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Drug related hospital admissions to the general adult medical wards at an academic hospital

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DRUG RELATED HOSPITAL ADMISSIONS TO THE GENERAL ADULT MEDICAL WARDS AT AN ACADEMIC HOSPITAL.

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A research report submitted to the Faculty of Health Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the degree of Masters of Clinical Hospital Pharmacy

Johannesburg, 2000.

DECLARATION.

I, Zuleika Goolam Rhemtula declare that this research report is my own work. It is being submitted for the degree of Masters of Clinical Hospital Pharmacy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Z G Rhemtula

11 day of September, 2000.

DEDICATION.

To my parents and sisters for their love, support, patience and encouragement.

ACKNOWLEDGEMENTS.

- My supervisor, Prof. Andries G.S. Gous for his guidance and patience in assisting me in the preparation of this research report.
- Dr. Hermien Gous, for her friendship and expert guidance whenever I needed to discuss the research report.
- Frank from the in patients medical record storage area for his co-operation.
- Nazmeera Ismail for the use of her computer.

ABBREVIATIONS.

1). ADR's	Adverse drug reactions.
2). CHBH	Chris Hani Baragwanath Hospital.
3). CVA	Cerebrovascular accident.
4). ED	Emergency Department.
5). EDL	Essential Drug List.
6). e.g.	Example.
7). etc.	Etcetera.
8). i.e.	That is.
9) NDP	National Drug Policy
10) PHC	Primary Health Care.
11). %	Percentage.
12). SD	Standard Deviation.

ABSTRACT.

Drug related hospital admissions is a well documented subject in many parts of the world. A similar study for the largest hospital in the world i.e. Chris Hani Baragwanath Hospital (CHBH) has not been done.

The objectives of the study were to determine the incidence, the drug related events, the pharmacological classification of the drugs involved and the average medication cost for all the drug related hospital admissions.

METHOD:

A retrospective analysis of 719 patients medical charts was done for all the patients discharged from the general medical wards over a period of 10 days. The data collected was recorded on the modified form: Pharmacist Patient Data Form and was further analysed using the modified form: Drug Therapy Assessment Worksheet. The results of this study will be presented in tabular and graphical format, using descriptive statistics.

RESULTS.

- The incidence of drug related hospital admissions was 21.7%.
- The drug related events leading to the hospital admissions included:
    - 53.2% Non-compliance
    - 14.7% Adverse drug reactions
    - 12.8% Intentional overdose
    - 12.2% Abuse of drugs
    - 5.1% Treatment errors
    - 1.3%Drug / drug interaction
    - 0.6% Drug / Disease interactions
- The average duration of stay was 5.67 days.
- A total of 43% females and 57% males were admitted
- The average age of the patients admitted was 44.1 years
- The antiepileptic, antihypertensive and illicit drugs accounted for 51.28% of the admissions.
- The average medication cost per patient per admission was R43.03.

RECOMMENDATIONS.

The recommendation is to increase the involvement of all health care providers in patient care and to introduce intensive counselling of patients by the pharmacist with regard to medication use and thereby allow patients to make informed decisions and take responsibility for their own health.

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1. INTRODUCTION:

The objectives of the National Drug Policy (NDP) of South Africa include the following:

1). To ensure the availability and accessibility of essential medicines to all citizens.

2). To ensure the safety, efficacy and quality of drugs.

3). To ensure cost effective and good prescribing and dispensing practices.

4). To promote the rational use of drugs by prescribers, dispensers and patients through provision of the necessary training, education and information.

5). To promote the individual responsibility for health, preventative and informed decision making.

The NDP demands that all health care professionals be committed to the fulfilling of the above objectives[1]. The investigator believed that the first step in fulfilling this commitment was the assessment of the problems encountered, especially those related to rational drug use. The investigator had therefore chosen to investigate the drug related hospital admissions to the general adult medical wards at the Chris Hani Baragwanath Hospital (CHBH) as an indicator of rational drug use by the prescriber, dispenser and especially the patient.

The NDP concept began receiving support during the 1980's when piecemeal approaches were leaving important problems unsolved. A focused NDP, suited to the needs of a particular country with clear priorities has been found to have significant impact on the availability and use of pharmaceuticals in such countries as Australia, Bangladesh, Columbia and the Philippines. A NDP is a guideline containing the goals of the Government for the pharmaceutical sector and the main strategies for implementing the goals [2].

The Conference of Experts on Rational Use of Drugs, convened by the World Health Organisation in November 1985, defined rational drug use as follows: The rational use of drugs requires that patients receive medication appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and to the community [2]. The indicator - rational drug use - would include the assessment of the following factors during prescribing and dispensing:

- The correct patient i.e. there are no contraindications and the probability of an adverse drug reaction (ADR) is negligible.
- The correct drug (efficacy, safety, suitability for the patient and cost effective) is given for the correct indication, in the correct dosage, route of administration and duration of treatment.
- The dispensing of the correct medication with the necessary information on the label and the necessary counselling of the patient about the prescribed medication.

- Patient compliance to the prescribed regimen is fundamental in ensuring rational drug use.

Irrational drug use can occur with polypharmacy, with the use of wrong or ineffective drugs or the underuse or incorrect use of effective drugs [2]. The notion that "one drug is good, two are better" dies hard. Drugs are often prescribed when no drug is needed because the patient expects or demands a pill or an injection [2]. To change this trend in the public sector that "every ill needs a pill", remains a challenge for the future.

The increasing number and availability of prescription and non-prescription drugs, complicated by the use of "herbal" medications from traditional healers can all result in increased ADR's, exacerbation of existing medical conditions or lead to new medical conditions requiring hospitalisation. Alternative medicine
includes acupuncture, reflexology etc. and in the South African context should include treatment from traditional healers (sangoma's). People living in rural areas have for years only known and received treatment from these traditional healers due to the lack of proper health care facilities. This culture should not be regarded as being unimportant.

The benefits of new therapeutic modalities to society and to individuals are uniformly hailed as a modern miracle. Diseases that only a few years ago were virtually always fatal now can be cured with drug therapy. Drug therapy can significantly enhance the quality of life when the medication use process works well. It produces outcomes that enables people to work, to live productive and enjoyable lives. But when the medication use process fails and toxicities occur, lives can be destroyed [3].

Drug related hospital admissions as an indicator of rational drug use can be sub-divided into the following drug related events:

- ADR's
- Drug - Drug interactions
- Drug - Disease interactions
- Drug - Food interactions
- Treatment errors
- Non-compliance
- Allergy
- Abuse of drugs
- Intentional overdose

The drug related events leading to hospital admissions have not been previously studied for the population usually seen at the CHBH. The findings of such a research project would be interesting and important for both the pharmacist and the hospital management for the development of strategies to:

- Implement the NDP and the Essential Drug List (EDL).
- Develop the improvement processes for medical, nursing and pharmaceutical care.
- Determine the type of patient based education programmes required for improving the rational use of drugs in the hospital.
- Budget control.

2. LITERATURE REVIEW.

Drug related hospital admission is a well documented subject in many parts of the world [4 - 12]. Any drug related event requiring hospitalisation can be regarded as being clinically significant as it requires some form of intervention, the simplest being admission for observation.

Schneitman – McIntire O, *et al.*[4] reported that 1074 (1.7%) of the 62 216 patient visits to the emergency department (ED) at a health maintenance organisation, during a period of a year were due to medication misadventures. The definition of medication misadventures included the following drug related events: non-compliance, inappropriate prescribing but excluded intentional overdose and substance abuse. Of the 1074 medication misadventures, 152 (14.2%) resulted in hospital admissions.

Prince BS, *et al.*[5] reported that 293 (2.9%) of the 10184 patients visits to the ED of a tertiary care hospital, during a period of 4 months were due to drug related illness. The definition of drug related illness included the following drug related events: ADR, overdose or abuse, non-compliance and drug interactions and toxicity. Of the 293 drug related illness, 71 (24%) resulted in hospital admissions.

The above 2 studies included both drug related visits to the ED and the drug related hospital admission, allowing for a more accurate and inclusive study design to detect the drug related problems affecting the population served by that institution.

Nelson KM, *et al.*[8] reported that 73 (16.2%) of the 452 consecutive patients admitted to the intensive care unit or internal medicine at a university affiliated country hospital during one month were due to drug related morbidity. The definition of drug related morbidity included the drug related events: ADR and drug therapy failures but excluded intentional overdose and substance abuse. The 16.2% was within the reported range of 5.9% - 22.3%.

Schneitman – McIntire O, *et al.*[4] categorised the drug related events leading to the most of the 1074 medication misadventures as follows:

- 462 (43%) undesired adverse effect
- 204 (19%) allergy
- 138 (12.8%) underuse
- 50 (4.7%) inappropriate dose prescribed
- 49 (4.6%) overuse
- 39 (3.6%) drug – disease interactions
- 36 (3.4%) drug – food interactions
- 26 (2.4%) drug – drug interactions
- 19 (1.8%) polypharmacy

The drug classes that caused the medication misadventures were as follows:

- 23.6% anti-infectives
- 23.3% analgesics
- 18.5% cardiovascular agents (including antihypertensive medication)
- 8.7% respiratory agents
- 6% hypoglycaemic agents
- 19.7% others

The median duration of hospital stay for the patients admitted was 4.5 days with a range of 1 – 80 days.

Prince BS, *et al.*[5] categorised the drug related events leading to the drug related illness as follows:

- 104 (35%) overdose or abuse
- 83 (28%) non-compliance
- 81 (28%) ADR's
- 23 (8%) toxicity
- 2 (1%) drug interactions

Some of the drug classes that caused the drug related illness were as follows:

- 68 (23%) drugs of abuse
- 50 (17.1%) anticonvulsants
- 37 (12.6%) antibiotics
- 26 (8.9%) respiratory drugs
- 20 (6.8%) antidepressants
- 16 (5.5%) cardiac drugs
- 15 (5.1%) antihypertensives
- 13 (4.4%) anti anxiety drugs
- 6 (2%) antidiabetic drugs

The average length of hospital stay for the patients admitted was 5.8 days. The average age of the patients seen for drug related illnesses was 42.4 years with a range of 1 – 93 years.

Nelson KM, *et al.*[8] categorised the drug related events leading to the 73 (16.2%) drug related hospital admissions as follows:

- 40 (54.8%) drug therapy failure of which 26 (65%) was due to non-compliance with drug therapy.
- 24 (32.9%) ADR's
- 9 (12.3%) overdose

The drug classes that caused the 73 (16.2%) drug related hospital admissions were as follows:

- 12 (16.4%) hypoglycaemic agents
- 10 (13.7%) diuretics
- 10 (13.7%) others
- 9 (12.3%) anti-infectives
- 8 (11%) cardiovascular drugs
- 7 (9.6%) psychotropic drugs
- 7 (9.6%) gastrointestinal drugs
- 4 (5.5%) non steroidal anti-inflammatory drugs
- 2 (2.7%) Anticonvulsants
- 2 (2.7%) antiepileptic drugs
- 2 (2.7%) steroids

The average length of hospital stay for the patients admitted was 4 days with a range of 1 - 36 days. The median age of the patients admitted for the drug related event was 43 years.

Einarson TR, *et al.*[9] reviewed and summarised studies reporting rates of drug related hospital admission. This review investigated admissions prompted by ADR's that occurred while the patient was taking the drug appropriately, reactions resulting from non-compliance or unintentionally inappropriate drug use. Excluded were drug related event such as abuse of drugs, alcoholism,

suicide attempt, intoxication or inadequate prescribing. Forty five English articles were included in the review and included articles from 1964 to 1991. All the studies were conducted in large usually teaching hospitals affiliated with universities and almost all were located in large urban areas. A total of 69187 hospital admissions were investigated and the prevalence of hospital admissions resulting from ADR's ranged from 0.2% - 21.7% with a mean of 5.5%.

The drug related hospital admissions due to ADR's were classified as follows:

- 71.5% side effects
- 16.8% excessive effects
- 11.3% hypersensitivity
- 0.4% idiosyncrasy

The drug classes implicated as causing the drug related hospital admission were: cardiac drugs (particularly digitalis), diuretics, antimicrobials, psychotropic drugs, steroids, non steroidal anti-inflammatory drugs and anticoagulants. The drug classes listed above caused one third of the drug related hospital admissions and 101 other drugs caused the remaining two thirds.

Pilzer JD, *et al.*[11] assessed 347 reported allergy cases. The drug classes involved in the 347 allergy reports were as follows:

- 185 (53.3%) anti-infective agents
- 61 (17.6%) narcotics
- 25 (7.2%) psychotropics
- 17 (4.9%) non steroidal anti-inflammatory drugs
- 17 (4.9%) cardiovascular drugs
- 42 (12.1%) others

Of the 347 reported allergies:

- 155 (44.7%) were true allergies or life threatening adverse effects and the drug was contraindicated.
- 62 (17.9%) were vague reactions and a true allergy could not be ruled out and the drug was therefore contraindicated.
- 88 (25.4%) were intolerance which included mild to moderate adverse reactions and the drug could be used if indicated.
- 15 (4.3%) were known pharmacological effects and the drug could be used after dosage modifications.
- 27 (7.8%) were not allergies to any drug and there was no history of an allergic reaction. The reports of allergy were given because of reported allergies in first-degree relatives, the drug was not producing the required effect or due to drug – drug interactions. The drug can be used in these patients.

Drummond SH, *et al.*[10] reported that 110 (0.3%) of all patients admitted to an acute-care teaching hospital during a 16 months period were due to drug overdose. It has been estimated that at least 1% of all the admissions and 5 – 10% of acute medical admissions was due to drug overdose.

The drug classes involved in the hospital admissions due to overdose were as follows:

- 40% benzodiazepines
- 33% tricyclic antidepressants
- 23% paracetamol
- 14% combination analgesics
- 11% anticonvulsants
- 9% antipsychotics

Alcohol was consumed in 38% of cases.

The average length of hospital stay was 2 days with a range of 1 – 26 days. The median age of patients admitted for the overdose was 31 years with a range of 14 – 88 years. Seventy three (66%) of the patients were females. A total of 261 items were ingested by 110 patients and 71% of patients ingested more than 1 item. The maximum number of drugs used in one case was seven.

Garabedian – Ruffalo SM, *et al.*[12] reported that a total of 645 drug – drug and drug – food interactions were identified by pharmacists during a drug interaction alert programme conducted over a period of 6 months. A total of 65 (10.1%) of the drug interaction interventions from the pharmacist were directed to the patients physician, while the majority i.e. 580 (89.9%) of the drug interaction interventions from the pharmacist were directed to the patients nurse. Of these 645 potential drug interactions 505 (78%) were drug – food interactions and 140 (22%) were drug – drug interactions.

The 505 drug – food interactions were caused by the following interactions:

- 267 (52.9%) were due to sucralfate + food. The result is the decreased effect of sucralfate due to the binding of sucralfate to the protein component of food.
- 149 (29.5%) were due to captopril + food. Food substantially decreases the absorption of captopril.
- 47 (9.3%) were due to oral penicillin + food. Food decreases the absorption of penicillin.
- 35 (7%) were due to erythromycin + food. Food does not affect the absorption of erythromycin ethylsuccinate.
- 7 (1.4%) were due to tetracycline + dairy products due to the chelation of tetracycline.

Nelson KM, *et al.*[8] reported a range of 5.9% to 22.3% for drug related hospital admissions. The wide variation in the range of drug related hospital admissions was also noticed in the literature review and occurred because of differences in:

- prescribing practices
- patient populations
- admission patterns
- severity of the patients illness
- time of the year the study was conducted
- study design
- duration of the study
- type of institution where the study was conducted
- method of evaluating data
- intensity of data collection
- patient inclusion and exclusion criteria depending on the definition of drug related hospital admission, etc.

No standardised validation method for evaluating drug related hospital admission are published which can be used in all setting to improve the comparability of data obtained with other studies.

3. OBJECTIVES:

Objectives of this research project were:

1). To determine the incidence of drug related hospital admissions to the general adult medical wards at the CHBH.

2). To categorise the drug related events leading to an admission.

3). To identify and pharmacologically classify the drugs involved in the admission.

4). To determine the average medication cost per patient per admission for all drug related hospital admissions.

4. METHOD:

4.1). Experimental design.

A retrospective analysis of the patient medical chart was conducted at the CHBH, which is a 2600 bed academic hospital. Seven hundred and thirty nine of the 2600 beds are medical beds. The medical records of all patients discharged from the general adult medical wards during the period 23 August 1999 to 1 September 1999 were reviewed retrospectively to identify any drug related hospital admissions.

A retrospective study has the advantage in that it can be done at the investigator convenience. No additional cost could be incurred as no changes could be made to the medication regimen and no additional laboratory test could be requested. The disadvantage of this type of study is that it is difficult to document all the surrounding circumstances because the patient has already been discharged. This study method relies on the accurate documentation in the medical records by the attending doctor. The findings of the study have no immediate benefit to the patient who has experienced the drug related event and the serious outcomes of the drug related events couldn't be prevented. This was the first study done at the CHBH to determine the drug related hospital admissions. The retrospective study design was acceptable and will provide valuable information for future investigations.

4.2). Data collection.

The medical records of the discharged patients were obtained from the in-patients medical records storage area using the form MRS 10: REQUEST FOR HOSPITAL CLINICAL RECORDS (Appendix A). The investigator received approximately 70 medical records daily. All the medical records reviewed were assigned a study number, which appeared on all documentation and forms. A list of the study number assigned together with the patient's name and hospital number was kept in the event that a medical record had to be retrieved. All records were manually researched by the investigator to identify any drug related events which could be the likely cause for the present admission. A patient was assumed to be compliant with the prescribed treatment regimen unless the doctor noted on admission that the patient was non- compliant or defaulted treatment or when other evidence clearly identified non-compliance e.g. extremely high blood pressure or sub therapeutic serum drug levels etc. The necessary demographic, medical and medication data for only the drug related hospital admissions were recorded on the modified form: PHARMACIST PATIENT DATA FORM (PPDF) [13] (Appendix B). The batches of medical records were returned to the in-patient medical storage area within the specified 7 days time period.

4.3). Data analysis.

The incidence of drug related admissions was calculated using the equation:

$$\frac{\text{Total number of identified drug related admissions}}{\text{Total number of patient medical records reviewed}} \times 100\%$$

The medication the patient received during the admission was recorded on the PPDF and was used to calculate the medication cost per patient per admission. The total quantity of medication received by the patient was multiplied by the purchase price of the medication. The purchase price used was the State Tender prices as per the hospital's pharmaceutical code lists. The cost of pre-packing the medication from bulk was not included in the purchase price due to the large number of different packaging forms and materials that could have been used.

The medical information recorded on the PPDF was further analysed using the modified form: DRUG THERAPY ASSESSMENT WORKSHEET (DTAW) [13] (Appendix C).

The DTAW assisted in categorising the drug related events leading to a hospital admission as follows:

- Adverse drug reactions (ADR's): Any unintended or undesired consequences of drug therapy reasonably and temporarily associated with the use of drugs administered at normal doses [9]. The ADR usually occurs

within a reasonable period after the medication is taken and in most cases improvement of the symptoms is observed after the offending drug is withdrawn [4]. Included here would be signs and symptoms as follows:

- nausea, vomiting, diarrhoea etc.

- Drug / Disease interactions: Interactions due to medication being incompatible with the patient's disease state [4] or due to inappropriate dosage selection for the medical condition, age and organ function of the patient.
- Drug / Drug interactions: interactions of one drug with one or more drugs in the regimen [4].
- Drug / Food interactions: Interaction caused by medication interacting with food [4].
- Allergy: hypersensitivity reaction to a suspected drug.
- Treatment errors: Included here is medication prescribed for no disease state, medication omitted for a certain disease state [7], therapeutic duplications and inappropriate dosage, drug, dosage interval or duration of treatment
- Non-compliance: Any deviation from the prescribed regimen. Includes under compliance i.e. taking too little or less frequently than prescribed or over compliance i.e. taking too much or more frequently than prescribed [9].
- Abuse of drug: Use of prescription medication or illicit drugs for non-therapeutic purposes [4]. Illicit drugs include: heroin, cannabis (dagga / marijuana), mandrax, glue, ecstacy, alcohol, etc.

- Intentional overdose: The use of prescription drugs, non-prescription drugs and / or toxic chemical substances commonly found in the home in an attempt to cause bodily harm or death.

The DTAW assisted in categorising the:

- Drug involved in the hospital admission and the drug's pharmacological classification according to the South African Medicine Formulary (SAMF)[14].
- The relationship between the drug and the hospital admission as:
  a). Definite: the hospital admission is undisputedly related to the drug.
  b). Probable: a chance that the hospital admission is related to the drug.

The PPDF and the DTAW were used for all drug related hospital admissions to standardise data collection from the medical records.

4.4). RISKS AND BENEFITS :

Strict patient confidentiality was maintained. A study number was assigned to each patient. No risks were identified with regards to revealing the identity of the patients. To identify the incidence and cost involved in drug related hospital admissions at the CHBH will greatly benefit the hospital as this information is not available to assist in the strategic planning for the reduction of hospital costs and the improvement of medical, nursing and pharmaceutical care to the patients.

4.5). THE STATISTICAL ANALYSIS:

The results of this study were presented mainly in the tabular and graphical format and consisted of descriptive statistics. The Microsoft Word^{R} version 7 and Excel^{R} version 7 programs were used to store and categorise the relevant information.

4.6). ETHICAL APPROVAL.

The study was approved by the Post-Graduate Committee and the Committee for Research on Human Subjects (Appendix D).

5. RESULTS.

A total number of 719 medical records of patients discharged from the general adult medical wards were reviewed from the 23 August 1999 to 1 September 1999 (10 days). One hundred and fifty six (21.7%) of the 719 medical records were identified as being admissions due to drug related events.

The total number of drug related hospital admissions as per drug related events were categorised as follows:

Table 5.1: Number of hospital admissions as per drug related events.

Drug related events requiring hospitalisation.	Number of hospital admission. (N = 156)	Percentage (%) of hospital admissions
Non-compliance	83	53.2%
ADR's	23	14.7%
Intentional overdose	20	12.8%
Abuse of drugs	19	12.2%
Treatment errors	8	5.1%
Drug / Drug interaction	2	1.3%
Drug / Disease interaction	1	0.6%
Drug / Food interaction	0	0%
Drug allergy	0	0%
TOTAL	**156**	**99.9%**

The graphical representation of the table above is as follows.

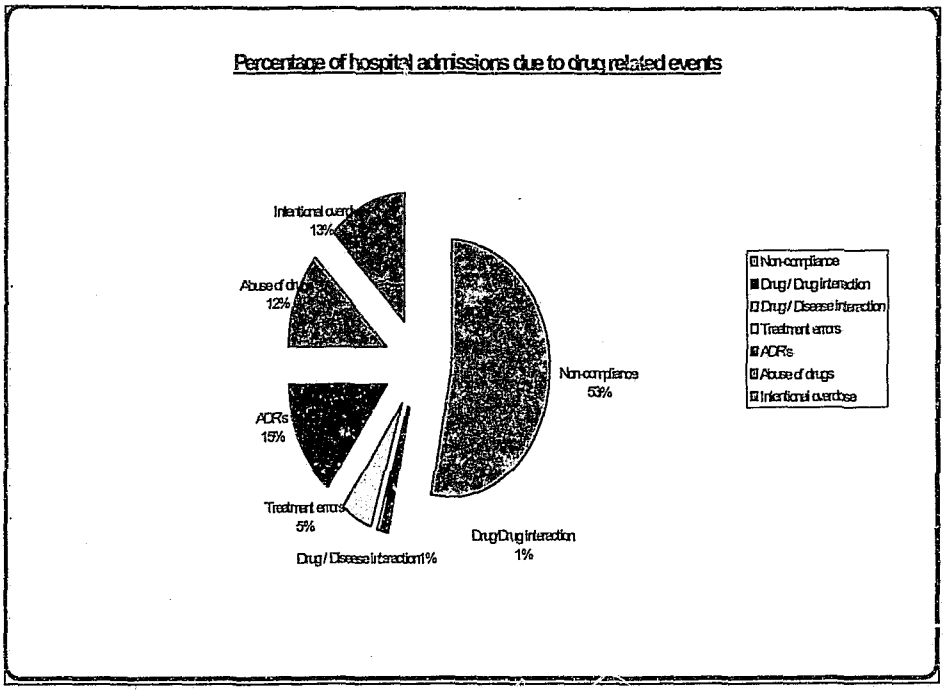


Figure 5.1: Percentage of drug related hospital admissions due to the different drug related events.

The drug related event, non-compliance accounted for more than 50% of the entire drug related hospital admissions. Non-compliance was categorised to help identify which chronic disease patients were the most non-compliant.

Table 5.2: Non-compliance in the different chronic disease states.

Chronic diseases.	Number of patients non-compliant	Percentage of patients non-compliant
Epileptic patients	31	37.4%
Hypertensive patients	19	22.9%
Diabetic patients	9	10.8%
Psychiatric patients	8	9.6%
Cardiac patients	7	8.4%
Asthmatic patient	5	6.0%
Tuberculosis patients	3	3.6%
Others	1	1.2%
TOTAL	**83**	**99.9%**

The highest percentage of non-compliance occurred in the epileptic patients followed by the hypertensive and the diabetic patients respectively.

The graphical representation of the table above is as follows.

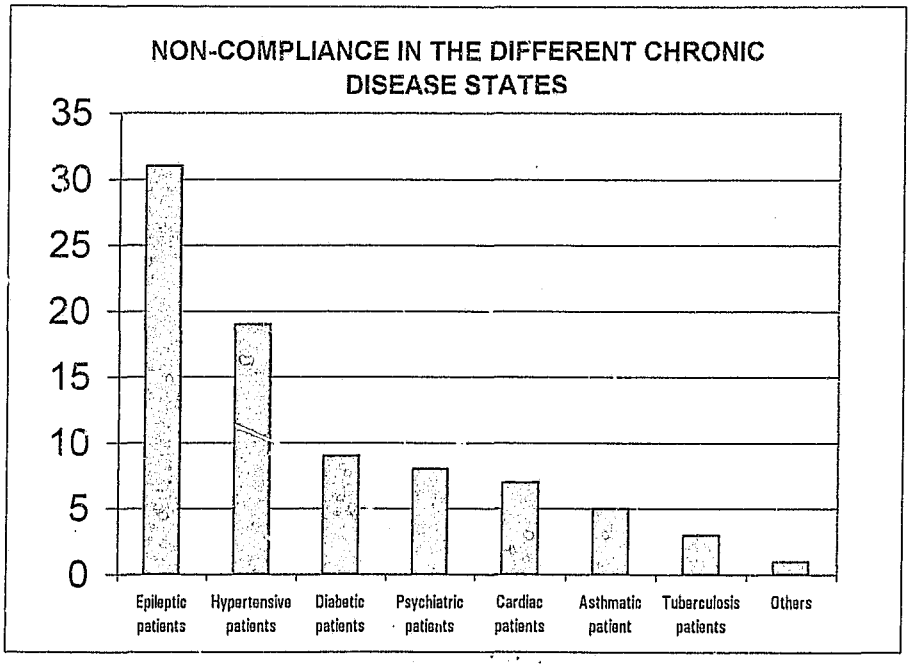


Figure 5.2: The % non-compliance in the different chronic disease states.

The duration of hospital stay for the drug related hospital admissions were categorised as follows:

Table 5.3: Duration of hospital stay.

No of patients. (N=156)	No of days admitted for.	Total number of days admitted for.
31	1	31
27	2	54
21	3	63
19	4	76
10	5	50
3	6	18
12	7	84
5	8	40
3	9	27
4	10	40
2	11	22
2	12	24
2	14	28
2	15	30
1	18	18
2	19	38
1	20	20
1	21	21
3	23	69
2	24	48
1	26	26
1	28	28
1	30	30
156 PATIENTS		**885 DAYS**

Thirty one patients (19.9%) of the patients were admitted for 1 day due to a drug related admission. One patient (0.6%) was admitted for 30 days.

In this study the 156 patients who experienced a drug related event were admitted for a total of 885 days. The average duration of hospital stay due to drug related events was 5.7 days with a range of 1 – 30 days.

The number and the range of days for which the patients were admitted as per drug related events were as follow.

Table 5.4: The range and average duration of stay in hospital as per drug related events.

Drug related events.	Range of days patients admitted for.	Average number of days (±SD) patient admitted for.
Non-compliance:		
Epileptic patients	1 – 15	3 (±2.8)
Hypertensive patients	1 – 18	4.3 (± 4.1)
Diabetic patient	1 – 6	3.2 (±1.3)
Psychiatric patient	1 – 24	14.1 (±10.6)
Cardiac patient	4 – 10	6.3 (2.10
Asthmatic patient	2- 19	7.6 (±7.1)
Tuberculosis patients	3 – 20	10 (±8.9)
Others	1	1(±0)
Drug / Drug interactions	3 – 5	4 (±1.4)
Drug / Disease interactions	24	24 (±0)
Treatment errors	4 – 26	11.1 (±8.4)
ADR's	1 – 12	4.8 (±3)
Abuse of drugs	1 – 30	9.5 (±8.6)
Intentional overdose	1 – 7	2.2 (±1.9)

The highest average number of days that a patient was admitted for was 24 days due to a drug / disease interaction, followed by 14.1 days for the non-compliant - psychiatric patient and 11.1 days for the treatment errors group. The lowest average number of days that a patient was admitted for was 1 day due to non-compliant - others.

Table 5.5: The gender and age of patients admitted as per drug related events.

Drug related events.	Females admitted. (N=67)	Males admitted. (N=89)	Average age (±SD) of patients admitted. (years).	Age range for patients admitted (years).
Non-compliance:				
Epileptic patients	7	24	40.0 (±17)	17 – 80
Hypertensive patients	14	5	59.6 (±9.6)	46 – 79
Diabetic patient	4	5	50.6 (±18.8)	26 – 79
Psychiatric patient	5	3	39.4 (± 10.8)	25 – 59
Cardiac patient	1	6	57.9 (±15.2)	38 – 80
Asthmatic patient	3	2	49.2 (±14.2)	30 – 67
Tuberculosis patients	1	2	40.7 (±22)	35 – 52
Others	1	0	50 (±0)	50
Drug / Drug interactions	1	1	51.1 (±10.6)	44 – 59
Drug / Disease interactions	1	0	32 (±0)	32
Treatment errors	4	4	45.5 (±18.2)	21 – 69
ADR's	9	14	43.8 (±15.1)	21 – 80
Abuse of drugs	3	16	34 (±15.9)	14 – 71
Intentional overdose	13	7	23.8 (±8.6)	14 – 44

A total of 67 (43%) females and 89 (57%) males were admitted for drug related events. The average age of the patients admitted for a drug related hospital admission was 44.1 years with a range of 14 – 80 years.

The average age of the non-compliant, ADR, and treatment error group was greater than 40 years. The average age of the intentional overdose and abuse of drug group was less than 25 years and 35 years respectively.

Table 5.6: Pharmacological classification of the drugs involved in the drug related hospital admissions and its relation to the admission.

Drug related events.	Pharmacological classification	No. of Adm.	Relationship	
			Definite	Probable
Non-compliance:				
Epileptic patients	Antiepileptic drugs	31	28	3
Hypertensive patients	Antihypertensive drugs	19	19	0
Diabetic patient	Drugs used in diabetes	9	9	0
Psychiatric patient	Psycholeptics drugs	8	8	0
Cardiac patient	Antifailure drugs	7	7	0
Asthmatic patient	Antiasthmatic drugs	5	5	0
Tuberculosis patients	Antimycobacterials	3	3	0
Others	Anticholinergic drugs	1	1	
Drug / Drug interactions	Antiepileptic and illicit drug	1	1	0
	Antimycobacterials and antiasthmatic drug	1	1	0
Drug / Disease interactions	Antithrombotic drugs	1	1	0
Treatment errors	Antihypertensivedrugs	3	2	1
	Antiepileptic drugs	1	0	1
	Analgesics	1	0	1
	Psycholeptic drugs	1	1	0
	Antifailure drugs	1	1	0
	Antiasthamatic drugs	1	1	0
ADR's	Antihypertensive drugs	1	1	0
	Antiepileptic drugs	5	4	1
	Psycholeptic drugs	1	1	0
	Illicit drugs	1	1	0
	Analgesics	2	2	0
	Antithrombotic drugs	2	2	0
	Antifailure drugs	1	1	0
	Laxatives	1	1	0
	Drugs used in diabetes	5	5	0
	"Herbal" drugs	4	4	0
Abuse of drugs	Cannabis	4	4	0
	Cannabis +alcohol etc	5	5	0
	Alcohol	9	9	0
	Anticholinergic drug	1	1	0
Intentional overdose	Includes: Antidiabetic, antidepressants, vitamins, illicit drugs, diuretics,antihelmintics, antipruritics, antiasthmatic drugs, antibiotics,unknown drugs toxic household items	14	14	0
		6	6	0
Totals		156	149	7

Antifailure drugs is not a classification in the SAMF, however due to the large range of drugs that was used in patients with congestive heart failure e.g. cardiac glycosides, the loop diuretics and the antihypertensive drugs, the word antifailure was created. "Herbal" drugs are drugs given to patients by the traditional healers.

The relationship between the drug involved and the hospital admission was classified as either being definite or probable. One hundred and forty nine (95.5%) of the drug related hospital admissions was classified as being definitely related to the drug implicated. Seven (4.5%) of the drug related hospital admissions was classified as being probably related to the drug implicated.

Table 5.7: Number and percentage of drug related hospital admissions as per pharmacological classification.

Pharmacological classification of drugs.	**Number of drug related hospital admissions for this class of drug.**	**Percentage of drug related hospital for this class of drug.**
Antiepileptic drugs	38	24.4%
Antihypertensives	23	14.7%
Illicit drugs	19	12.2%
Drugs used in diabetes	14	9.0%
Psycholeptic drugs	10	6.4%
Antifailure drugs	9	5.8%
Antiasthmatic drugs	7	4.5%
Antimycobacterials	3	1.9%
Antithrombotic drugs	3	1.9%
Analgesics	3	1.9%
Anticholinergics	2	1.3%
Others	25	16.0%
Total	156	100.0%

The antiepileptics were responsible for 38 (24.4%) of all the drug related hospital admissions, followed by the antihypertensives and illicit drugs. The pharmacological classification: others collectively included all the pharmacological classes of drugs that were below 1%.

The graphic representation of the table above is as follows.

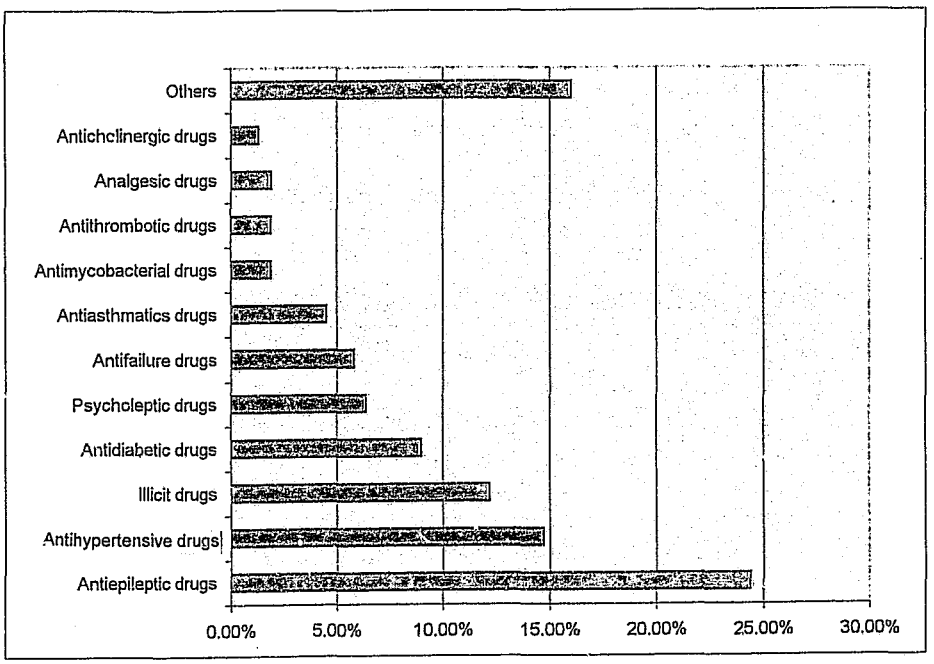


Figure 5.3: The percentage of drug related hospital admissions as per the pharmacological classifications.

Table 5.7 indicated that the highest percentage of drug related hospital admissions was due to the antiepileptic drugs followed by the antihypertensive drugs, illicit drugs and drugs used in diabetes. Table 5.2 showed a similar trend, the most non-compliant patients were the epileptic patients followed by hypertensive patients and the diabetic patients.

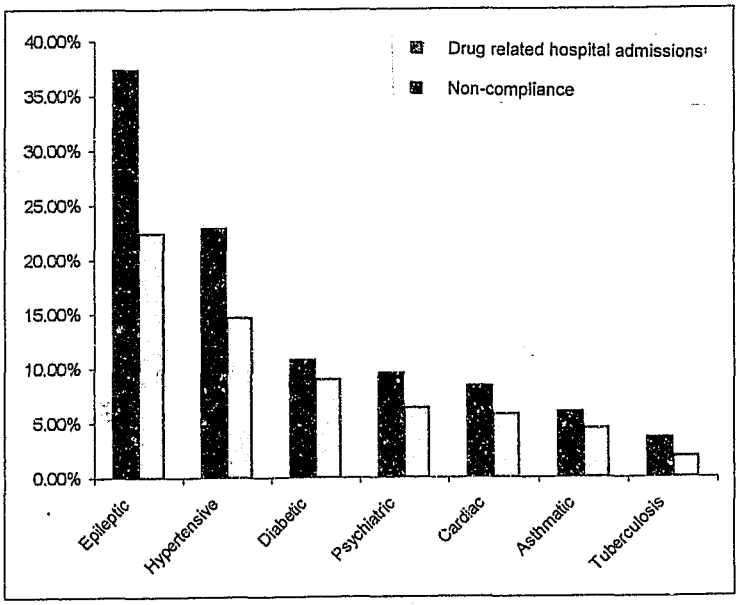


Figure 5.4:Comparison of the % non-compliance with the % of hospital admissions for the chronic disease states.

Table 5.8: The range and average medication cost for the hospital admission per drug related events.

Drug related events	Medication known on admission.		Range of medication cost	Total medication cost.
	Yes	No		
Non-compliance:				
Epileptic patients	19	12	R0.83 - R343.49	R765.84
Hypertensive patients	9	10	R0.34 - R205.34	R485.28
Diabetic patient	3	6	R0.00 -R84.75	R134.81
Psychiatric patient	5	3	R0.00 - R231.81	R677.94
Cardiac patient	5	2	R16.83 - R77.54	R268.80
Asthmatic patient	4	1	R0.00 - R476.41	R790.13
Tuberculosis patients	1	2	R142.98 - R529.67	R912.77
Others	1	0	R0.00	R0.00
Drug / Drug interactions	2	0	R7.89 - R73.70	R81.66
Drug / Disease interactions	1	0	R95.11	R95.11
Treatment errors	5	3	R5.03 - R248.08	R551.59
ADR's	18	5	R0.00 - R282.66	R1110.46
Abuse of drugs	19	0	R0.00 - R452.06	R586.98
Intentional overdose	17	3	R0.00 - R170.29	R250.79
Totals	**109**	**47**		**R6712.16**

The cost of R0.00 was when no medication was administered during the hospital stay or when the patients prescription chart was not in the medical records. 15 patient's prescription charts were not in the medical records.

6. DISCUSSION.

The retrospective study conducted at the CHBH identified 156 (21.7%) drug related hospital admissions during a period of 10 days. A high rate of drug related hospital admissions was expected by the investigator for the following reasons:

- Communication barriers between the pharmacist and patient. South Africa has 11 official languages and interpreters are not available to interpret dosage instructions to patients who do not understand English.
- The lower level of education of most patients seen at the hospital. Written instructions in English are also not understood by the patients and they rely on friends and family members to interpret and instruct them on how to use their medication. Instructions that are not understood cannot be performed.
- Lack of intensive counselling of patients due to the increase in the workload of the pharmacists caused by the critical shortage of pharmacist in the public sector.

In comparison the referenced material reported the following incidence of drug related hospital admissions:

- 14.2% reported by Schneitman – McIntire O, *et al.*[4]
- 24% reported by Prince BS, *et al.*[5]
- 16.2% reported by Nelson KM, *et al.*[8]

Drug related hospital admissions are not a new problem. The reported range of 5.9% to 22.3% for drug related hospital admissions includes studies done as far back as 1976 [8]. The range is still in use and the incidence of 21.7% for the drug related hospital admission, for the study conducted at the CHBH is within the upper end of this range. This indicates that drug related hospital admissions is not a decreasing problem. As the objectives of the NDP are implemented and the availability and accessibility of essential drugs increase to all South African citizens, this problem of drug related hospital admissions might increase.

A brief discussion follows on each of the drug related event involved in the drug related hospital admissions:

- Non-compliance.

  Non-compliance accounted for greater than 50% of the drug related hospital admissions. In comparison the referenced articles reported non-compliance in: 28% of patients in the study done by Prince BS, *et al.*[5] and 35 % of patients in the study done by Nelson KM, et al.[8] The high incidence of non-compliance could also be related to the communication and language barriers, lower level of education and the lack of intensive counselling as discussed earlier.

A patient was classified as being non-compliant if the patient used the medication inconsistently, intentionally discontinued the medication, if stated in the medical chart that the patient defaulted or if the drug serum concentrations were sub-therapeutic. Table 5.2 indicates that the highest percentage of non-compliance occurred in the epileptic patients followed by the hypertensive patients and then the diabetic patients respectively. Chronic diseases, especially hypertension and diabetes do not have immediate serious complications or signs and symptoms. These conditions are often diagnosed as part of a routine test for the immediate problems that the patient may present with. Total compliance is a major problem with this group of patients. The long-term effects of such chronic diseases need to be explained to the patient in detail. Lack of an understanding of the disease process, the directions and instructions on medication usage, inconvenient dosage schedules, physical disabilities, religious belief etc. can all be possible reasons why a patient takes or refuses to take his or her medication.

- ADR's

ADR's accounted for 23 (14.7%) of all the drug related hospital admissions at CHBH. The reported range for ADR's is 0.2 – 21.7% [9].

In comparison the referenced material reported higher ADR rates compared to the study done at the CHBH:

- 43% in the study by Schneitman – McIntire O, *et al.*[4]
- 28% in the study by Prince BS, *et al.*[5]
- 32.9% in the study by Nelson KM, *et al.*[8]

The possible reasons for this low percentage of ADR's in the study conducted at the CHBH could be due to:

- The retrospective study design which was not favourable in assisting doctors and pharmacist to increase their awareness of ADR's.
- ARD's could be missed as patients did not volunteer and doctors did not prompt the patient for information about ADR's.
- ADR's were not documented in the medical records as they may have been vague descriptions of events that occurred.
- Communication / language barriers.
- The high incidence of non-compliance means less drug was taken and therefore the chance of an ADR occurring is also decreased.

The ADR's includes 4 admissions due to "herbal" medications received from traditional healers. The word "herbal " medication is used because in 3 of the 4 medical records it was documented as such. One of the 4 admissions was due to a sunlight soap enema, a toxic household item that was administered by the traditional healer to clean the bowel.

The definition of a drug: is any chemical compound that may be used on or administered to humans and animals to aid in diagnosis, treatment or prevention of disease[15]. Drugs are intended for use in recommended doses. High doses of any drug can be harmful or toxic to humans and are described as being the ADR of the drug. Certain toxic chemical items have pharmacological classifications e.g. the antiseptics and disinfectants and are intended for external use only. Similarly these household chemical items are intended for household use and are relatively non toxic to humans if used externally and in recommended doses. For this reason drug related events due to household items were included in the study conducted at the CHBH.

The drug classes involved in causing 60.8% of the ADR's were the antiepileptic drugs, drugs used in diabetes and herbal intoxication.

- Intentional overdose.

= It has been estimated that approximately 1% of all hospital admissions are due to intentional drug overdose [10]. In the study conducted at the CHBH:

- The incidence of intentional overdose was 20 (12.8%) of all hospital admissions (n=719). The incidence is much higher and the possible reasons for this could be that drugs are more accessible, there is an increased awareness of the toxic effects of drugs and its abuse potential, unemployment, family and peer pressure can lead to an extremely stressful lifestyle or it could be an attention seeking idea.
- The average length of hospital stay was 2.2 days with a range 1 - 7 days.
- The average age of the patients involved in intentional overdosing was 23.8 years with a range of 14 – 38
- 65% females and 35% males were admitted for intentional overdosing.
- A total of 22 different items (i.e. medication and household items) were ingested by 20 patients.
- Twelve patients (60%) ingested 1 item and 8 patients ingested more than 1 item
- Six patients (30%) ingested household items e.g. bleech (e.g. Jik^{R}, parrafin and Jeyes^{R} toilet cleaner) and rattex^{R}.
- The maximum number of drugs used in one case was six items.
- Three patients (15%) used illicit drugs together with other therapeutic drugs to overdose.

- Eight patients (20%) intentionally overdosed after an interpersonal conflict with a loved one.
- Three patients (15%) used paracetamol in combination with other drugs and 1 patient intentionally overdosed on paracetamol alone.
- Three patients (15%) used hypnotic-sedatives assumed to be benzodiazepines in combination with other drugs to overdose.
- One patients (5%) intentionally overdosed using an antidepressant.
- For 19 of the 20 patients this was the first attempt at intentionally overdosing.

In comparison to the study done at the CHBH, Drummond SH, *et al.*[10] reported that 110 (0.3%) of all patients admitted to an acute-care teaching hospital during a 16 month period were due to drug overdose.

The findings of that study were as follows;

- The median length of hospital stay was 2 days with a range of 1 – 26 days.
- The median age of patients admitted for the overdose was 31 years with a range of 14 – 88 years.
- Seventy three (66%) of the patients were females.
- A total of 261 items were ingested by 110 patients and 71% of patients ingested more than one item.
- The maximum number of drugs used in one case was seven.

- The drug classes involved in the hospital admissions due to overdose were as follows:
  - 40% benzodiazepines
  - 33% tricyclic antidepressants
  - 23% paracetamol
  - 14% combination analgesics
  - 11% anticonvulsants
  - 9% antipsychotics
  - Alcohol was consumed in 38% of cases.

- Abuse of drugs.

Drug abuse and drug dependence are amongst the most common medical problems, approximately 40% of all hospitalisations in the U.S. population [16]. In this study conducted at the CHBH, abuse of drugs accounted for 19 (12.2%) of all admissions. The incidence at present is relatively low comparatively but the incidence is on the increase as the availability and accessibility of these illicit drugs increases in South Africa.

The use of drugs for mood altering purposes is almost as old as human beings themselves. The bible makes mention of wine and intoxication. Opium has been used for medicinal purposes for over 3000 years. Cocaine has been used for more than 2000 years by the Indians of South America in the form of coco leaves where it was originally used as an

anaesthetic agent [16]. The use of designer drugs is the recent trend of drug abuse. In the study conducted at the CHBH, illicit drugs such as heroin, cannabis (dagga / marijuana), mandrax tablets, ecstasy, sniffing of glue, alcohol and crack were abused.

The following findings were for the drug related event - abuse of drug in the study conducted at the CHBH:

- 9 (47%) of the 19 patients admitted for abuse of drug was due to alcohol alone. Alcohol is freely available and relatively cheap. This drug is mainly abused by patients with an average age of 47.8 years with a range of 29 – 71 years.
- 4 (21%) of the patients abused dagga alone. The average age of the patient for this group of patient was 24.5 years with a range of 22 – 26 years.
- 5 (26%) of the patients abused a combination of illicit drugs. The average age of the patient for this group was 21.4 years with a range of 14 –29 years.
- 1 (5%) of the patients abused an anticholinergic agent alone.

- Treatment errors.

  In the study conducted at the CHBH, treatment errors accounted for 8 (5.1%) of all drug related hospital admissions. The 8 treatment errors were categorised as follows:

  - 3 (37.5%) inappropriate dose for the patients conditions
  - 2 (25%) medication omitted for a disease state
  - 2 (25%) medication prescribed but the patients defaulted medication because the prescribed medication was not available at the Primary Health Care (PHC) clinics. These two cases were not regarded as being non-compliant.
  - 1 (12.5%) inappropriate drug for the patients condition

  The synonyms identified in the literature review for treatment errors included: inappropriate prescribing, prescribing errors, and drug therapy failures. True treatment errors are difficult to identify and what might seem as an inappropriate drug or dosage for the patient may have occurred due to the normal progression of the patient's disease state. To identify treatment errors a more thorough patient medical history need to be taken and documented. The different definitions of treatment errors made comparison with the referenced material extremely difficult.

- Drug – Drug Interactions.

  Garabedian- Ruffalo SM *et al.*[12] identified 140 (22%) drug – drug interactions during a drug interaction alert program conducted over a period of 6 months. The study at CHBH identified 2 (1.3%) drug – drug interactions requiring a drug related hospital admission. In the referenced study above the pharmacist were extremely alert and aware and scrutinized all scripts for drug – drug interactions. For the study conducted at the CHBH the limitations of the retrospective study design becomes apparent again.

  The 2 drug – drug interactions identified were as follows;

  - The first drug interaction was between phenytoin and alcohol. The patient is known to have ingested alcohol and has had numerous previous admissions due to phenytion toxicity. The patient was discharge with no dosage adjustment and no record was found in the patients medical chart of this being a drug – drug interaction.

  - The second drug interaction was between theophylline and isoniazid. Isoniazid is known to increase theophylline levels. This drug interaction was documented by the doctor in the patient's medical chart.

- Drug – Disease interactions.

  Only 1 (0.6%) patient of all the drug related hospital admissions was due to drug – disease interaction. A pregnant patient was admitted to the CHBH for a period of 24 days to have her medication changed from warfarin to heparin for the gestational period 9 – 11 weeks.

- Drug – Food interactions.

  No drug – food interactions were identified in the study conducted at the CHBH. Drug – food interactions are often overlooked at ED visits and on admissions. Most patients are often asked about their medication but very seldom about the medication administration in relation to meal times. Food can significantly affect absorption of certain medication resulting in sub-therapeutic treatment. Simple interventions such as identifying drug – food interactions on labels and counselling of patients to increase their awareness of such interactions can prevent drug – food interactions and more attention will have to be directed to this drug related event in the future.

- Drug allergy.

  None of the drug related hospital admissions in this study was due to allergy. Most allergic reactions manifest as a rash and can be easily missed. The most severe allergic reaction i.e. anaphylaxis is associated with substantial morbidity and mortality. Accurate history taking is important to avoid missing patient allergies and to assist in differentiating them from drug intolerance, adverse effects of drug etc.

Table 5.3 shows that the 156 patients were admitted for a total of 885 days. The average duration of hospital stay for this study was 5.67 days with a range of 1 – 30 days. One hundred and twenty three patients (78.8%) were admitted for 7 days or less and the total duration of stay for these 123 patients was 376 days. Thirty three (21.2%) patients were admitted for greater than 7days and the total duration of stay for these 33 patients was 509 days. Of these 33 patients:

- Fifteen patients were admitted for non-compliance
- Eleven patients were admitted for abuse of drugs
- Four patients were admitted for treatment errors
- Two patients were admitted for ADR's
- One patient was admitted for drug / disease interaction.

Non-compliance and abuse of drugs accounted for 78.8% of all drug related hospital admissions requiring hospitalisation greater than 7 days.

The relationship between the drug involved and the hospital admission was classified as either definite or probable. From table 5.6 it can be seen that 149 (95.5%) of the drug related hospital admissions were classified as being definitely related to the drug implicated. For the study conducted at the CHBH relationship between the drug and the hospital admission is classified as definite if:

- Non-compliance on drug therapy resulted in the signs and symptoms of the disease and compliance with the drug therapy alleviated the signs and symptoms of the disease.
- Documented drug / drug interactions.
- Documented Drug / disease interactions.
- Documented signs and symptoms of illicit drug use.
- Drugs not available from the PHC clinics and therefore the patients defaulted.
- Known medical conditions without treatment.
- Intentional overdose due to known drugs or chemical substances.

Table 5.6 shows that 7 (4.5%) of the drug related hospital admissions were classified as being probably related to the drug implicated. The 7 relationships where the drug and the hospital admission are classified as probable will be briefly discussed:

Non-compliance – antiepileptic drugs.

- Two known epileptic patients admitted for seizures. On admission the 2 patients had sub-therapeutic serum drug concentrations and were also hypoglycaemic (blood glucose levels < 2mmols/l) probably due to alcohol abuse. Hypoglycaemia can precipitate seizures and since the exact precipitating factor for the seizures could not be identified the 2 admissions were classified as probably related to the drug.
- One known epileptic patient admitted for inappropriate behaviour, aggression, irritability, paranoia etc. The serum drug level for phenytoin was sub -therapeutic. The patient has a history of alcohol abuse. The above symptoms could also be due to alcohol withdrawal (mentioned in the medical records), hence the classification of the admission as probably related to the drug.

Treatment error – antiepileptic drugs.

- A known epileptic patient on phenytoin and phenobarbitone. Serum drug levels of both drugs were in the lower end of the therapeutic range. The patient had three generalised tonic clonic seizures prior to admission. The seizures could not be related definitely to the low end therapeutic drug levels and therefore it was assumed that this was inappropriate treatment for the control of epilepsy in this patient and hence the classification of the admission as probably related to the drug.

Treatment error – analgesic.

- A patient admitted to the hospital for severe headaches. On admission the patients blood pressure was 200/130. The patient visited the PH.C. clinics two weeks prior to admission for the same problem and was given paracetamol tablets for the headaches. It is assumed that the patient's blood pressure was high on the visit to the PHC clinic. The treatment of paracetamol was to treat the symptom i.e. the headache and not the cause of the headache which is the high blood pressure. The headache could not be related definitely to the high blood pressure alone and hence the classification of the admission as probably related to the drug .

Treatment error – antihypertensive drugs.

- A known hypertensive patient admitted for signs and symptoms of cerebro vascular accident (CVA). On admission the patients blood pressure was 180/120. In hospital she was prescribed the same treatment as per her out patient treatment medical records on which she was previously well controlled. The blood pressure did not improve. Another class of drug to treat the patient's hypertension was required to control her high blood pressure. The signs and symptoms of C.V.A. most probably was due to the progression of the disease state and not related directly to her treatment and hence the classification of probable.

ADR – antiepileptic.

- Patient admitted for a severe rash after receiving an injection at the P.H.C. clinic. The patient was treated and discharged on phenytoin a month prior to admission, for a depressed skull after being assaulted. The patient had a fine rash since. One week prior to admission the patient went to the P.H.C. clinic for an unknown reason and was given an "injection for fits". This injection worsened the rash. During the hospital stay the patient was diagnosed as being HIV positive. Rashes are common in HIV patients and therefore the classification of the admission as probably related to the drug.

The last two, probable cases required the clinical outcome of treatment and the results of laboratory test before the cause of hospital admission could be determined. The above results were available only after a few days into the hospitalisation and were not available on admission. Due to the retrospective nature of this study it was possible to review the full hospital stay. These two case studies were the only two drug related admissions that were not obvious on admission.

One of the objectives of the study was to identify and pharmacologically classify the drugs involved in the drug related hospital admissions. Table 5.7 indicated that the highest percentage of drug related hospital admissions were due to the antiepileptic drugs followed by the antihypertensive drugs, illicit drugs and the drugs used in diabetes. The most commonly implicated pharmacological classes of drugs involved in drug related hospital admissions with the exception of illicit drugs are all used for the treatment of chronic diseases. The drug classification involved and the extent of drug related hospital admissions due to a particular drug classification varies amongst the different studies referenced and no conclusive relationship can be made.

Table 5.8 illustrates that in 109 (69.9%) of the drug related hospital admissions the medication that has been used prior to the admission was documented in the medical records. This included where the patient described the medication and dosage they were using and the doctor made a positive identification of the drug. In 47 (30.1%) of drug related hospital admissions no documentation of the medication used prior to admission was recorded. It was assumed that the medication was not known. In 135 (86.5%) of the medical records it was documented that the hospital admission was drug related. In 21 (13.5%) of the medical records no mention was made that the hospital admission was drug related.

The medication received by the patient during the hospital admission was calculated and multiplied by the purchase price of the drugs. The problems encountered with the medication costing were as follows:

- The haemoglucotest chart, urine analysis chart, hydration charts, special medication e.g. heparin and digoxin admininstration chart and the loading dose charts were not always found. Notes in the medical records made references to these charts and therefore it was realised that they were missing. The costing for the above missing medication could not be done.
- Medication was prescribed but the medication was not signed for as being given and it was therefore assumed that it was not given.
- Dressings done in the wards e.g. Betadine^{R} dressings were not costed because the quantity of antiseptic cream and sterile water or normal saline used from ward stock was not documented on the prescription chart or in the medical chart.
- Clonazepam e.g. 2-4mg PO / IMI was prescribed. It is not clearly noted on the prescription chart as to what dose and which route of administration was used. For costing purposes the lowest dose and the oral route of administration was assumed and costed accordingly.

The above mentioned problems were significant as these patients with the "problem" medication charts were included in the calculation of the average medication cost per patient for the drug related hospital admissions. The above mentioned problems had definitely lowered the calculated total and average medication cost for drug related hospital admissions.

Table 5.8 shows that the total medication cost for all the drug related hospital admissions equalled R6012.16. The average medication cost per patient per drug related hospital admissions was R43.03.

In the ten-day period of this study 156 drug related hospital admissions were identified. Extrapolating this finding to 365 days of the year it can be assumed that 5694 patients could be admitted annually as drug related hospital admissions. The total medication cost for these 5694 patients at R43.03 per patient per admission would amount to R245 012.82 per annum. The amount of R245 012.82 is only 0.5% of the annual pharmaceutical budget at the CHBH. The medication cost would need to be repeated in a prospective study to obtain an accurate medication costing for drug related hospital admissions.

7). CONCLUSIONS.

All 4 of the objectives of the study conducted at the CHBH were achieved.

The objectives and results of this study were as follows:

Objective 1: To determine the incidence of the drug related hospital admissions to the general medical wards of an academic hospital.

A total of 719 medical records were reviewed of which 156 were identified as being drug related hospital admissions. The incidence of drug related hospital admissions for the study conducted at the CHBH was 21.7%.

Objective 2: To categorise the drug related events leading to an admission.

The drug related events leading to a hospital admission were the following:

- Non-compliance: responsible for 53.2% of all drug related admissions.
- ADR's: responsible for 14.7% of all drug related admissions.
- Intentional overdose: responsible for 12.8% of all hospital admissions.
- Abuse of drugs: responsible for 12.2% of all hospital admissions.
- Treatment errors: responsible for 5.1% of all drug related admission.
- Drug - Drug interactions: responsible for 1.3% of all drug related admissions.
- Drug - Disease interactions: responsible for 0.6% of all drug related admissions.
- Drug – Food interactions responsible for 0% of all drug related admissions
- Allergy: responsible for 0% of all drug related admissions.

For the non-compliance group:

- The epileptic patients were responsible for 37.4% of the admissions.
- The hypertensive patients were responsible for 22.9% of the admissions.
- The diabetic patients were responsible for 10.8% of the admissions.
- The psychiatric, cardiac, asthmatic, tuberculosis and other patients were responsible for the balance of the 28.9% of admissions.

The following was applicable to all the drug related hospital admissions:

- The average duration of stay was 5.67 days with a range of 1 - 30 days.
- A total of 67 (43%) females and 89 (57%) males were admitted.
- The average age of the patients admitted was 44.1 years with a range of 14 80 years.
- In 109 (69.9%) of the drug related hospital admissions the drugs used prior to the admission was known. In 47 (30.1%) of the cases the drugs used prior to admission was not known.
- In 135 (86.5%) of the medical records it was documented that the admission was drug related. In 21 (13.5%) of the medical records it was not documented that the admission was drug related.

Objective 3: To identify and pharmacologically classify the drugs involved in the admission.

- The antiepileptic drugs: responsible for 24.4% of the hospital admission.
- The antihypertensive drugs: responsible for 14.7% of the drug related admissions.
- The illicit drugs: responsible for 12.2% of the drug related admission.
- The drugs used in diabetes: responsible for 9% of the drug related admission.
- The psycholeptics: responsible for 6.4% of the drug related admissions.
- The antifailure drugs:responsible for 5.8% of the drug related admissions.
- The antiasthmatic drug: responsible for 4.5% of the drug related admissions.
- The antimycobacterials: responsible for 1.9% of the drug related admissions.
- The antithrombotics: responsible for 1.9 % of the drug related admissions.
- The analgesics: responsible for 1.9% of the drug related admissions.
- The anticholinergics: responsible for 1.3% of the drug related admissions.
- The other drugs: responsible for 16% of the drug related admissions. This group of drugs collectively included all those drugs that contributed less than 1% to the hospital admission.

The relationship between the drug involved and the hospital admission was classified as either being definite or probable. One hundred and forty nine (95.5%) of the drug related hospital admissions were definitely related to the drug implicated. Seven (4.5%) of the drug related hospital admissions were probably related to the drug implicated.

Objective 4: To determine the average medication cost per patient, per admission for all the drug related admissions.

The total medication cost for the 156 drug related hospital admissions amounted to R6712.16. Numerous problems were encountered with determining the medication cost per patient per admission and the calculated average medication cost of R43.03 was much lower as a result. Extrapolation indicated that 5694 patients will be admitted annually for drug related events. The total medication cost for these 5694 patients would amount to R245 012.82. This accounts for only 0.5% of the annual pharmaceutical budget at the CHBH. A prospective study to determine the drug related hospital admissions will need to be conducted in which a more accurate average medication cost per patient per admission can be determined.

8). RECOMMENDATIONS.

The high rate of non-compliance identified in the study conducted at the CHBH, suggests that a more patient orientated education strategy is needed to improve on the overall patient care. Information sharing with all the health care providers about the problem of non-compliance will be of added value to increase patient education efforts and encourage greater co-operation from the patient.

The pharmacist duties so far has been to get the right drug, in the right strength and in the right dosage form to the right patient at the right time [18].

The pharmacy profession is faced with significant new challenges with the advent of the scope of practice for the pharmacy support personnel. Many of the above duties can and will be done by the pharmacy assistants. The role of the pharmacist must expand to take the challenges and become involved in pharmaceutical care: " the responsible provision of drug therapy for the purpose of achieving definite outcomes that improves a patients quality of life..."[16]. Interaction with the patients to maximise the effective use of their medication is one of the core activities of the pharmacists. Pharmacist need to be precise in their definition of the range and depth of such core activities.

The definitions and criteria for the level of interventions are defined below [17].

- Level 1: Medicine label reinforcement: Involves information giving to the patient at the counter, at the time of dispensing the script. The duration of the consult is 1-2 minutes and is mainly the re-inforcement of the label. Patient feed back is minimal.
- Level 2: Medicine consultation: Involves giving advice and information at the counter, at the time of dispensing the script. The duration of the consult is up to 10 minutes and is the label reinforcement plus the benefits, precautions and adverse effects of the medication dispensed. The patient feedback is substantial in this type of counselling.
- Level 3: Medicine counselling: This is a two -way interaction, by appointment and in a counselling area. The counselling session can last for up to 30 minutes exploring all aspects of the patient's medication taking. The feedback from the patient is extensive.

It therefore remains the responsibility of every health care worker especially the pharmacist to provide intense counselling and information (level 3) to the patient in an endeavour to educate the patient so that the patient may make informed decisions and take responsibility for their own health and well being. Interpreters will be required to assist with this process. This will fulfill another of the NDP's objectives i.e. to promote the individuals responsibility for health, preventative and informed decision making.

The following recommendations will not in any way decrease drug related hospital admissions but will facilitate easier data collection for future retrospective studies:

- To standardise the admission with regard to the information obtained from the patients.
- To relook at the medical record filing and storage procedure so as to minimise loose sheets being sent from the wards to the storage area and thereby prevent vital documentation's or patient information's from being misplaced.
- To request doctors to write more legibly.
- To request doctors not to create their own abbreviations.
- To request all health care workers to carefully document laboratory results, loading doses, intravenous fluid administered, surgical items etc. on the correct forms in the medical bed letters.

REFERENCES.

1. Gous AGS, Holderness MC, Mokhobo KP *et al*, editors. Essential drug programme - South Africa. Standard treatment guidelines and essential drug list. PHC. South Africa: The Department of National Health. 1996.
2. Quick JD, Rankin JR, Laing RO,*et al.* editors. Managing Drug Supply. Management Science for Health in collaboration with the World Health Organisation, 2nd ed. revised and expanded. USA: Kumarian Press. 1997
3. Brushwood DB. Medication errors and pharmacist responsibilities. Glaxo Wellcome health care education. 1997.
4. Schneitman - McIntire O, Farnen TA, Gordon N, Chan J, Toy WA. Medication misadventures resulting in emergency department visits at an HMO medical centre. Am J Health - Syst Pharm. 1996; 53:1416 - 22.
5. Prince BS, Goetz CM, Rihn TL, Olsky M. Drug related emergency department visits and hospital admissions. Am J Hosp Pharm. 1992; 49:1696 -1700.
6. Hewitt J. Drug related unplanned readmissions to hospital. Aust J Hosp Pharm. 1995; 25: 400 - 3.
7. Dennehy CE, Kishi DT, Louie C. Drug related illness in emergency department patients. Am J Health - Syst Pharm. 1996; 53:1422 - 6.
8. Nelson KM, Talbert RL. Drug related hospital admissions. Pharmacotherapy 1996; 16(4): 701 – 707.

9. Einarson TR. Drug related hospital admissions. Ann Pharmacother. 1993; 27: 832 - 40.

10. Drummond SH, Peterson GM, Kaye AEF. Hospital admissions due to drug overdose. Aust J Hosp Pharm. 1994; 24: 231 - 4.

11. Pilzer JD, Timothy BG, Mutnick AH. Drug allergy assessment at a university hospital and clinic. Am J Health – Syst Pharm. 1996, 53: 2970 –5.

12. Garabedian – Ruffalo SM, Syrja – Farber M, Lanius PM, Pluciinski A. Monitoring Drug – Drug and Drug – Food interactions. Am J Hosp Pharm. 1988; 45:1530 – 4.

13. Leslie AS, Mason NA. Advanced pharmaceutical care, clinical skills programme. Constructing a patient drug therapy problem list (module 3). An educational program developed by ASHP and sponsored by Glaxo 1993.

14. Conradie AE, Straughan JL, editors. South African Medicine Formulary, 4th ed. South Africa: Produced by the Department of Pharmacology, Medical School, University of Cape Town.1995.

15. Drug. Dorland's illustrated medical dictionary, 28th ed. Philadelphia: W.B. Saunders Company, 1994: 507.

16. Angaran DM, Rector TS. Monitoring and improving pharmaceutical care with performance indicators. In: DiPiro TJ, Talbert RL, Hayes PE, *et al*, editors. Pharmacotherapy. A pathophysiological approach, 2nd ed. Connecticut: Appleton and Lange, 1993: 7 -- 14.

17. Raynor DK. Time to redefine "counselling?". The International Journal of Pharmacy Practice. Dec 1996; 185 – 186.

18. Brushwood DB. Medication errors and the risk management significance of the pharmacist documentation in patients records. Glaxo Wellcome health care education. 1997.

19. Microsoft Word[R] version 7 and Excel[R] version 7.

APPENDICES.

APPENDIX A.

BARAGWANATH HOSPITAL/HOSPITAAL

FORM/VORM MHS 10

REQUEST FOR HOSPITAL CLINICAL RECORDS
VERSOEK VIR HOSPITAAL KLINIESE REKORDS

PURPOSE REQUIRED FOR:
DOEL WAARVOOR BENODIG

RECORDS NOT TO BE REMOVED OFF HOSPITAL PREMISES
REKORDS MAG NIE VANAF HOSPITAALPERSEEL VERWYDER WORD NIE

	PATIENT'S NAME NAAM VAN PASIËNT	HOSP. NO.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

I undertake not to remove above records from hospital property and to return same within 7 days after issue to me.

Ek onderneem om rekords nie vanaf hospitaal perseel toe verwyder nie om binne 7 dae na uitreiking aan my, terug te besorg.

APPROVED : .....
GOEDGEKEUR

SIGNATURE OF DOCTOR/DOKTER SE HANDTEKENING

SECTION : .....
AFDELING

NAME PRINTED: .....

DATE .....
DATUM:

RECEIVED BY .....
ONTVANG DEUR:

ISSUED BY/UITGEREIK DEUR: ..... DATE/DATUM: .....

1990.10.30.

APPENDIX B

PHARMACIST PATIENT DATA FORM	
DEMOGRAPHIC AND ADMINISTRATIVE INFORMATION	
STUDY NUMBER:	
DATE OF BIRTH:	WEIGHT:
GENDER:	EMPLOYED: YES NO
ADMISSION DATE:	DISCHARGE DATE:
ALLERGIES/INTOLERANCES:	
HISTORY OF PRESENT ILLNESS: (list signs and symptoms)	
PAST MEDICAL HISTORY:(list signs and symptoms)	
FAMILY AND SOCIAL HISTORY:	
LIFESTYLE:	
DIET:	
EXERCISE:	
TOBACCO:	
CAFFEINE:	
ALCOHOL:	
SUBSTANCE ABUSE:	
OTHERS:	
SUMMARY OF ACUTE AND CHRONIC MEDICAL PROBLEMS:	
1).	2).
3).	4)
5).	6).
7).	8).
9).	10).

VITAL SIGNS/ LABORATORY DATA - INITIAL/FOLLOW UP:	
DATE:	
WT:	
TEMP:	
B.P.	
PULSE:	
LAB TEST	REFERNCE RANGES
Na	135-147 mmol/l
K	3.3 -5.0 mmol/l
Cl	99 -111 mmol/l
CO2	18 -29 mmol/l
BUN	2.6 -7.0 mmol/l
Cr	60 -120 mmol/l
Glu	3 -6 mmol/l
Glyc Hgb	< 8%
Ca	2.15 -2.62mmol/l
phos	1 -1.5 mmol/l
T Prot	55 -85G/L
Alb	35 -50G/L
T Bili	2 -2.1umol/l
D. Bili	0 -5 umol/l
ID Bili	0 -17 umol/l
AST	6 -38 u/l 37*
ALT	6 -40 u/l 37*
LDH	320 -462 u/l 37*
Alk Phos	40 -120 u/l 37*
GGT	7 -50 u/l 37*
RBC	4.07 -5.3 *10^9/l
WBC	3.9 -9.3 *10^9/l
PLT	150000-440000u/l
Hgb	12 -15mmol/l
Hct	0.36 -0.46mmol/l
INR	1 1.5
PTT	30-40 sec
DRUG SERUM CONCENTRATIONS:	
Date	
Digoxin	1-2ng/ml
Theo	10-20ug/ml
Gent / Tob	2-5ug/ml
Vanco	10-30ug/ml
Phenytoin	10-20ug/ml
Carb	8-12ug/ml

DRUG THERAPY					
Drug Name/Dose/Strength/Route	Prescribed schedule	Duration start - stop dated	Total quantity of medication used	Price	Total cost
DRUG THERAPY ON ADMISSION					
DRUG THERAPY DURING HOSPITILIZATION AND ON DISCHARGE					
ANY O.T.C. MEDICATION TAKEN/ TRADITIONAL MEDICATION					

Appendix C

DRUG THERAPY ASSESMENT WORKSHEET (DTAW)

Study number: _____

Correlation between medical problems and drug therapy:

List of medical problems:

1) _____

2) _____

3) _____

4) _____

Drugs for the medical problem:

1) _____

2) _____

3) _____

4) _____

DRUG PROBLEM	ASSESSMENT	NAME OF DRUG INVOLVED IN THIS TYPE OF DRUG PROBLEM	PHARMACOLOGICAL CLASSIFICATION OF THE DRUG	RELATIONSHIP OF DRUG PROBLEM TO THE DRUG MENTIONED	COMMENTS/NOTES
Adverse drug reactions	☐ Are there symptoms or medical problems that may be drug induced ☐ A reasonable temporal relationship between the beginning of drug therapy and the onset of adverse effects ☐ Disappearance of the adverse reaction on discontinuation or dosage reduction ☐ Inability to explain the symptoms or events by other known conditions or pre-dispositions of the patients ☐ Reappearance of the symptoms on re-exposure or laboratory test showing toxic drug levels or induced metabolic disturbances that explain the symptoms	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	

DRUG THERAPY ASSESMENT WORKSHEET (DTAW)

Study number: _____

DRUG PROBLEM	ASSESSMENT	NAME OF DRUG INVOLVED IN THIS TYPE OF DRUG PROBLEM	PHARMACOLOGICAL CLASSIFICATION OF THE DRUG	RELATIONSHIP OF DRUG PROBLEM TO THE DRUG MENTIONED	COMMENTS/NOTES
Drug / disease interactions	☐ Are there any medications contraindicated for the medical conditions (relatively or absolutely) ☐ Are the prescribed dose and dosing intervals appropriate ie. Within the usual dose and/or adjusted to the patient factors	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Drug / Drug interactions	☐ Are there any drug / drug interactions. Are they clinically *significant? (include social* drugs)	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Drug / Food interactions	☐ Are there any drug / food interactions. Are they clinically significant	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Abuse of drugs	☐ Is the patient currently on any social drugs or abusing a known prescription drug ☐ Can the sudden decrease or discontinuation of these drugs be related tot the patients symptoms (eg. Withdrawal)	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	

DRUG PROBLEM	ASSESSMENT	NAME OF DRUG INVOLVED IN THIS TYPE OF DRUG PROBLEM	PHARMACOLOGICAL CLASSIFICATION OF THE DRUG	RELATIONSHIP OF DRUG PROBLEM TO THE DRUG MENTIONED	COMMENTS/NOTES
Drug allergy or intolerance	☐ Is the patient allergic or Intolerant to any medication (stated in the medical chart)	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Treatment errors	☐ Are there drugs without medical indications ☐ Are there any untreated medical conditions. Do they require drug therapy ☐ Are there any drug duplications	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Non - compliance	☐ Is the prn medication used appropriately ☐ Is the route and dosage form of administration appropriate ☐ Is the length of the course appropriate ☐ The patient failed to receive a medication due to a system error or non-compliance ☐ Are there factors hindering the achievement of therapeutic efficacy eg. No transport, complexity of the regimen etc.	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	
Intentional overdose	☐ The use of prescription drugs, non-prescription drugs and /or toxic chemical substances commonly found in the home in an attempt to cause bodily harm or death	1) 2) 3)	1) 2) 3)	☐ Definite: undisputably related to the drug ☐ Probable:A chance that the reaction is related to the drug ☐ Unevaluable	

Appendix D

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)
Ref: R14/49 Rhemtula

CLEARANCE CERTIFICATE PROTOCOL NUMBER M990423

PROJECT Drug Related admission To The General Adult Medical Wards Of An Academic Hospital

INVESTIGATORS Miss ZG Rhemtula

DEPARTMENT Department of Pharmacy, Baragwanath Hospital

DATE CONSIDERED 990430

DECISION OF THE COMMITTEE *

Approved unconditionally

DATE 990503 CHAIRMAN ..... (Professor P E Cleaton-Jones)

* Guidelines for written "informed consent" attached where applicable.

c c Supervisor: Prof AGS Gous
Dept of Department of Pharmacy, Baragwanath Hospital

Works2\Main0015\HumEth97 wdbWI 990423

==========

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10001, 10th Floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

DATE ..... SIGNATURE .....

PROTOCOL NO.: M 990423

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix D

Faculty of Health Sciences
UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

7 York Road PARKTOWN Johannesburg 2193 Telegrams WITSMED Telex 4-24655.SA
FAX 643-4318 TELEPHONE 647-2075
E-MAIL jmainwa@chiron.wits.ac.za

MS ZG RHEMTULA
30 A PRESIDENT STREET
JOHANNESBURG
2001

APPLICATION NUMBER 9612701K
STATUS (DEG 87) (MM303) PZZ

1999-12-16

Dear Ms Rhemtula

Approval of protocol entitled Drug related admissions to the adult medical wards of an academic hospital

I should like to advise you that the protocol and title that you have submitted for the degree of Master Of Pharmacy have been approved by the Postgraduate Committee at its recent meeting. Please remember that any amendment to this title has to be endorsed by your Head of Department and formally approved by the Postgraduate Committee.

Prof AGS Gous has/have been appointed as your supervisor/s. Please maintain regular contact with your supervisor who must be kept advised of your progress.

Please note that approval by the Postgraduate Committee is always given subject to permission from the relevant Ethics Committee, and a copy of your clearance certificate should be lodged with the Faculty Office as soon as possible, if this has not already been done.

Yours sincerely

JO Mainwaring (Mrs)
Faculty Officer
Faculty of Health Sciences

Telephone 647-2075/2076

Copies - Head of Department____Supervisor/s

The University of the Witwatersrand rejects racism and racial segregation. It is committed to non-discrimination in the constitution of its student body, in the selection and promotion of its staff, and in its administration

Appendix D

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

CERTIFICATE OF SUBMISSION TO BE SIGNED BY ALL SUPERVISORS OF HIGHER DEGREE CANDIDATES

I, Zuleka Goolam Khemtula, candidate for the degree of
(name)
M Pharm
(degree)
has submitted his/her thesis/dissertation/research report entitled:

Drug related hospital admissions to the general adult medical wards at an academic hospital

1. Has this thesis/dissertation/research report been submitted with the acquiescence of the supervisor?

(Yes/No)

2. To the best of your knowledge are you able to verify that:

(a) this is the candidate's work except as otherwise stated by the candidate?

(Yes/No)

(b) the substance (nor any part of it) has not being submitted in the past nor is being submitted for a degree in any other university?

(Yes/No)

(c) the candidate has acknowledged wherever any information used in the thesis, dissertation or other work has been obtained by him/her while employed by, or working under the aegis of, any person or organisation other than the University or its associated institutions?

(Yes/No)

NB: PLEASE TICK THE APPROPRIATE WORD

3. I certify that this thesis/dissertation/research report has the approval of the Animal Ethics Committee/Committee for Research on Human Subjects and the Number of the Certificate of Approval is Ref R14/49 Premtula - M990423

Name of Supervisor Prof AGS Gray Signature

Date: 2/3/2000

POSTGRADUATE OFFICE, FACULTY OFFICE - MEDICAL SCHOOL
7 YORK ROAD, PARKTOWN, 2193

Uppendix E

GAUTENG PROVINCIAL GOVERNMENT

DEPARTMENT OF HEALTH

ENQUIRIES	**DR. J. NACH**	**CHRIS HANI**
TEL NO.	**933 9154**	**BARAGWANATH HOSPITAL**
FAX NO.	**938 8161**	**P.O. BERTSHAM 2013**
		28 SEPTEMBER 1998

The Records Department
CHRIS HANI BARAGWANATH HOSPITAL

Ms. Z. Rhemtula has permission to access patients hospital records.

Nach

DR. J. NACH
SUPERINTENDENT
/mlk
1998/09/28

Author Rhemtula Z G
Name of thesis Drug Related Hospital Admissions To The General Adult Medical Wards At An Academic Hospital Rhemtula Z G 2000

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