriptions written in October 2008 were considered for the sampling process. Only military prescriptions were included. Prescriptions from practitioners in private practice

were purposely excluded. The reason being that all military dependants and members should be accommodated within the military system and that the number of private practitioner prescriptions was so small that their presence was insignificant.

3.5.4 Sampling procedures

Simple random sampling i.e. each prescription selected had the same probability of being selected (Williams *et al.*, 2006), was used to select the sample of 840 prescriptions from the 14 facilities. The researcher visited all 14 dispensing points in the PHC military clinics in Gauteng and confirmed the sample size according to the weighted calculations shown in Table 3.2. An independent sampler selected the prescriptions until the correct number of prescriptions for each facility was drawn. The sampler selected prescriptions written during the month of October 2008.

At two clinics, i.e. Dequaria and 68 Air School, the researcher found that the pharmacists' assistants were deployed internationally during October 2008. These dispensaries were therefore closed for that period. Prescriptions written during January 2009 at 68 Air School and prescriptions written during September 2008 at Dequaria, were then sampled, as they were readily accessible. This had no effect on the data as the prescribers were not deployed and continued prescribing as usual.

The questionnaires were distributed to doctors and nurses throughout the PHC military clinics in Gauteng, at the time of data collection from the prescriptions. Questionnaires were also distributed at a Gauteng quarterly nurse management forum meeting on 24 July 2009.

Of the 44 respondents to the questionnaire, 37 were nurses and seven were doctors. The respondents were distributed throughout the PHC military clinics in Gauteng, as shown in Table 3.3.

Table 3.3: Responses to questionnaire

| Clinic | Doctors | Nurses | Total |
|-----------------|----------------|---------------|--------------|
| Waterkloof | 2 | 7 | 9 |
| Wonderboom | 1 | 4 | 5 |
| Rietondale | 1 | 4 | 5 |
| SAMHS Academy | 1 | 3 | 4 |
| SAAF Gym | 1 | 3 | 4 |
| Dunnotar | | 3 | 3 |
| No clinic name* | | 3 | 3 |
| Kempton Park | | 2 | 2 |
| Murrayhill | 1 | 1 | 2 |
| PD School | | 2 | 2 |
| Krygkor | | 2 | 2 |
| Lenz | | 1 | 1 |
| Heidelberg | | 1 | 1 |
| Doornkop | | 1 | 1 |
| Total | 7 | 37 | 44 |

* The 'no clinic name' entry in the table indicates valid questionnaires completed but the respondents, possibly because of the anonymity of the questionnaire, failed to indicate which clinic they were from.

3.6 DATA COLLECTION INSTRUMENTS

The prescription data were collected on a data collection sheet (refer to Appendix 1). The data collection sheet indicated the prescription number, whether the prescriber was a doctor or a nurse, the total number of items and the number of non-adherent items on the prescription. Non-adherent items were recorded by name on the data collection sheet.

A prescription check sheet (refer to Appendix 2) was used at the same time as the data collection sheet, to control the accuracy and bias of the researcher. Ten percent (10%) of the prescriptions were drawn from the selected sample and checked by a pharmacists' assistant or pharmacist, other than the researcher, for accuracy. The number of accurately checked prescriptions as well as the number of inaccurately checked prescriptions was recorded.

An anonymous questionnaire (refer to Appendix 3), consisting of a section of dichotomous questions, and a section where respondents were requested to provide possible reasons for non-adherence as well as suggestions for improvement of adherence, was used.

Before completing the questionnaire all doctors and nurses were asked to sign a separate 'questionnaire completed' attendance form (refer to Appendix 4). They were not asked to sign a consent form.

3.7 DATA COLLECTION PROCEDURES

An independent sampler selected the correct sample size of prescriptions for each dispensing point, as calculated above (refer to Section 3.5.2). The researcher, who is familiar with the MMCL, completed the data collection sheet at each dispensing point. The prescription number, whether a doctor or a nurse wrote the prescription, the total number of items on the prescription and the number of non-adherent items were recorded. The researcher also recorded any non-adherent items by name, on the data collection sheet.

At Murrayhill Clinic the researcher found some prescriptions written by Operational Emergency Care Practitioners (Ops Medics). These prescriptions were regarded as being written by Nursing Professionals as these Ops Medics also had to adhere to the MMCL restrictions and had undergone the relevant training.

The questionnaires were distributed throughout the PHC military clinics in Gauteng to doctors and nurses who were available to complete them at the time when the researcher was evaluating the prescriptions in any one clinic. To make up the number of respondents required for the sample, questionnaires were also taken to a quarterly nurses' management forum meeting, distributed and collected from there.

3.8 DATA ENTRY AND ANALYSIS

Data were analysed in consultation with a statistician. The researcher captured the raw data from the data collection sheets into Microsoft Excel™ spreadsheets designed by the statistician. Entered data were checked for correctness and accuracy.

The first spreadsheet indicated a line number, prescription written by doctor or nurse, prescription number, number of items on the prescription and number of non-adherent items, if any.

Non-adherent items were captured on a second spreadsheet and this spreadsheet indicated a line number, prescription number, an item code number and the generic name of the non-adherent item.

A separate sheet indicated the locality of the dispensing point as either Northern Region or Southern Region and whether it was a pharmacy or dispensary (no pharmacist).

The quantitative data from the prescriptions were analysed descriptively and proportions of adherent prescriptions and items were compared between prescriber types (doctors and nurses), facility location (close to 1 Military Hospital or not) and facility types (pharmacies or dispensaries), using the Chi square test. Differences were considered significant at levels where $P < 0.05$.

A Microsoft Excel™ spreadsheet was used to tabulate responses from the questionnaires completed by the doctors and nurses. Reasons given for possible non-adherence were tabulated and grouped. The same procedure was followed for suggested ways given to improve adherence.

3.9 RELIABILITY AND VALIDITY OF THE DATA

Reliability can be defined as the extent to which test scores are accurate, consistent or stable (Struwig & Stead, 2001).

Validity refers to the accuracy of the study. It can also be defined as the extent to which a research design is scientifically sound or appropriately conducted (Struwig & Stead, 2001).

To control bias and verify the accuracy of the researcher, regarding items in the code list and the prescribing scope of practice of nurses and doctors, 10% of the sample selected for each dispensing point was calculated. This number of prescriptions was then drawn from the selected sample in a simple random manner. These prescriptions were double checked for accuracy by the pharmacist or pharmacists' assistant at each dispensing point and signed by them. They were free to consult the MMCL in order to do this. No discrepancies were found during this process.

Entered data were also checked and verified for accuracy to increase the validity and reliability of the data.

3.10 ETHICAL CONSIDERATIONS

Ethical approval to conduct the study was obtained from the University of Limpopo, Medunsa Campus, Research and Ethics Committee. Refer to Appendix 5 for a copy of the clearance certificate.

Permission to conduct the study at the PHC military clinics in Gauteng, was granted by the Director of Pharmacy at the South African Military Health Services Head Quarters in Pretoria (refer to Appendix 6).

To ensure confidentiality of patients and prescribers, no names were recorded. Only prescription numbers were recorded on the data collection sheets and questionnaires were completed anonymously.

3.11 SUMMARY

In this chapter the methodology used in this study was discussed. The research design and study sites were described. Discussion surrounding the sample included the sampling frame, the sample size, inclusion and exclusion criteria and sampling procedures. Data collection instruments and procedures were detailed. A discussion of the data analysis procedures and methods to ensure reliability and validity followed.

The results from the data collected for this study are presented in Chapter 4.

CHAPTER 4

RESULTS

4.1 INTRODUCTION

The results based on the data collected in this study are presented in this chapter.

In total, 838 prescriptions were sampled and analysed for adherence to the MMCL. Non-adherent prescriptions were defined as those that contained any number of non-adherent items. A non-adherent item was defined as any item prescribed by either a doctor or a nurse that was not within their MMCL scope of practise.

Proportions of adherent prescriptions and items were compared between prescriber types (doctors and nurses), facility location (close to 1 Military Hospital [Northern Region] or not [Southern Region]) and facility types (dispensaries [no pharmacist] and pharmacies) using the Chi-square test.

Forty four prescribers (doctors and nurses) completed a questionnaire to determine their perceptions on the use of the MMCL. Responses were summarised descriptively.

4.2 PRESCRIPTIONS ANALYSED

Table 4.1: Total number of prescriptions analysed

| Type of facility | Facility name | Region | Prescriptions by doctors | | Prescriptions by nurses | | Total |
|------------------|---------------|--------|--------------------------|--------------|-------------------------|--------------|------------|
| | | | Number | % | Number | % | |
| Pharmacy | Krygkor | N | 15 | 30.0% | 35 | 70.0% | 50 |
| | Rietondale | N | 23 | 23.0% | 77 | 77.0% | 100 |
| | Waterkloof | N | 72 | 60.5% | 47* | 39.5% | 119 |
| | Wonderboom | N | 25 | 31.3% | 55 | 68.8% | 80 |
| | Doornkop | S | 35 | 87.5% | 5 | 12.5% | 40 |
| | Dunnotar | S | 15 | 30.6% | 34 | 69.4% | 49 |
| Dispensary | 68 Air School | N | 15 | 37.5% | 25 | 62.5% | 40 |
| | Dequaria | N | 13 | 21.7% | 47 | 78.3% | 60 |
| | Murrayhill | N | 38 | 54.3% | 32 | 45.7% | 70 |
| | SAAF Gym | N | 7 | 17.5% | 33 | 82.5% | 40 |
| | SAMHS Acad | N | 25 | 31.3% | 55 | 68.8% | 80 |
| | Heidelberg | S | 4 | 20.0% | 16 | 80.0% | 20 |
| | Kempton Park | S | 3 | 10.0% | 27 | 90.0% | 30 |
| | Lenz | S | 58 | 96.7% | 2 | 3.3% | 60 |
| | Total | | 348 | 41.5% | 486 | 58.0% | 838 |

*Including four prescriptions written by a nurse and signed by a doctor

N=Northern Region (close to 1 Military Hospital); S=Southern Region (not close to 1 Military Hospital)

The four prescriptions written by a sister and signed by a doctor from Waterkloof represent an irregularity that will have to be addressed by the relevant authorities. Two prescriptions, one each from Waterkloof and Dunnotar, were duplicated on the data collection sheet. The duplicates were discarded.

Of the total number of prescriptions analysed (n=838), 41.5% were written by doctors and 58.5% by nurses. On average nurses wrote the majority of prescriptions at each dispensing point. Notable exceptions were Waterkloof, Doornkop Murrayhill and especially Lenz, where doctors wrote 96.7% of the prescriptions.

There was one pharmacy dispensing point each from the Northern Region, Waterkloof, and from the Southern Region, Doornkop, where doctors wrote the majority of the prescriptions.

The dispensaries also had one dispensing point each from the Northern Region, Murrayhill, and from the Southern Region, Lenz, where doctors wrote the majority of the prescriptions.

Table 4.2: Proportions of prescriptions written by nurses and doctors, by type of dispensing facility

| Facility type | Prescriptions written by doctor | | Prescriptions written by nurse | | Total |
|---------------|---------------------------------|--------------|--------------------------------|--------------|------------|
| | Number | % | Number | % | |
| Pharmacy | 185 | 42.2% | 253 | 57.8% | 438 |
| Dispensary* | 163 | 40.8% | 237 | 59.3% | 400 |
| Total | 348 | 41.5% | 490 | 58.5% | 838 |

*No pharmacist

The four prescriptions written by a nurse and signed by a doctor (Table 4.1) were considered to be written by a nurse in the above table.

Table 4.2 illustrates that 42.2% of prescriptions written by doctors were dispensed in pharmacies and 40.8% in dispensaries. Of the prescriptions written by a nurse, 57.8% were dispensed in pharmacies and 59.3% in dispensaries.

Clinics that have pharmacies and therefore pharmacists, have doctors on a more regular basis than clinics with only dispensaries.

4.3 NUMBER OF ITEMS PER PRESCRIPTION

As part of the data analysis, the number of prescriptions and items per clinic, prescriber type, facility type and location of facility were determined. The average number of items per prescription in each case was calculated. The results are shown in Tables 4.3 to 4.6 below and indicate that an average of 3.4 items were prescribed per prescription.

Table 4.3: Average number of items per prescription per clinic

| Clinic | Number of prescriptions | Total number of items | Average number of items per prescription |
|---------------|--------------------------------|------------------------------|---|
| 68 Air School | 40 | 118 | 3.0 |
| Dequaria | 60 | 255 | 4.3 |
| Doornkop | 40 | 177 | 4.4 |
| Dunnotar | 49 | 149 | 3.0 |
| Heidelberg | 20 | 52 | 2.6 |
| Kempton Park | 30 | 89 | 3.0 |
| Krygkor | 50 | 138 | 2.8 |
| Lenz | 60 | 176 | 2.9 |
| Murrayhill | 70 | 201 | 2.9 |
| Rietondale | 100 | 323 | 3.2 |
| SAAF Gym | 40 | 121 | 3.0 |
| SAMHS Academy | 80 | 273 | 3.4 |
| Waterkloof | 119 | 450 | 3.8 |
| Wonderboom | 80 | 310 | 3.9 |
| Total | 838 | 2 832 | 3.4 |

Table 4.3 above illustrates that the average number of items prescribed per prescription was the highest at Doornkop Clinic (4.4) and the lowest at Heidelberg Clinic (2.6).

Table 4.4: Average number of items per prescription by prescriber type

| Prescriber type | Number of prescriptions | Total number of items | Average number of items per prescription |
|------------------------|--------------------------------|------------------------------|---|
| Doctors | 348 | 1151 | 3.3 |
| Nurses | 490* | 1681* | 3.4 |
| Total | 838 | 2 832 | 3.4 |

* Including four prescriptions with a total of 34 items written by nurses and signed by doctors

On average doctors prescribed fewer items (3.3) compared to nurses (3.4) (refer to Table 4.4).

Table 4.5: Average number of items per prescription by facility type

| Facility type | Number of prescriptions | Total number of items | Average number of items per prescription |
|---------------|-------------------------|-----------------------|--|
| Pharmacy | 438 | 1547 | 3.5 |
| Dispensary | 400 | 1285 | 3.2 |
| Total | 838 | 2 832 | 3.4 |

Table 4.5 shows that on average fewer items were prescribed at clinics where there was a dispensary (3.2) and not a pharmacy (3.5). In the Northern Region, close to 1 Military Hospital, prescriptions contained on average more items (3.4), compared to the Southern Region (3.2) (refer to Table 4.6).

Table 4.6: Average number of items per prescription by location of facility

| Location | Number of prescriptions | Total number of items | Average number of items per prescription |
|------------------|-------------------------|-----------------------|--|
| Northern Region* | 639 | 2 189 | 3.4 |
| Southern Region | 199 | 643 | 3.2 |
| Total | 838 | 2 832 | 3.4 |

*Close to 1 Military Hospital

4.4 ADHERENCE TO MMCL

Overall it was found that of the 838 prescriptions analysed, 89.9% were fully adherent to the MMCL (Table 4.7). Of the 2832 items analysed, 96.4% were adherent (Table 4.8).

4.4.1 Adherence to the MMCL by clinic

Table 4.7: Total number of adherent prescriptions

| Clinic | Total number of prescriptions | Fully adherent prescriptions | |
|---------------|-------------------------------|------------------------------|--------------|
| | | Number | Percent |
| Doornkop | 40 | 40 | 100.0% |
| Heidelberg | 20 | 20 | 100.0% |
| Lenz | 60 | 60 | 100.0% |
| 68 Air School | 40 | 39 | 97.5% |
| Krygkor | 50 | 48 | 96.0% |
| Dunnotar | 49 | 46 | 93.8% |
| SAMHS Academy | 80 | 76 | 95.0% |
| Murrayhill | 70 | 66 | 94.3% |
| Wonderboom | 80 | 70 | 87.5% |
| Kempton Park | 30 | 26 | 86.7% |
| Dequaria | 60 | 51 | 85.0% |
| SAAF Gym | 40 | 34 | 85.0% |
| Rietondale | 100 | 82 | 82.0% |
| Waterkloof | 119 | 95 | 79.8% |
| Total | 838 | 753 | 89.9% |

Prescriptions analysed from Doornkop, Heidelberg and Lenz Military Clinics, all in the Southern Region, were 100% adherent. The least adherent clinics were Waterkloof and Rietondale with 79.8% and 82% adherence respectively. These two clinics are the busiest clinics in Gauteng, both of them have pharmacies, thus also pharmacists, and both are located in the vicinity of 1 Military Hospital.

Table 4.8: Total number of adherent items

| Clinic | Total number of items | Adherent items | |
|---------------|-----------------------|----------------|--------------|
| | | Number | Percent |
| Doornkop | 177 | 177 | 100.0% |
| Heidelberg | 52 | 52 | 100.0% |
| Lenz | 176 | 176 | 100.0% |
| 68 Air School | 118 | 117 | 99.2% |
| Dunnotar | 149 | 146 | 98.0% |
| Krygkor | 138 | 136 | 98.6% |
| Murrayhill | 201 | 197 | 98.0% |
| SAMHS Academy | 273 | 267 | 97.8% |
| Wonderboom | 310 | 298 | 96.1% |
| Dequaria | 255 | 244 | 95.7% |
| Kempton Park | 89 | 85 | 95.5% |
| SAAF Gym | 121 | 114 | 94.2% |
| Rietondale | 323 | 303 | 93.8% |
| Waterkloof | 450 | 417 | 92.7% |
| Total | 2 832 | 2 729 | 96.4% |

Table 4.7 illustrates that 89.9% of prescriptions analysed were adherent compared to 96.4% of items analysed (Table 4.8). This indicates that a small number of items were responsible for non-adherence to the MMCL.

4.4.2 Adherence to the MMCL by prescriber type

There was a significant difference between the number of prescriptions adherent to the MMCL written by doctors and those written by nurses. Table 4.9 shows that 96.8% of prescriptions written by doctors adhered to the MMCL compared to 84.9% written by nurses ($P < 0.001$; Chi square test).

Table 4.9: Total number of adherent prescriptions by prescriber type

| Prescriber type | Total number of prescriptions | Fully adherent prescriptions | | <i>P</i> (Chi square test) |
|-----------------|-------------------------------|------------------------------|--------------|----------------------------|
| | | Number | % | |
| Doctor | 348 | 337 | 96.8% | <0.001 |
| Nurse | 490 | 416 | 84.9% | |
| Total | 838 | 753 | 89.9% | |

Similarly (Table 4.10), the total number of adherent items on prescriptions written by doctors (99.0%), was significantly more ($P < 0.001$; Chi square test) compared to those written by nurses (94.5%).

Table 4.10: Total number of adherent items (by prescriber type)

| Prescriber type | Total number of items | Adherent items | | <i>P</i> (Chi square test) |
|-----------------|-----------------------|----------------|--------------|----------------------------|
| | | Number | % | |
| Doctor | 1151 | 1140 | 99.0% | <0.001 |
| Nurse | 1681 | 1589 | 94.5% | |
| Total | 2 832 | 2 729 | 96.4% | |

4.4.3 Adherence by type of dispensing facility

Tables 4.11 and 4.12 illustrate that dispensaries were more adherent than pharmacies. There was a significant difference in adherence between prescriptions dispensed in pharmacies (87.0%) compared to those dispensed in dispensaries (93.0%) ($P < 0.004$; Chi square test).

Table 4.11: Total number of adherent prescriptions by facility type

| Facility type | Total number of prescriptions | Fully adherent prescriptions | | <i>P</i> (Chi square test) |
|---------------|-------------------------------|------------------------------|--------------|----------------------------|
| | | Number | % | |
| Pharmacy | 438 | 381 | 87.0% | 0.004 |
| Dispensary | 400 | 372 | 93.0% | |
| Total | 838 | 753 | 89.9% | |

Table 4.12 below illustrates that the total number of adherent items on prescriptions dispensed in pharmacies was 95.5%, compared to 97.4% in dispensaries ($P < 0.006$; Chi square test).

Table 4.12: Total number of adherent items by facility type

| Facility type | Total number of items | Adherent items | | <i>P</i> (Chi square test) |
|---------------|-----------------------|----------------|--------------|----------------------------|
| | | Number | % | |
| Pharmacy | 1547 | 1477 | 95.5% | 0.006 |
| Dispensary | 1285 | 1252 | 97.4% | |
| Total | 2 832 | 2 729 | 96.4% | |

4.4.4 Adherence to the MMCL by region

Adherence to the MMCL at dispensing points in the Northern Region, which is in the vicinity of 1 Military Hospital, and the Southern Region, further away from 1 Military Hospital, was compared.

The percentage of fully adherent prescriptions in the Northern Region was 87.7% compared to 96.5% in the Southern Region (Table 4.13). The percentage of items that adhered was 95.6% in the Northern Region and 98.9% in the Southern Region (Table 4.14). In both cases the difference between adherence in the Northern Region and the Southern Region was significant ($P < 0.001$; Chi square test).

Table 4.13: Total number of adherent prescriptions by region

| Region | Total number of prescriptions | Fully adherent prescriptions | | <i>P</i> (Chi square test) |
|--------------|-------------------------------|------------------------------|--------------|----------------------------|
| | | Number | % | |
| North | 639 | 561 | 87.8% | <0.001 |
| South | 199 | 192 | 96.5% | |
| Total | 838 | 753 | 89.9% | |

Table 4.14: Total number of adherent items by region

| Region | Total number of items | Adherent items | | <i>P</i> (Chi square test) |
|--------------|-----------------------|----------------|--------------|----------------------------|
| | | Number | % | |
| North | 2 189 | 2093 | 95.6% | <0.001 |
| South | 643 | 636 | 98.9% | |
| Total | 2 832 | 2 729 | 96.4% | |

The results showed that facilities further away from 1 Military Hospital (in the Southern Region) were more adherent than facilities in the vicinity of 1 Military Hospital (in the Northern Region) (Table 4.13 and Table 4.14). Only seven items on seven different prescriptions from the Southern Region were prescribed in non-adherence to the code list.

4.5 NON-ADHERENT ITEMS TO THE MMCL

Table 4.15: Non-adherent items grouped by therapeutic class

| Therapeutic class | Number of items prescribed | | |
|--------------------------------------|----------------------------|-----------|------------|
| | By doctor | By nurse | Total |
| Steroid | 1 | 23 | 24 |
| Antihyperlipidaemic | 2 | 11 | 13 |
| Antibiotic | | 12 | 12 |
| Non-steroidal anti-inflammatory drug | 1 | 11 | 12 |
| Gastro-intestinal | | 10 | 10 |
| Antihypertensive | 2 | 6 | 8 |
| Supplement | | 6 | 6 |
| Antifungal | 1 | 4 | 5 |
| Central nervous system | 3 | 1 | 4 |
| Hormone treatment for acne | | 2 | 2 |
| Eye drop | 1 | 1 | 2 |
| Urinary tract | | 1 | 1 |
| Diuretic | | 1 | 1 |
| Antiseptic | | 1 | 1 |
| Platelet aggregation inhibitor | | 1 | 1 |
| Antiviral | | 1 | 1 |
| Total | 11 | 92 | 103 |

Table 4.15 illustrates that the therapeutic class mostly prescribed non-adherently to the MMCL, was steroids. Details of the items prescribed within each class are shown in Table 4.16.

Table 4.16: Details of non-adherent items prescribed

| Therapeutic class | Detail | Generic Name | Number of items prescribed | |
|--------------------------------------|------------------------------|------------------------------|----------------------------|----------|
| | | | By doctor | By nurse |
| Steroid | Nasal spray | budesonide | | 9 |
| | | fluticasone | 1 | |
| | Ointment | prednisolone and cinchocaine | | 6 |
| | Cream | methylprednisolone | | 5 |
| | | clobetasone | | 1 |
| Suppositories | prednisolone and cinchocaine | | 2 | |
| Antihyperlipidaemic | First-line statin | atorvastatin | | 5 |
| | | simvastatin | | 4 |
| | Second line statin | pravastatin | 1 | 2 |
| | Other | ezetimibe | 1 | |
| Antibiotic | Macrolide | azithromycin | | 7 |
| | | clindamycin | | 2 |
| | Cephalosporin | cefuroxime | | 2 |
| | Aminoglycoside | kanamycin | | 1 |
| Non-steroidal anti-inflammatory drug | Cox 2 inhibitor | meloxicam | | 7 |
| | Cox inhibitor | lornoxicam | | 3 |
| | Coxib | celecoxib | 1 | 1 |
| Gastro-intestinal | Proton pump inhibitor | omeprazole | | 4 |
| | Laxative | ispaghula husks | | 4 |
| | Antispasmodic | methixene and others | | 1 |
| | | mebeverine | | 1 |
| Antihypertensive | Angiotensin receptor blocker | telmisartan | | 5 |
| | | losartan | 2 | |
| | Central-acting | moxonidine | | 1 |
| Supplement | Minerals and electrolytes | magnesium | | 4 |
| | | calcium | | 1 |
| | Iron syrup | iron syrup | | 1 |

| Therapeutic class | Detail | Generic Name | Number of items prescribed | |
|------------------------|--------------------------------|-------------------------------|----------------------------|-----------|
| | | | By doctor | By nurse |
| Antifungal | | itraconazole | | 3 |
| | | ketoconazole | 1 | 1 |
| Central nervous system | Antidepressant | venlafaxin | 1 | |
| | | mirtazapine | 1 | |
| | Hypnotic | zopiclone | | 1 |
| | Anxiolytic | buspirone | 1 | |
| Dermatological | Hormone treatment for acne | cyproterone, ethinyoestradiol | | 2 |
| Eye drop | Glaucoma | latanoprost | 1 | |
| | Corticoid | fluoromethalone | | 1 |
| Urinary tract | Antispasmodic | flavoxate | | 1 |
| Diuretic | | torasemide | | 1 |
| Antiseptic | Mouth wash | benzydamine, chlorhexidine | | 1 |
| Anticoagulant | Platelet aggregation inhibitor | clopidogrel | | 1 |
| Antiviral | | valaciclovir | | 1 |
| Total | | | 11 | 92 |

Table 4.17 below shows that the item mostly prescribed in non-adherence to the MMCL specifically by nurses, was budesonide nasal spray.

Table 4.17: Specific items prescribed in non-adherence by nurses

| Item description | Frequency prescribed |
|---------------------------------------|-----------------------------|
| Budesonide nasal spray | 9 |
| Azithromycin tablets | 7 |
| Meloxicam | 7 |
| Prednisolone and cinchocaine oint | 6 |
| Methyl prednisolone cream | 5 |
| Atorvastatin | 5 |
| Telmisartan | 5 |
| Magnesium | 4 |
| Simvastatin | 4 |
| Omeprazole | 4 |
| Ispagula husks | 4 |
| Lornoxicam | 3 |
| Itraconazole | 3 |
| Pravastatin | 2 |
| Clindamycin | 2 |
| Cefuroxime | 2 |
| Prednisolone and cinchocaine supps | 2 |
| Cyproterone, ethinyloestradiol | 2 |
| Other items | 1 |

Of the 11 non-adherent items prescribed by doctors, two items were for losartan and one each for fluticasone, pravastatin, ezetimibe, celecoxib, ketoconazole, venlafaxin, mitazapine, buspirone and latanoprost eye drops.

4.6 PRESCRIBERS' PERCEPTIONS ON THE USE OF THE MMCL

A questionnaire on perceptions of the use of the MMCL was completed by 37 nurses and seven doctors. The questionnaire consisted of a general section of dichotomous questions, a section suggesting possible reasons for non-adherence and a section for suggestions for improvement of adherence to the MMCL.

Table 4.18: Statement responses to questionnaire

| Statement | Doctors | | | Nurses | | | Total | | |
|--|---------|----|-----|--------|----|----|-------|----|----|
| | n* | Nr | % | n* | Nr | % | n* | Nr | % |
| Owens a personal copy of the MMCL | 7 | 5 | 71 | 37 | 29 | 78 | 44 | 34 | 77 |
| MMCL is too restrictive | 7 | 6 | 86 | 36 | 21 | 58 | 43 | 27 | 63 |
| Referrals take more than 14 days | 6 | 6 | 100 | 36 | 35 | 97 | 42 | 41 | 98 |
| Would like to see STGs included in the MMCL | 7 | 6 | 86 | 37 | 33 | 89 | 44 | 39 | 89 |
| Need an electronic format of the MMCL | 7 | 6 | 86 | 37 | 27 | 73 | 44 | 33 | 75 |
| Received feedback on the use of the MMCL | 7 | 0 | 0 | 35 | 5 | 14 | 42 | 5 | 12 |
| There is a shortage of doctors in Gauteng Military Clinics | 7 | 7 | 100 | 36 | 35 | 97 | 43 | 42 | 98 |

* Not all respondents provided a response to all the questions, thus difference in sample size

Table 4.18 illustrates the following:

- Only 71% of the doctors and 78% of the nurses that completed the questionnaire had their own personal copy of the MMCL.
- More doctors (86%) compared to nurses (58%) felt that the MMCL is too restrictive.
- 98% of respondents indicated that referrals to 1 Military Hospital specialist departments took longer than 14 days.
- 89% of all respondents indicated that they would like STGs included in the MMCL.
- 75% of respondents indicated a need for an electronic format of the MMCL.
- No doctors that completed the questionnaire had received feedback regarding the use of the MMCL. Five nurses (12%) that completed the questionnaire said that they had received feedback regarding the use of the MMCL. Two respondents indicated that this feedback was in the form of consultations with pharmacists and three respondents indicated that it was in the form of a reprimand from the pharmacist.

- All the doctors that completed the questionnaire (7) and 97% of nurses that completed the questionnaire indicated a shortage of doctors in the Military Clinics of Gauteng.

4.7 PRESCRIBERS' REASONS FOR NON-ADHERENCE TO THE MMCL

Table 4.19: Possible reasons given for non-adherence to the MMCL

| Reason for non-adherence to the MMCL | | Number of doctors (n=7) | Number of nurses (n=37) | Total (n=44) | |
|--------------------------------------|-----------------------------|-------------------------|-------------------------|--------------|------|
| | | | | Number | % |
| Staff Shortages | Shortage of personnel | 2 | 9 | 11 | 25.0 |
| | Repeat prescriptions needed | 1 | 5 | 6 | 13.6 |
| | Too many patients | 0 | 5 | 5 | 11.4 |
| Implementation of the MMCL | Introduction and training | 2 | 6 | 8 | 18.2 |
| | Use of MMCL time-consuming | 0 | 7 | 7 | 15.9 |
| | Compared to other books | 0 | 7 | 7 | 15.9 |
| | MMCL too restrictive | 2 | 5 | 7 | 15.9 |
| | MMCL not updated regularly | 1 | 2 | 3 | 6.8 |
| MMCL not available | | 3 | 4 | 7 | 15.9 |
| Treatment regimens/guidelines | | 1 | 6 | 7 | 15.9 |
| Stock shortages | | 2 | 2 | 4 | 9.1 |
| Referrals take long | | 2 | 0 | 2 | 4.5 |

Reasons given for non-adherence to the MMCL were grouped into six main categories (refer to Table 4.19) and will be discussed briefly.

4.7.1 Staff shortages

Staff shortages as a possible reason for non-adherent prescribing to the MMCL was cited by 11 (25%) (nine nurses and two doctors) respondents. Nine of these respondents, mentioned doctors specifically.

Five nurses commented on the need to prescribe restricted items, not within their scope of practise, on repeat prescriptions in the clinics when no doctor was present. Five nurses commented on the high volume of patients attending the military clinics in Gauteng.

In addition to the possible reasons provided for non-adherence to the MMCL, one nurse commented on the distances that patients travelled to get to the clinics and that they therefore could not merely be sent from pillar to post because of the MMCL restrictions.

4.7.2 Implementation of the MMCL

Eight respondents (18.2%) (six nurses and two doctors) commented on the introduction of the MMCL and training regarding the use of the MMCL. Seven nurses indicated that they felt that the MMCL was too time consuming. Seven nurses indicated that they would rather use other books in which diagnosis codes, dosing guidelines, side effects and precautions were available. One nurse indicated that the South African Medicines Formulary (SAMF) and the Monthly Index of Medical Specialities (MIMS) were more user friendly.

Four respondents (three nurses and one doctor) commented on attitudes of prescribers towards the MMCL. One nurse felt that it was easier to phone a pharmacist and one suggested that nurses and doctors were just too lazy to consult the MMCL. A doctor commented on patients who demand medicines and doctors that just prescribe with disregard to the MMCL.

Seven respondents (five nurses and two doctors) commented on the MMCL restrictions. One doctor commented on patients followed-up in clinics after specialist consultation at a tertiary hospital and then requiring specialist medicines at the clinics. One nurse commented on the restrictions being cost related and felt that this was not always the best way.

Three respondents (two nurses and one doctor) commented on the MMCL not being updated regularly.

4.7.3 Availability of the military medical code list

Seven respondents (four nurses and three doctors) commented on the availability of the MMCL. Two doctors and four nurses commented that the MMCL was not available. One doctor indicated that doctors and nurses might not be aware that the MMCL exists.

4.7.4 Absence of treatment guidelines

Seven respondents (six nurses and one doctor) indicated that the reason for non-adherence might be that there were no treatment guidelines available in the MMCL. The doctor commented on the fact that there were different regimens at different institutions.

4.7.5 Stock shortages

Four respondents (two nurses and two doctors) commented on stock shortages in clinics as being a possible reason for non-adherence to the MMCL.

4.7.6 Referrals to specialist doctors

Two doctors commented that referrals to specialist departments at the hospital take too long. One of the doctors mentioned that the patients could be treated in the clinics as effectively.

4.8 PRESCRIBERS' SUGGESTIONS FOR IMPROVEMENT OF ADHERENCE TO THE MMCL

Doctors and nurses made the following suggestions for improvement of adherence to the MMCL:

4.8.1 Implementation of the MMCL

Eleven respondents (seven nurses and four doctors) suggested that there should be more in-service training regarding the MMCL. One nurse suggested that the MMCL training be part of the PHC training. More information, information sessions, education regarding the use of the MMCL and constant reminders about the MMCL were suggested. Five

respondents (three nurses and two doctors) suggested more regular meetings with pharmacists.

Five respondents (four nurses and one doctor) suggested feedback, annual updates and MMCL workshops.

One nurse each suggested that clinic nurses be included at MMCL meetings and that there be ongoing dialogue regarding the MMCL.

Six nurses suggested that the restrictions on items that nurses may prescribe according to the MMCL be narrowed.

4.8.2 Address staff shortages

Nine respondents (seven nurses and two doctors) suggested that more doctors be employed in the PHC military clinics in Gauteng. Two nurses mentioned the employment of more pharmacists.

4.8.3 Distribution of the MMCL

Seven respondents (four nurses and three doctors) suggested that the MMCL be more widely distributed.

Four nurses suggested an electronic format of the MMCL.

4.8.4 Treatment guidelines

Eight respondents (six nurses and two doctors) suggested more information in general and treatment guidelines included in the MMCL.

4.8.5 Referral system

One doctor and one nurse suggested improvements to the referral system to specialist departments at 1 Military Hospital.

4.9 SUMMARY

In this chapter the results of the study were presented. A brief introduction was given. This was followed by an evaluation of the prescriptions sampled as well as an analysis of the number of items per prescription. Prescribers' adherence to the MMCL was presented in detail. This was followed by an analysis of the items responsible for prescriptions to be non-adherent to the MMCL. The questionnaire on prescribers' perceptions of the MMCL was analysed and the reasons given for possible non-adherence and suggestions made for improvement of adherence were presented in detail.

A discussion of the results presented in this chapter, follows in Chapter 5.

CHAPTER 5

DISCUSSION OF RESULTS AND LIMITATIONS OF THE STUDY

5.1 INTRODUCTION

The results presented in Chapter 4 are discussed in this chapter. The discussion focuses on prescriptions analysed by prescriber and facility type, the average number of items prescribed per prescription, adherence to the military code list, including a discussion concerning adherence between prescriber types, dispensing facilities and regions. The items responsible for non-adherent prescribing to the MMCL are discussed. Indicators for non-adherence to the code list as well as suggestions for better adherence as suggested by the prescribers are presented. Finally the limitations of the study are outlined.

5.2 PRESCRIPTIONS ANALYSED

A total of 838 prescriptions were sampled and analysed for adherence to the MMCL.

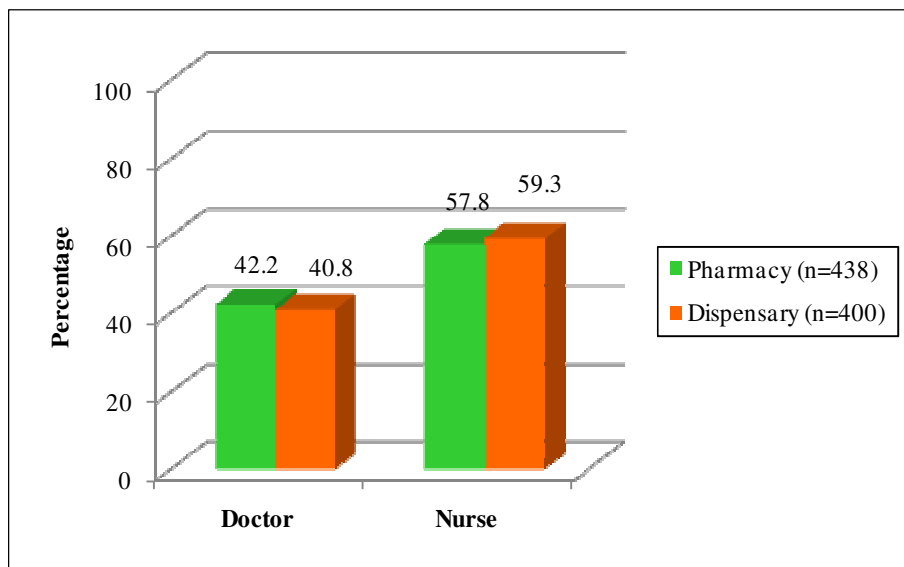


Figure 5.1: Percentage of prescriptions written by doctors and nurses

On average nurses wrote the majority of prescriptions (n=838) seen at both pharmacies (managed by pharmacists) and dispensaries (managed by pharmacists' assistants).

5.3 AVERAGE NUMBER OF ITEMS PER PRESCRIPTION

Fig 5.2 presents a summary of the average number of items per prescription, per facility and region.

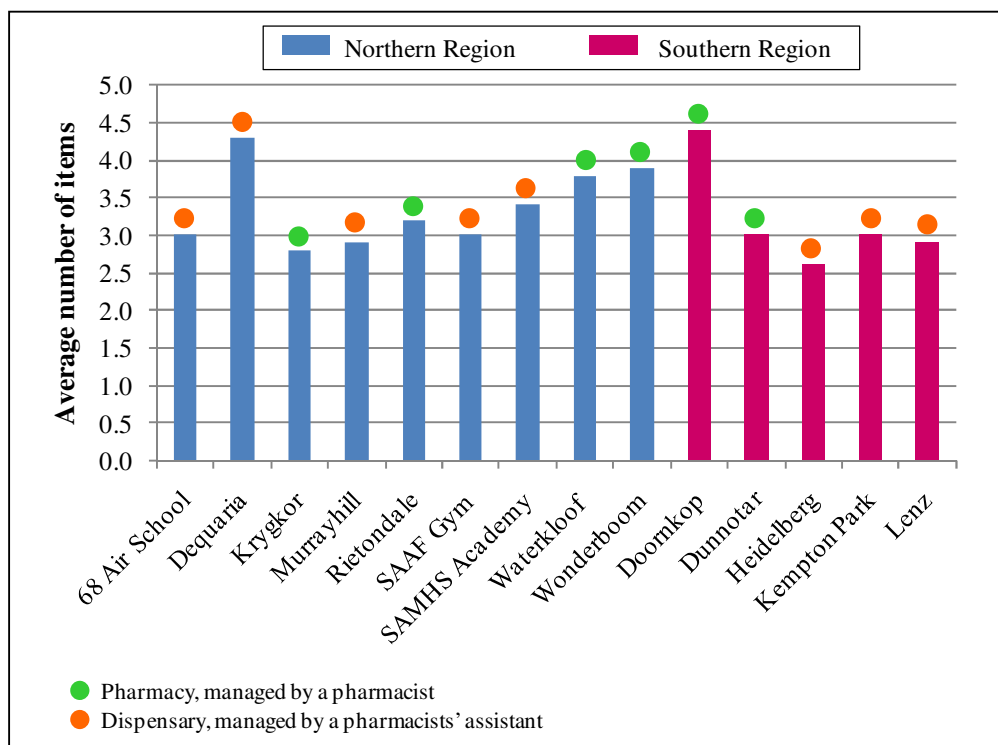


Figure 5.2: Average number of items per prescription

The average number of items prescribed per prescription in this study was 3.4. This figure compares to the study by Dippenaar and colleagues (2005) where it was found that the average number of items per prescription dispensed in the Heidedal Community Health Centre in Bloemfontein was 3.3.

The HSRC (2006) review reported that the average number of items per prescription, prescribed by medical staff in public hospitals and private surgeries in the Western Cape was 3.0 and in Limpopo 3.4. Results of a survey conducted in South Africa in 2003 to measure the impact of the Essential Drugs Programme (EDP) at PHC level, revealed a lower average of 2.2 items per prescription. An earlier publication by Meyer (1999), based on WHO recommendations for rational drug use, suggested that the average number of drugs per prescription at primary health care level should be below two.

The WHO (2009) report, summarising data for medicine use in primary care in developing and transitional countries, indicates that the average median number of medicines prescribed per patient in studies done between 1982 and 2006 was 2.45.

Although the average number of items per prescription in the military clinics in Gauteng compares to previous data from South Africa, it is higher compared to the results of the WHO (2009) report. The average number of items prescribed per prescription could be decreased with educational interventions, information, awareness and managerial interventions. The decrease can be accomplished on prescriptions written by doctors as well as on those written by nurses.

5.4 ADHERENCE TO THE MILITARY MEDICINE CODE LIST

Overall 96.4% of items (n=2832) were prescribed from the MMCL.

This figure is high and compares favourably to the results of the EDP survey conducted in South Africa in 2003 where 90.0% of all prescribed items were found to be in accordance with the national EDL (DOH, 2003b).

These results also compare well to the HSRC Review of 2006 where 92.0% of drugs prescribed in public hospitals in the Western Cape were according to the EDL and 93.1% in Limpopo.

According to the WHO (2009) report, the median percentage of medicines prescribed from an essential medicines list or formulary steadily rose from 66 in 1982-1991 to 89.4 in 2004-2006. There is currently no monitoring system in the PHC clinics in Gauteng for adherence to the MMCL. The International Conference on Improving the Use of Medicines (ICIUM) reiterated that each country should have a national medicine program that includes built-in monitoring systems (Holloway, 2006).

Table 5.1 presents a summary of the percentage adherent prescriptions and items by type of prescriber, facility and clinic location.

Table 5.1: Percentage adherent prescriptions and items by type of prescriber, facility and clinic location

| Type | | Adherent prescriptions (n=838) | | | Adherent items (n=2832) | | |
|------------|------------|-----------------------------------|------|--------|----------------------------|------|--------|
| | | n | % | P* | n | % | P* |
| Prescriber | Doctor | 348 | 96.8 | <0.001 | 1151 | 99.0 | <0.001 |
| | Nurse | 490 | 87.9 | | 1681 | 94.5 | |
| Facility | Pharmacy | 438 | 87.0 | 0.004 | 1547 | 95.5 | 0.006 |
| | Dispensary | 400 | 93.0 | | 1285 | 97.4 | |
| Region | North | 639 | 87.8 | <0.001 | 2189 | 95.6 | <0.001 |
| | South | 199 | 96.5 | | 643 | 98.9 | |

*Chi Square test

5.4.1 Comparison of prescriptions between different prescriber types

More prescriptions written by doctors (96.8%) in the PHC military clinics in Gauteng were adherent to the MMCL, compared to nurses (84.9%; $P < 0.001$). According to the WHO (2009) report the average number of drugs prescribed per patient by prescriber type indicated a median of 2.6 for medical doctors and 2.4 for paramedics or nurses. It must be noted that the majority of prescribers, by far, in the PHC military clinics in Gauteng are nurses.

A factor contributing to the non-adherent prescribing by nurses could be that in the PHC sector, nurses have to deal with many patients moving between the primary and hospital sectors with their specific medicine requests. These patients very often request their repeat prescriptions from the nurses in the clinics. More often than not, these prescriptions from the hospital and from doctors, contain restricted items i.e. those items that cause non-adherence to the MMCL when prescribed by nurses. Should the nurse then prescribe the restricted items, the prescription immediately becomes non-adherent.

This transition between the primary and tertiary sector was also problematic in the United Kingdom. Duerden and Walley (1999) called for a joint formulary for primary and secondary care in the United Kingdom. Separate budgets existed for primary and secondary care and patient transition between the two sectors was a problem.

Kasje *et al.*, (2004) stated that joint drug formularies and treatment guidelines had been developed to reduce problems arising at the interface between primary and secondary care.

5.4.2 Comparison between prescriptions dispensed in dispensaries and pharmacies

Prescriptions dispensed in dispensaries were more adherent (93%), compared to those dispensed in pharmacies (87%; $P < 0.001$). At pharmacies, one or more pharmacists were usually present.

Dispensaries are staffed by post-basic pharmacists' assistants, who are required to comply with the South African Pharmacy Council's rules and regulations, published in the Good Pharmacy Practice Manual (SAPC, 2008). The scope of practice for post-basic pharmacists' assistants clearly states that they may dispense only repackaged medicines and patient ready packs according to protocols and standard operating procedures. They will thus necessarily carry less stock and a smaller range in a dispensary. Patients usually take prescriptions with restricted items to a pharmacy for dispensing, as these are well distributed in the PHC area.

Prescribers, at pharmacy dispensing points, could be tempted to prescribe restricted items, as these items are available in the pharmacy anyway.

5.4.3 Adherence to the MMCL by Region

For the purposes of this study, Gauteng was divided into a Northern Region (Tshwane and surrounding area), in close proximity to 1 Military Hospital and a Southern Region, which is more in and around Johannesburg.

The percentage of fully adherent prescriptions in the Northern Region was lower (87.8%) compared to 96.5% in the Southern Region ($P < 0.001$). The results indicated that facilities further away from 1 Military Hospital were more adherent to the MMCL than those in close proximity to it.

There could be a number of possible reasons for the difference in adherence to the MMCL between the Northern and the Southern Region. As discussed in the previous

section, on average, prescriptions dispensed in pharmacies were less adherent compared to those dispensed in dispensaries. There are only two pharmacies in the Southern Region i.e. Doornkop and Dunnotar, compared to four in the Northern Region, i.e. Armscor, Waterkloof, Rietondale and Wonderboom.

Patients in the Northern Region have more ready access to specialists at the 1 Military Hospital. They often choose to fill their new prescriptions from a clinic pharmacy. Long waiting times at the hospital pharmacy is often cited as the reason for this. They also request repeat prescriptions from a clinic doctor or nurse and then obtain their medicines from a clinic pharmacy. Patients from the Southern Region have to travel long distances to get to the specialist departments. They very often obtain their prescriptions directly from the hospital pharmacy and do not request repeat prescriptions from the clinic.

There seems to be less of a transition between the primary and hospital sectors in the Southern Region.

5.5 ITEMS RESPONSIBLE FOR NON-ADHERENT PRESCRIBING

The items causing the most non-adherent prescribing by nurses were the corticoid nasal sprays, especially budesonide. The MMCL dictates that nurses may freely prescribe beclomethasone, doctors budesonide and specialists fluticasone. It is suggested that an updated price comparison be done between the available nasal sprays and that the sprays be divided into a first line and a second line treatment and that both these categories be opened to nurses and doctors for prescribing.

Azithromycin was the antibiotic that caused the most non-adherent prescribing by nurses. Azithromycin has a once daily dosing, for three days only, which is very convenient when compared to the other macrolide antibiotics on the MMCL.

The antibiotic cefuroxime was also prescribed by nurses, but far less frequently. Nurses were probably prescribing this item when no doctors were present in the clinics.

Meloxicam was the cox-2 inhibitor that caused the most non-adherent prescribing by nurses. It has a better side-effect profile than the other non-steroidal anti-inflammatory

drugs on the code list and was not prescribed regularly. It was prescribed seven times by nurses on the prescriptions that were analysed for this study.

Lornoxicam was prescribed three times by nurses. This item is not within the scope of practise of nurses and therefore was probably requested by patients on repeat prescriptions.

The combination of prednisolone and cinchocaine is a problem as the other haemorrhoid ointment on the code list has become increasingly difficult to obtain. Nurses are therefore prescribing the combination.

Ispagula husks are currently restricted for use by doctors only, but nurses prescribed it. Nurses have only one other bulk forming laxative available to prescribe, but this is not kept in stock at the hospitals. The result of this is that should the prescription be presented at the hospital, either because the patient happens to be there or there is a stock outage at the clinic, it cannot be filled. In this case, the patient is the one that is inconvenienced.

Atorvastatin, telmisartan, simvastatin, omeprazole, magnesium and all the other items should never be initiated by a nurse and these items were probably requested for by patients on repeat prescriptions.

In summary, problem items for nurses were corticoid nasal sprays, especially budesonide, azithromycin, meloxicam and ispagula husks.

5.6 INDICATORS FOR NON-ADHERENCE TO THE MMCL AND SUGGESTIONS FOR IMPROVEMENT OF ADHERENCE

Indicators for non-adherence to the MMCL have been grouped into six main categories according to frequency of comments made by respondents.

5.6.1 Staff shortages and referrals

The majority of statement responses from respondents (97%-100%) indicated that there was a shortage of doctors in the PHC military clinics in Gauteng (refer to Table 4.18). It is necessary that the posts for doctors in the PHC military clinics be fully staffed at all

times. Failure to do so places extreme pressure on the entire PHC area in Gauteng and especially the nurses. It also results in an overflow of patients that need to be seen by a doctor, at the hospital or at another clinic.

Ninety eight percent (98.0%) of respondents indicated that referrals to the specialist departments took more than 14 days (refer to Table 4.18). Consequently patients had to be treated in the clinics first. Patients also requested repeat prescriptions from the clinic and when no doctor was available the nurse was necessitated to prescribe the restricted items. Patients should never demand repeat prescriptions from nurses at PHC level. It is suggested that a further study investigate this phenomenon.

Problems faced by nurses were that many of the clinics were in outlying areas and that patients travelled long distances to get to the clinics. If the clinic was not staffed with a doctor then items restricted to doctors could not be prescribed. Under these conditions the nurse very often prescribed the relevant restricted item.

5.6.2 Implementation of the military medicine code list

The implementation of the MMCL by both doctors and nurses seemed to be inadequate. According to the respondents, proper training on its use was not provided, neither were reasons given for its implementation in the first place.

Negative attitudes towards the MMCL were recorded. Proper training and reasons for the implementation of the MMCL would result in improved attitudes.

A misperception existed among nurses that the MMCL in its current form was a reference book. Many nurses felt that the use of the MMCL was time consuming and that they would rather use other reference books. Training would enlighten them that the MMCL in its current form was not a reference book but a code list.

Responses to the questionnaire revealed that feedback regarding the use of the MMCL was minimal. According to a study in Ireland it was found that if a hospital formulary was introduced on its own with no active interventions such as feedback on prescribing habits, peer comparison and information on drugs, the formulary did not achieve its objectives (Freely *et al.*, 1990).

In this military environment no doctors and only 14% of nurses that completed the questionnaire had received feedback regarding the MMCL and yet the adherence was 89.9%.

According to the results, there was a lack of information from the MMCL committee meetings to the prescribing health care professionals.

It is strongly suggested that more training, education, information sessions, workshops and awareness creation regarding the use of the MMCL occur in the PHC military area of Gauteng.

It is also strongly suggested that pharmacists should be more actively involved in promoting and upholding the MMCL, as they are the recognised custodians of medicine.

The nurses have quarterly meetings in Gauteng where all nursing officers in charge are present. It is recommended that a pharmacist attends each meeting and presents a talk, an update and feedback from MMCL meetings or information in general to the nurses.

Pharmacists should regularly attend meetings where all the doctors from Gauteng are present to reinforce the MMCL and respond to and forward any problems and suggestions from that forum to the MMCL committee.

The MMCL in its current form does not make provision for patients that are seen for the first time at a specialist department at a hospital and then followed- up for the repeat prescriptions at a military clinic. The rules and regulations regarding the MMCL should allow for this scenario. Several respondents commented on patients requesting restricted items from clinic doctors or nurses.

Overall, the restrictions of the MMCL were very well accepted. Only 15.9% of respondents commented on the restrictions (refer to Table 4.19). Some nurses felt that the restrictions needed to be swayed for short periods to allow patients to get appointments at specialist departments.

One nurse commented on the restrictions being cost related and felt that this was not always the best way. Furniss (2000) said that the cheapest drug in a class might not always be the drug of choice.

5.6.3 Availability of the MMCL

The distribution of the code list was not widespread enough. Fewer than 80% of all health care practitioners had their own copy of the MMCL. In an ideal situation one would expect every prescriber to have a copy. This would most probably attribute to a higher adherence rate.

It is extremely important that each and every prescriber should have a copy of the MMCL. It is strongly suggested that statistics indicating the exact number of prescribers in the primary health environment as well as the hospital environment be presented to the MMCL committee so that these can be used as a guideline to obtain additional funds and optimise budgeting for the printing of enough copies of the MMCL.

Four nurses suggested an electronic format of the MMCL. Electronic formularies have been investigated and are freely available in most countries. However it was found that both predominantly e-prescribers and traditional prescribers showed high levels of formulary compliance, being 83.2% and 82.8% respectively, and that there was no difference in generic drug utilisation rates between e-prescribers and traditional prescribers (Ross *et al.*, 2005).

5.6.4 Treatment guidelines

Seven prescribers suggested inclusion of treatment guidelines in the MMCL. The South African EDL for PHC, used in public sector health care facilities, includes standard treatment guidelines (DOH, 2008). The MMCL committee is currently considering and evaluating the possibility of including treatment guidelines in the MMCL.

The researcher is of the opinion that the inclusion of standard treatment guidelines in the MMCL will be very beneficial to the military PHC prescribing community.

If this aligns with current treatment guidelines used in the public sector the transition of doctors between various hospitals and the PHC sectors could be enhanced.

5.6.5 Stock shortages

According to the WHO (2002) essential medicines are those that satisfy the priority health care needs of the population. They are intended to be available within functioning health care systems at all times in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price that individuals and the community can afford.

It is thus of utmost importance that the availability of essential medicines in the PHC sector be secured. It is suggested that EDL items in the MMCL be highlighted so that extra care can be taken by both the pharmacy personnel and the procurement section to ensure that these essential drugs are always in stock in sufficient quantities.

5.6.6 The primary health care sector in the military health service should be better defined

The perception gained from this study is that the primary sector is not well understood at hospital level. The PHC sector is big and expanding. It plays a very important role in reducing PHC patient load from the hospital. It is suggested that the statistics indicating the size of the primary sector be presented to the MMCL meeting and that better representation be made by the PHC sector on the MMCL committee. Feedback from the MMCL meetings to the PHC sector should be magnified.

5.7 LIMITATIONS OF THE STUDY

The research was restricted to the PHC military clinics in Gauteng only. Other provinces in South Africa were not included, neither were hospitals. The results are therefore not representative of the entire military service.

Only prescriptions written by military prescribers were analysed as the researcher felt that there was no real need for military patients to visit private practitioners. It would have been interesting however to see whether private practitioners who had received copies of the MMCL were adhering to its regulations.

5.8 SUMMARY

In this chapter, the results of the study were discussed. The discussion focussed on the average number of items prescribed per prescription and adherence to the MMCL, which included a discussion concerning adherence between prescriber types, dispensing facilities and regions. The items responsible for non-adherent prescribing to the MMCL were discussed. Indicators for non-adherence to the code list as well as suggestions for better adherence as suggested by the prescribers were discussed. The chapter ended with a discussion of the limitations of the study.

The conclusion and recommendations based on the results of this study will be presented in Chapter 6.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

In this chapter the conclusion drawn from the results discussed in Chapter 5 are presented. The chapter ends with an outline of recommendations that emanated from the study.

6.2 CONCLUSION

The average number of items per prescription (3.4) in the military clinics in Gauteng was relatively high, compared to the EDP impact survey of 2003, although it compared well to data from other provinces in South Africa, which were published later.

The study found that, in general, the 96.4% overall item adherence to the MMCL by prescribers in the PHC military clinics in Gauteng, was high, compared to the 90% adherence of all prescribed items to the EDL, found in the EDP impact survey at PHC level in South Africa in 2003. Prescriptions written by doctors adhered more to the code list than those written by nurses. Prescriptions dispensed in dispensaries, where there is no pharmacist, were significantly more adherent than those dispensed in pharmacies.

Prescriptions dispensed in the Southern Region of Gauteng were significantly more adherent to the code list than those dispensed in the Northern Region, which is closer to 1 Military Hospital.

Only a limited number of items in this study were responsible for non-adherent prescribing to the MMCL. The most common items, especially in the case of nurse prescribing, were corticoid nasal sprays, azithromycin, meloxicam and ispagula husks.

The main reasons for non-adherence to the MMCL according to the respondents in this study were staff shortages, implementation and availability of the code list, the absence of STGs and delayed referrals to specialist departments.

Suggestions for improvement included better implementation of the MMCL, distribution of and information on the code list, addressing staff shortages, including STGs in the code list and improving the referral system to hospitals from clinics.

6.3 RECOMMENDATIONS

Based on the findings of this study the following recommendations are made:

- Introduce a managerial, monitoring tool or system for prescribing from the MMCL.
- Introduce an electronic version of the MMCL.
- Involve pharmacists and pharmacists' assistants more actively in promoting the MMCL, as they are the recognised custodians of medicine.
- Better representation by the PHC sector on the MMCL committee.
- Feedback from MMCL meetings to prescribers as well as pharmacists in the PHC military clinics should be magnified.
- Highlight EDL items in the MMCL so that extra care can be taken by both the pharmacy personnel and the procurement section to ensure that these essential drugs are always in stock in sufficient quantities.
- Revisit restrictions on certain items, especially budesonide, fluticasone, meloxicam, azithromycin and ispagula husks for prescribing by nurses.
- Address staff shortages in PHC clinics, especially doctors.
- Provide training on effective prescribing and the rational use of medicine for nurses and doctors to reduce the number of items prescribed per prescription.
- Carry out further studies on the disparity in adherence between the Northern Region and the Southern Region of Gauteng, the fact that prescriptions dispensed in dispensaries where there are no pharmacists, are significantly more adherent than those dispensed in pharmacies and the disparity in the number of items per prescription from clinic to clinic.

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APPENDICES

Appendix 1: Data collection sheet

| DATA COLLECTION SHEET | | | MILITARY CLINIC..... No Of Prescriptions to be Analysed..... | | | | | | | | | | |
|------------------------------|-----------------|-------------|---|----------|--------------------------------------|-----------------------------|------------------------------|--|--|--|--|--|--|
| No | Prescription no | Written By: | | | Total no of items on prescription | No of items non-adherent | If non-adherent state items: | | | | | | |
| | | Doctor | Nurse | Dr&Nurse | | | | | | | | | |
| 1 | | | | | | | | | | | | | |
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Appendix 2: Prescription check sheet

PRIMARY HEALTH CARE CLINIC:

PRESCRIPTIONS CHECKED BY:

DATE:

Number of prescriptions checked:

Number of accurately checked prescriptions:

Number of inaccurately checked prescriptions:

SIGNATURE:

Appendix 3: Anonymous questionnaire

QUESTIONNAIRE

To all prescribers:

Clinic: _____

I am currently completing my Masters Degree at Medunsa. My reseach topic is Adherence to the MMCL in the Primary Health Care Military Clinics in Gauteng. This questionnaire will greatly assist me in my research. Research conducted by Maj SG Engelbrecht.

THIS IS AN ANONYMOUS QUESTIONNAIRE!

Please answer honestly as this will assist the Organisation ultimately.

- 1. Are you a doctor or a nurse?
- 2. Do you have your own personal copy of the MMCL?
- 3. Is the MMCL too restrictive for your scope of practice?
- 4. Do patient referrals to specialist departments at Military Hospitals take:
- 5. Would you like to see treatment guidelines in the MMCL?
- 6. Is there a need for an electronic format of the MMCL?
- 7. Have you ever had any feedback regarding the use of the MMCL?
If "yes" what kind of feedback?.....
- 8. Is there a shortage of Doctors in the Primary Health Care Military Clinics in Gauteng?

9. Please give two reasons why you think that there could be non-adherence to the MMCL?

.....

.....

10. Please suggest two ways to improve adherence?

.....

.....

THANK YOU

Appendix 5: Medunsa Research and Ethics Committee Clearance Certificate

UNIVERSITY OF LIMPOPO
Medunsa Campus



MEDUNSA RESEARCH & ETHICS COMMITTEE
CLEARANCE CERTIFICATE

P O Medunsa
Medunsa
0204
SOUTH AFRICA

MEETING: 08/2008

Tel: 012 - 521 4000
Fax: 012 - 560 0086

PROJECT NUMBER: MREC/H/197/2008: PG.

PROJECT :

Title: Adherence to the Medicine Code List in primary health care military clinics in Gauteng

Researcher: Ms S Engelbrecht
Supervisor: Prof AGS Gous (Pharmacy)
Hospital Superintendent: AA Louw (HS Manavien)
Involved departmental Head: MR Sume (Medicine) & DM van Dyk (Pharmacy)
Department: Pharmacy
School: Health Care Sciences
Degree: MSc (Med) Pharmacy

DECISION OF THE COMMITTEE:

MREC approved the project.

DATE: 07 October 2008




PROF GA OGUNBANJO
CHAIRPERSON MREC

Note:

- i) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
- ii) The budget for the research will be considered separately from the protocol. PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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Appendix 6: Permission from the Military Service

RESTRICTED

Telephone: (012)-671-5002
Facsimile: (012)-671-5192
Enquiries: Lt Col D.M. van Dyk



SG (DPHARM)/R/522/1
SAMHS Headquarters
Directorate Pharmacy
Private Bag X102
Centurion
September 2008

PERMISSION TO DO RESEARCH PROJECT

1. Your letter dated 6th of August 2008 has reference.
2. With this the Directorate Pharmacy grants permission to proceed with the research project as mentioned in your letter.
3. For your further attention.

(D.M. VAN DYK)
DIRECTORATE PHARMACY: LT COL

DISTR

For Info

SO1 Pharm AMHU GT

(Attention: Lt Col J.A. Viljoen)
(Attention: Maj S.G. Engelbrecht)

World-Class Clinical Service

RESTRICTED