PREVALENCE OF MEDICATION ERRORS AT TEMA GENERAL HOSPITAL

BY

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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Date

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ABSTRACT

With a lot of drugs to choose from, the most educated professional health care providers make medication errors, and somewhat less experienced providers may compound the problem. A medication error may be defined as any preventable event that may cause or lead to inappropriate medication use or patient harm. Medication errors may be caused by factors such as: sleep deprivation, mental lapses and fatigue, inadequate knowledge of drugs and of a patient's existing medical conditions, faulty drug identification, patient's allergies not documented, and handwriting and dosage errors. The study setting was at Tema General Hospital. It is a district referral hospital in the Greater Accra Region of Ghana. The study aimed to identify the prevalence of medication errors at the hospital. The number of errors from a sample of two hundred (200) inpatients' folders on admission was recorded over an eight-week period. The errors were categorized as errors of prescription writing, dispensing and administration. Methods used for detecting these errors were: An interviewer-administered questionnaire, analyses of sampled folders to identify causal factors, incidence reports and direct observation. Overall, 501 of the errors, representing 48.8%, were detected as prescribing errors. A total of 187 dispensing errors representing 18.3% were detected, while 338 of the errors representing 32.9% were drug administration.

The study confirmed the view held earlier that medication errors do occur at the hospital. Moreover, the errors cut across the whole spectrum of service provided, and that medication errors seldom occur because of one person.

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CHAPTER ONE – INTRODUCTION

1.1 BACKGROUND

The goal of drug therapy is the achievement of defined therapeutic outcomes that improve a patient's quality of life while minimizing patient risk (1). There are inherent risks, both known and unknown, associated with the therapeutic use of drugs (prescription and nonprescription) and drug administration devices.

The incidents or hazards that result from such risks have been defined as drug misadventure, which include both adverse drug reactions (ADRs) and medication errors (2).Medication errors are serious problems throughout the world. These errors have a huge economic impact on healthcare system, patients and payers alike. Medication errors occur in all types of patients, in all type of setting; their proximal causes can be associated with prescribers, dispensers, nurses, caregivers or patients (3). Aside, these may compromise patient confidence in the health care system. It is estimated that drugs constitute 60-80% of the cost of health care in Ghana (4).

To help address the increasing cost of drugs and medical supplies with the expanding provision of health services and its effect on the national health budget, the Ministry of Health has asked health facilities to form monitoring teams for rational use of medicines and quality assurance. Also, health facilities should constitute Drug and Therapeutics Committees. Furthermore, these programmes have been put in place in order to help achieve the Ministry of Health set goal, through the Ghana Health Service (5). The goal is to ensure:

- A significant reduction in the rates of infant, child and maternal mortality.
- Effective control of risk factors that expose individuals to the major communicable diseases;
- Improved access to health services, especially in the rural areas;

- A health system effectively redirected towards public health services;
- Effective and efficient management of the health system.

By World Health Organization (WHO) definition: Rational use of medicines requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community. This means that rational prescribing should meet the following criteria:

-Appropriate indication; this implies that the reason to prescribe is based on sound medical considerations

-Appropriate drug, considering efficacy, safety, suitability for the patient and cost

-Appropriate dosage, administration and duration of treatment.

-Appropriate patient, that is, no contraindications exist, and the likelihood of adverse reactions is minimal.

-Appropriate information; that patients should be educated about their ailments and the medication prescribed for them.

-Patient adherence to treatment (6).

Members of drugs and therapeutic committee are, among other things:

To maintain hospital formulary lists.

To maintain an emergency drug list

To standardize prescribing policies and treatment guidelines

To oversee antimicrobial sensitivity patterns and infection control

To monitor dispensing practices and

To monitor medication errors and adverse drugs reactions (7).

The quality assurance programme was introduced as a programme for improving professional self-regulation, peer review and a system that promotes continuous improvement in quality of care within the service environment. The framework recognizes the impact of high investments in developing clinical effectiveness as a critical factor in maintaining staff morale and improving essential elements of care.

With the existence of these programmes at the general hospital notwithstanding, available figures on rational use of medicines for the period 2004 and 2005 were not encouraging (8), as shown from the table below:

Table 1.RATIONAL USE OF MEDICINES PRESCRIBING AND CLINICAL QUALITY OF CARE INDICATORS AT TEMA GENERAL HOSPITAL.

OBJECTIVE	REGIONAL TARGET	INSTITUTIONAL PERFORMANCE JAN-DEC 2004	INSTITUTIONAL PERFORMANCE JAN-DEC 2005	COMMENTS
Number of drugs per prescription	3	**3.3**	**3.3**	Did not meet regional target
Percentage of drugs prescribed by generic name	85	**33.9**	**44.4**	Far below regional target
Percentage of prescriptions with antibiotic	40	**26.2**	**27.9**	Met regional target
Percentage of prescriptions with injection	20	**34.6**	**27.0**	Below regional target
Percentage of medicines prescribed from the Essential				Below

Drugs List	95	**61.2**	**66.5**	regional target
Percentage of prescriptions with written diagnosis	80	**87.0**	**89.8**	Met region's requirement
Percentage of patients with temperature taken	100	**Not available**	**95.2**	Below regional requirement
Percentage of patients with weight taken	100	**Not available**	**54.6**	Below regional requirement
Percentage of patients with blood pressure taken	100	**Not available**	**90.9**	Below regional requirement

From Table 1, some of the implications are that; reduced percentage of medicines prescribed by generic name leads to a great cost to both patient and the National Health Insurance Scheme (NHIS).

An increase in average number of drugs per prescription result in poor patient compliance and increase in both cost to him/her and the national health insurance scheme. Furthermore, chances of adverse drug reactions and making mistakes, either on the part of patient or the health care provider would be more likely. There is also a higher chance of prescription error when names of prescribed medicines are abbreviated and in branded names rather than generic names. The increased use of medicines via parenteral route for simple non-specialized cases of common occurrence is also worrying, judging from its associated complications. This could also mean that there is non-compliance among providers of health care at the hospital.

1.2 DEFINITION OF MEDICATION ERRORS

Medication error is any error in the process of prescribing; dispensing, administering, monitoring, drug therapy regardless of whether an injury occurred or the potential for an injury was present (9). When an injury occurs as result of the drug therapy, that injury becomes an adverse drug event.

According to United States national co-ordination council for medication errors and prevention, medication errors can also be defined as any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient or consumer. Such events may be related to professional practice, health care products procedures and systems including: prescribing; order communication, product labeling, packaging and nomenclature, compounding, dispensing, distribution, administration education monitoring and use (10).

The term "prevalence" of medication errors refers to the estimated population of people who are victims of medication errors at any given time (11).

1.3 CLASSIFICATION AND CAUSES OF MEDICATION ERRORS

Medication errors can be broadly classified as prescribing, dispensing or drug administration errors as shown in figure 1.3.1.

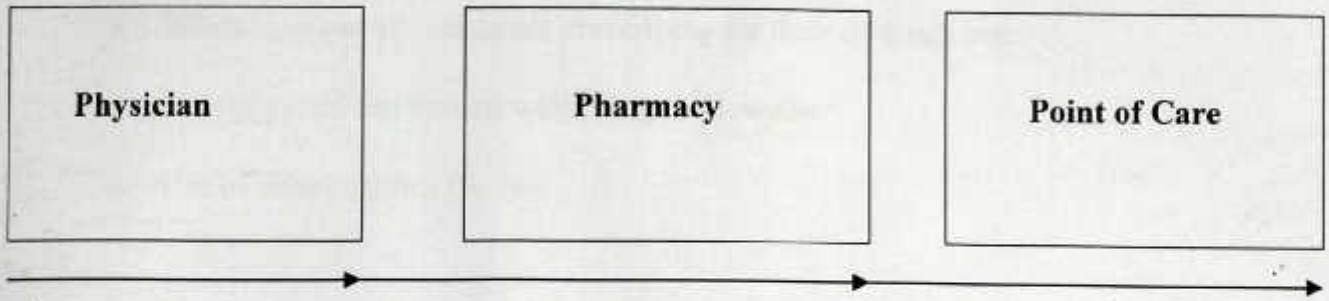


Figure 1.3.1 Stages of medication errors.

Prescribing **Dispensing** **Administration**

1.3.1 Risk factors that affect the three classes of medication errors are (12):

- Unfamiliar work environment
- High workload
- Poor team communication
- Incomplete patient information e.g. allergy
- Lack of knowledge of the prescribed drug
- Inexperienced and inadequately trained staff
- Workplace environmental problems that lead to increased job stress

1.3.2 Prescribing Errors

Prescribing errors may be defined as an incorrect drug selection for a patient, be it the dose, the strength, the route, the quality, the indication, the contraindications and also failure to comply with legal requirements for writing of prescription by the prescriber (13). In other words prescribing errors may be either classified as drug related errors or prescription writing errors.

Causes of prescribing errors

Among the many risk factors are:

- Whether or not clinicians are prescribing for their own patients
- Poor physical and mental well being of prescriber
- Use of abbreviations (9, 14).

1.3.3 Dispensing Errors

These are errors that occur at any stage during the dispensing process from the receipt of the prescription in the pharmacy through to the supply of a dispensed product to the patient (14). Some of these factors include:

- Incorrect strength of medicine
- Incorrect drug
- Incorrect quantity supplied
- Supply of wrong dosage form and ambiguous drug labels
- Access to drugs by non-pharmacy personnel
- Poor illegible handwriting by prescriber
- Change in shift that may result in inaccurate or lack of documentation
- Increased number or quantity of medications per patient
- Improper drug storage
- Confusing drug product nomenclature, packaging, or labeling
- Poorly functioning oversight committees
- Unavailability of medications
- Faulty drug stocking or delivery methods

1.3.4 Administration Errors

A drug administration error may be defined as a discrepancy between the drug therapy received by the patient and the drug therapy intended by the prescriber.

The "five rights" have long been the basis for nurse education on drug administration i.e. giving the right dose of the right drug to the right patient at the right time by the right route (9, 14)

Some of the factors include:

- Wrong drug name or dosage form
- Mistake on calculating dosage by nursing staff during drug administration to a patient
- Atypical or unusual and critical dosage.
- Failure to follow institution/facility policies and procedure
- Incorrect quantity administered
- Poor handwriting by physician in the patient's folder
- Poorly functioning oversight committees
- Inexperienced and inadequately trained staff
- Storage of look-a-like preparations side by side in the drug trolley

1.4 STATEMENT OF THE PROBLEM

Medication errors can result from inappropriate prescribing and/or poorly functioning oversight committees like Drug and Therapeutics Committees and quality assurance monitoring teams. Inappropriate prescribing at Tema General Hospital has been of much

concern to both management of the institution and the Greater Accra Regional Health Directorate in particular, and Ghana Health Service in general.

Figures obtained from some prescribing indicators on Rational use of medicines and Quality of clinical care monitoring for the year 2004/2005 identified lack of understanding about the rational use of drugs and appropriate prescribing (8). From these outcomes the hypothesis of the study will be that prevalence of medication errors exist in the hospital.

1.5 SIGNIFICANCE OF STUDY

Each year as many as 98,000 Americans die of medical mistakes! This is more than the number of lives lost annually to car accidents, breast cancer, or AIDS according to a 2000 report from the institute of medicine (IOM), a division of the National Academy of Sciences (15).

Focusing on the medication error portion of the puzzle, it is estimated that approximately $2 billion annually is spent on treating hospitalized patients for preventable adverse drug events. Medication errors alone kill more than 7,000 people each year: more than the 6,000 people lost to work place injuries annually (16).

One review of adverse drug reaction literature estimates that over 50% of drug-related admissions are preventable and therefore considered medication errors. Many individuals point to the release of the institute of medicine report. "To Err is Human: Building a Safer Health system," as the catalyst for medication error reform. In reality medication errors have been studied for over 30years. Many high profile cases, such as the fatal error at Dana Farber Cancer Institute in 1995, served to focus media attention on the problem; and many groups,

such as The National Coordinating Council from Medication Error Reporting and Prevention (NCC MERP), Institute for Safe Medicine Practices (ISMP), and the National Patient Safety Foundation (NPSF) came into being years before the release of the institute of medicine report (17).

In Ghana, although little is known about the prevalence of medication errors, one is tempted to believe that in relative terms, the picture painted about the United States as far as the prevalence of medication errors are concerned, might not be different if not even worse. Children and older people are at a greater risk of medication errors. The elderly has a high level of morbidity, often with multiple health problems and hence need to take several medications. In addition frailty, changes in drug distribution and susceptibility to renal and hepatic impairment all mean that these patients are more susceptible to adverse drug events (18). Children and infants are particularly at risk of medication errors mainly due to incorrect dosage, because of the need to modify dosages based on age and weight. The dosage modification may be either overlooked or miscalculated.

Looking at the significance of medication errors as stated above it would be appropriate to carry out research on medication errors at Tema General Hospital.

1.6 RESEARCH SETTING

The General Hospital in Tema was the setting for this study.

It is a district referral hospital in the Greater Accra Region of Ghana. From 2006 it also served as a teaching hospital for both medical and pharmacy house officers.

It has an average daily attendance of about 420 patients/clients. The hospital provides inpatient and outpatient services for the inhabitants of mainly Tema and Ashiaman as well as other smaller sub districts and surrounding villages.

The hospital with a bed capacity of 280 has a total of 31 medical doctors; among them are 4 house officers. There are two medical assistants, 3 pharmacists, 246 nurses, and 155 other health care workers make up the hospital staff.

The services provided by the hospital include Medical, Surgical, Obstetrics and Gynaecology, Dental, Pharmaceutical, Laboratory, Paediatrics, Ophthalmology, Radiology and Physiotherapy.

1.7 AIMS AND OBJECTIVES OF THE STUDY

The project aims to:

- Identify the prevalence of medication errors at Tema General Hospital

Objectives are to:

- Identify the prevalence of different types of medication error (prescribing, dispensing, and administration).
- Determine contributing factors to medication errors.
- Recommend interventions that could be used to reduce medication errors and ensure that patients/clients at the facility receive safe, quality health care.

CHAPTER TWO - METHODOLOGY

2.1 STUDY SAMPLE

The study was conducted at Tema General Hospital, a district referral hospital in Tema Municipal area in the Greater Accra Region. There were two hundred and eighty beds at the study hospital. The study covered an eight-week period, from March 10, 2006 through to May 10, 2006.

Convenience sampling method was used for data gathering during the study. This sampling method may be referred to as the collection of information from members of the population who are conveniently available to provide it (19).Some advantages of this method are: it is convenient, inexpensive, less time consuming and patients are not obliged to participate in the study.

A sample of two hundred (200) inpatients' folders on admission was selected for this study. These patients were made up of adults and children, as well as both sexes.

The number of folders picked for the study from the individual wards was directly proportional to the bedding capacity of that ward. For instance, whilst general female ward with 39 beds had 24 inpatients' folders picked, 11 folders came from children's ward, which had 16beds.For instance, as with other sampled folders, the 24 folders from general female ward were selected based on the first 24 folders that met the selection criteria during the period under review.

2.2 METHODS USED

The methods used for detecting prescribing errors were:

An interviewer-administered questionnaire for the patient (20)

Analyses of sampled folders to identify causal factors.

The methods used to collect data on dispensing errors were:

An interviewer administered questionnaire for the patient

Incident reports by nurses and some pharmacy staff

Analyses of sampled folders and comparison of these with medications that affected patients were taking and

Direct observation of pharmacy staff in the dispensary by data collectors.

An interviewer-administered questionnaire, analyses treatment sheet chart of sampled folders and direct observation were the methods used to collect data on administration errors.

During the data collection everything, as much as possible, was done to avoid behavioral change of prescribers, dispensers and nurses. For instance, no specific time was set aside to do the observation. This was done during routine ward rounds.

Refer to indices I, II & III, pages 46,56 and 66 for sample data.

2.3 ETHICAL CONSIDERATIONS

It is important to consider the rights of respondents in every research.

The purpose for which the questionnaire was being administered was explained to each patient that was involved in the study and an opportunity given to either decline or accepts to take part. Participants were made aware of the fact that their rights will and the types of services they expect to receive will not be affected by refusal to participate in the study. Earlier, permission was sought from hospital management.

2.4 RESEARCH RESULTS

2.4.1 Data Analysis

Data was analyzed using Microsoft Excel.

2.4.2 PRESCRIBING ERRORS

In the study, out of the 200-inpatient folders that were assessed, a total of 501 prescribing errors were detected. The breakdown is presented in the column chart format (figure 2.1)

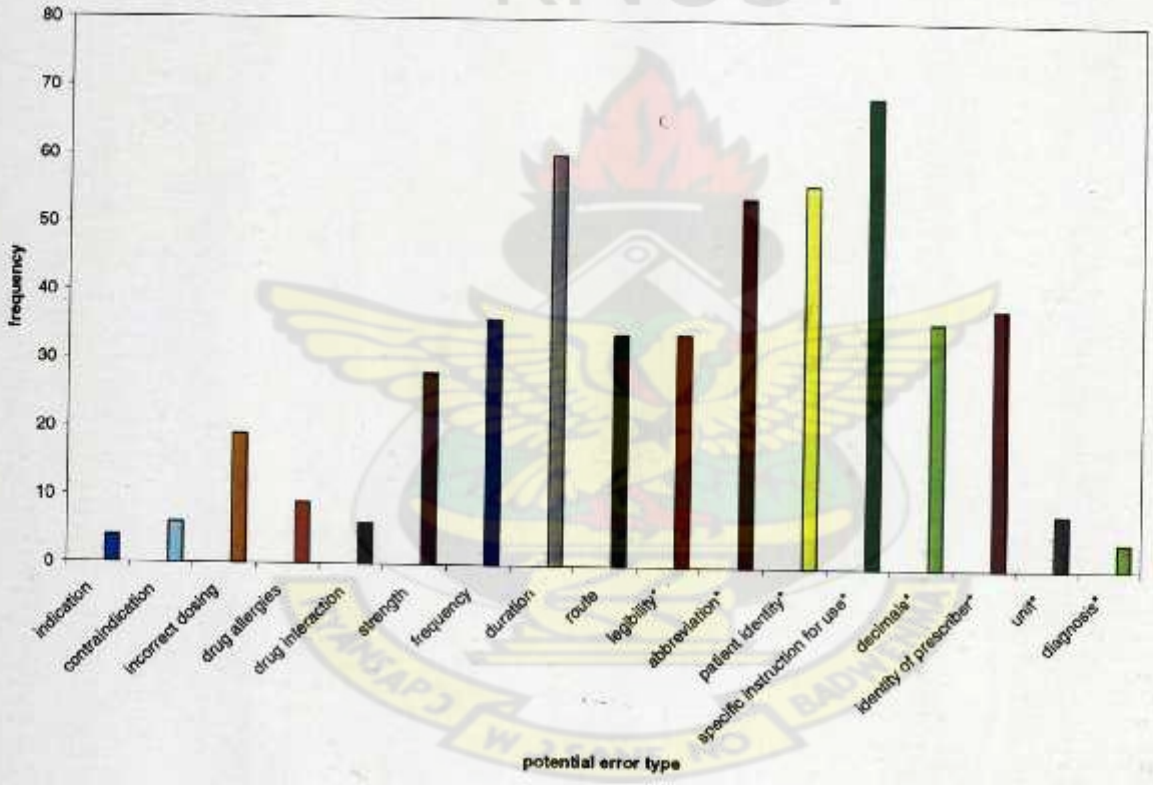
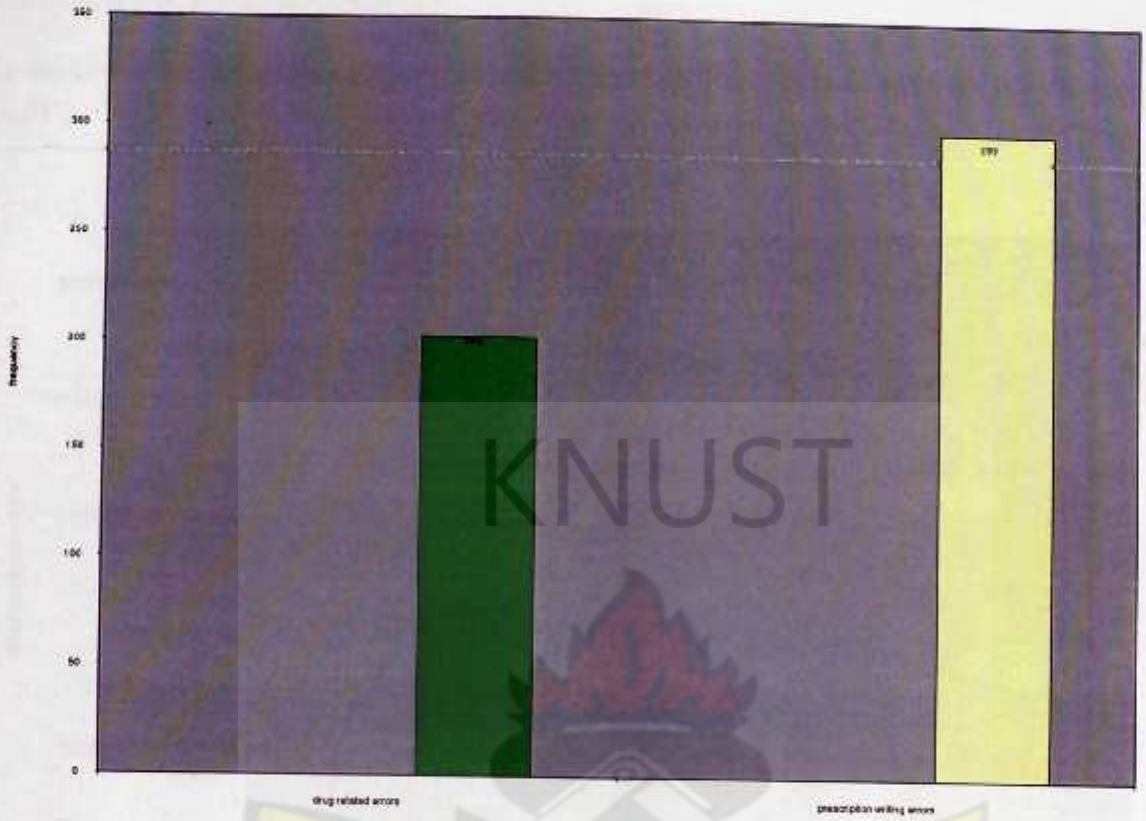


Figure 2.1 Frequency of potential errors

From the column chart it must be noted that the least common encountered prescribing errors were of prescribing indication type, errors involved diagnosis, contraindication and drug interaction.

Overall, out of 501 prescribing errors that were detected, the failure to comply with legal requirements for writing of prescription resulted in 299 errors. The remaining 202(501-299) errors came about as a result of problems with the medicines that were prescribed. Figure 2.2 depicts this.



Prescribing errors

Figure 2.2 Frequency of prescribing errors, classified as prescription writing errors and drug related errors.

2.4.3 DISPENSING ERRORS

In the study, 187 dispensing errors were detected and this is presented in the bar chart format (2.3)

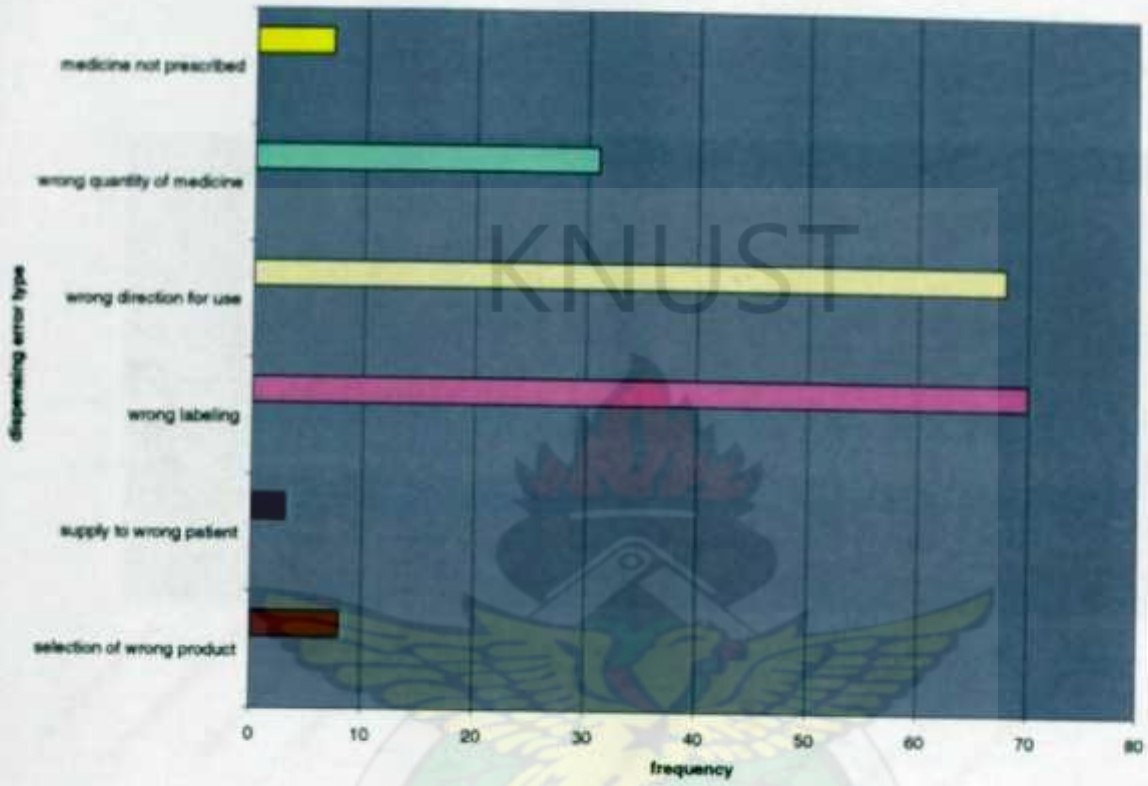


Figure 2.3 Frequency of dispensing errors

2.4.4 ADMINISTRATION ERRORS

In the study, a total of 338 administration errors were detected. The column chart (figure 2.4) depicts the breakdown.

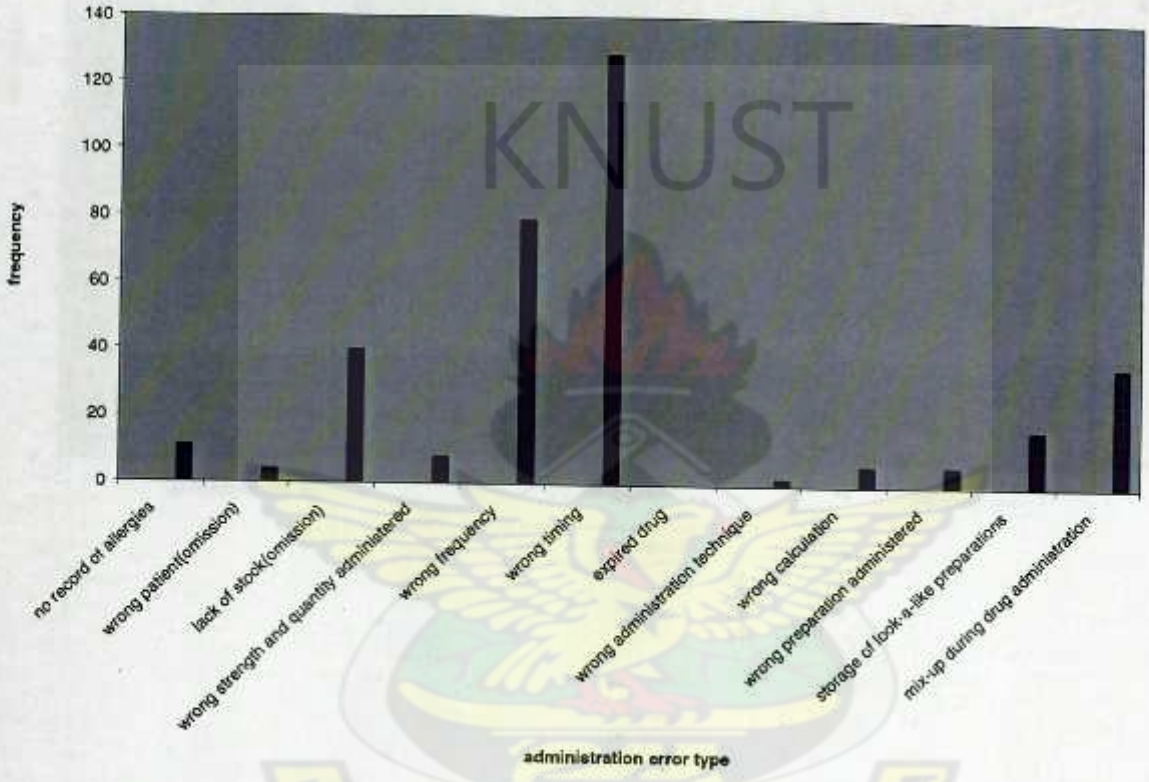


Figure 2.4 Frequency of administration errors.

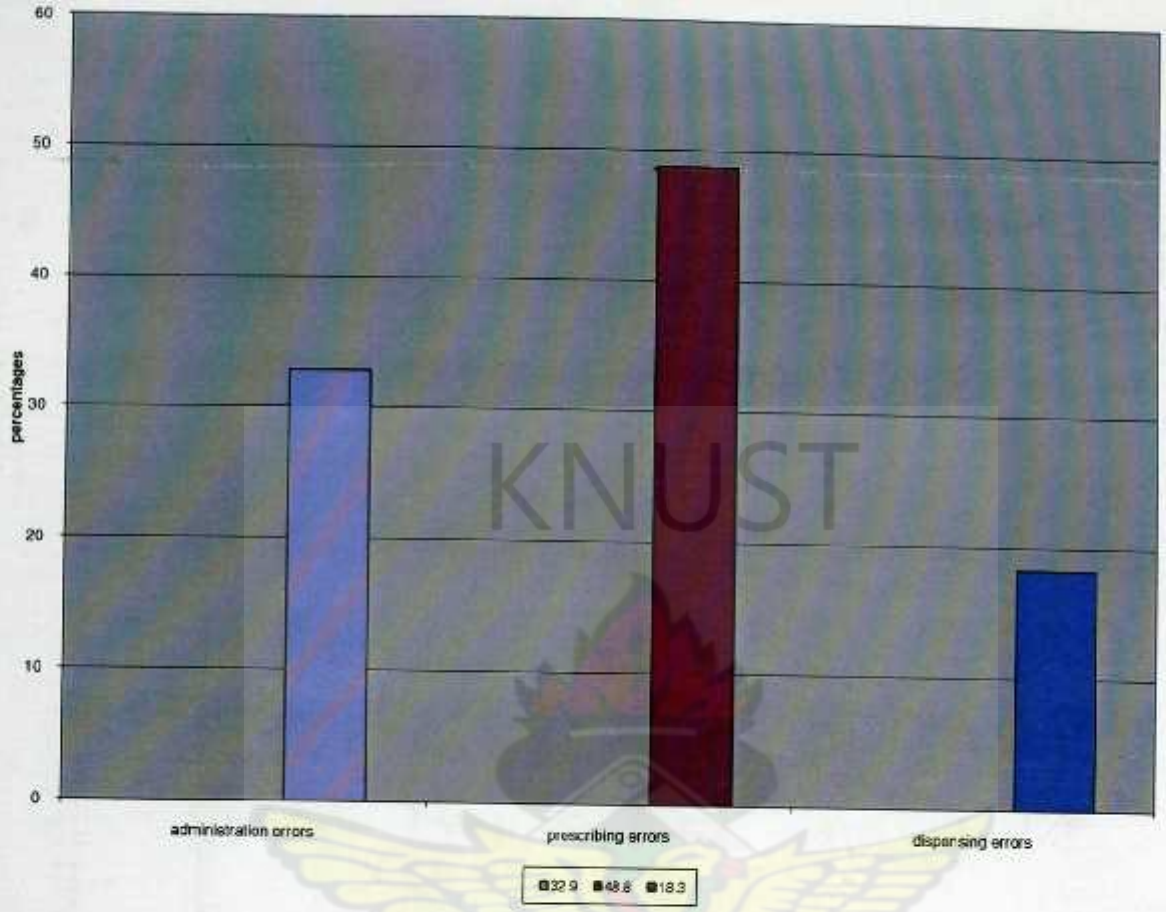
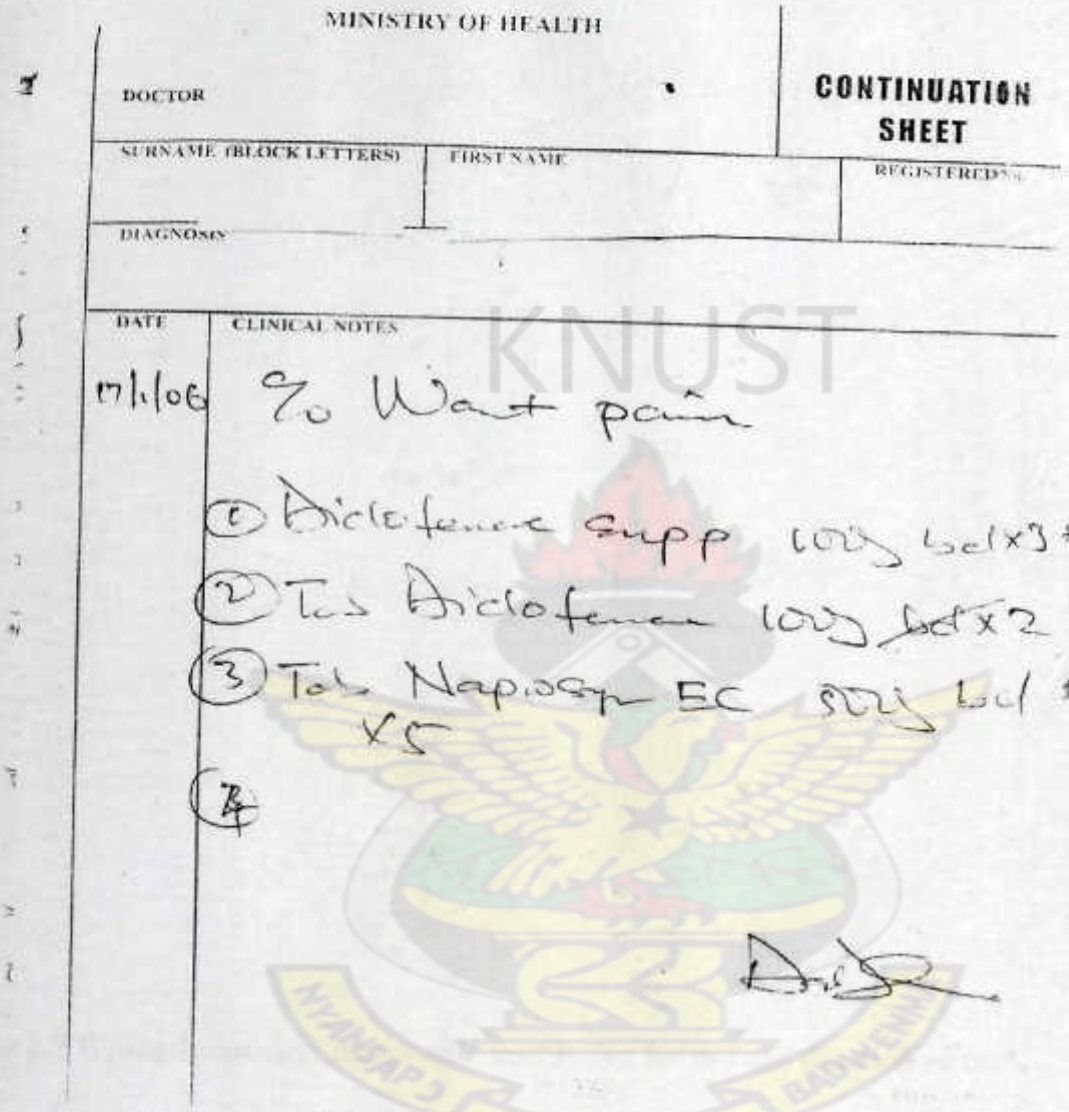


Figure 2.5 Summary of medication errors

SELECTED CASE REPORTS



MINISTRY OF HEALTH

DOCTOR

CONTINUATION SHEET

SURNAME (BLOCK LETTERS) | FIRST NAME | REGISTERED

DIAGNOSIS

DATE | CLINICAL NOTES

17/1/06 C/O Waist pain

① Diclofenac Supp 100mg bd x3 *

② Tab Diclofenac 100mg bd x2 *

③ Tab Naproxen EC 500mg bd * x5

℞

Figure 2.6 A prescription with medication overdosing*.
* Location of an error.

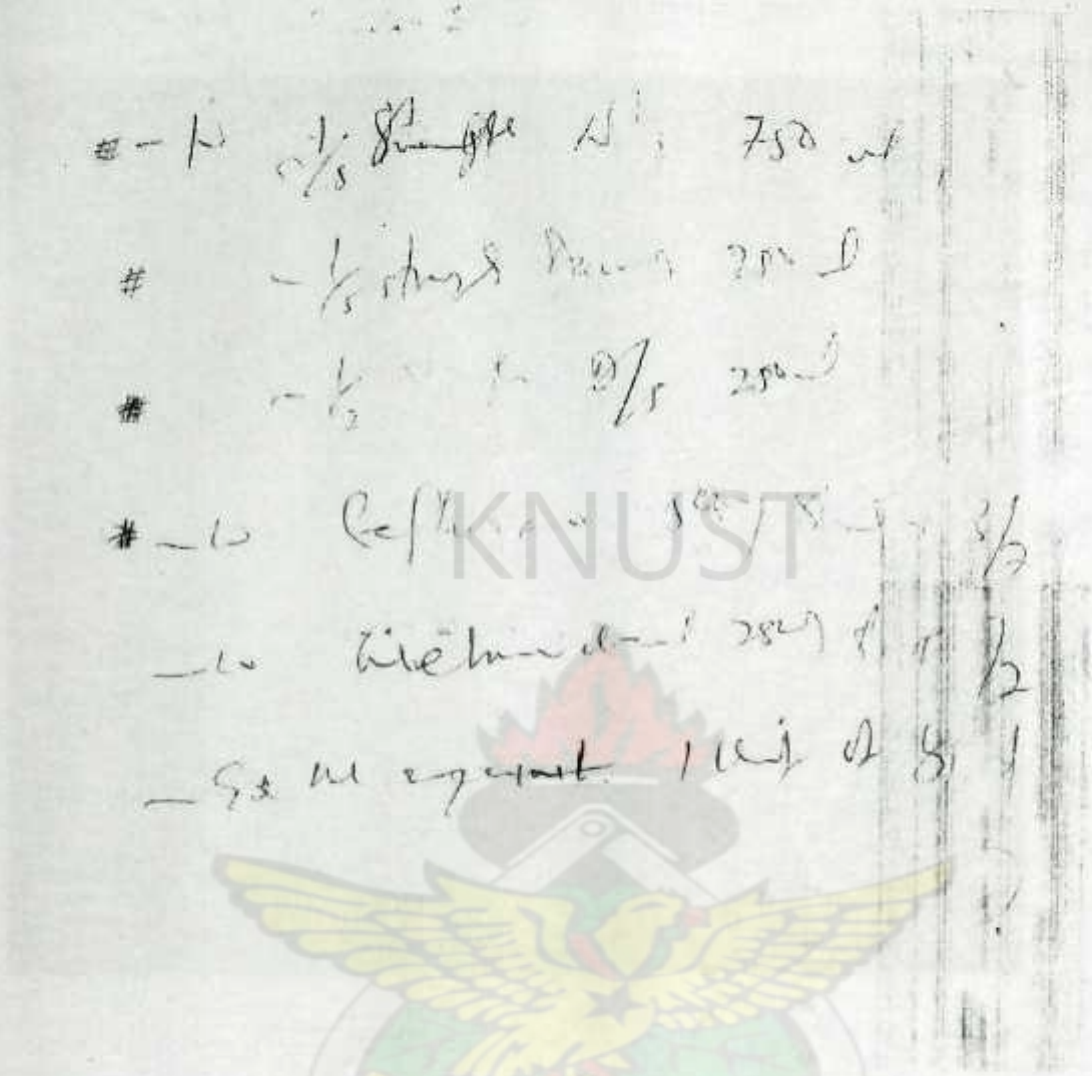


Figure 2.7 Wrong frequency, no specific instruction for use and duration errors*.

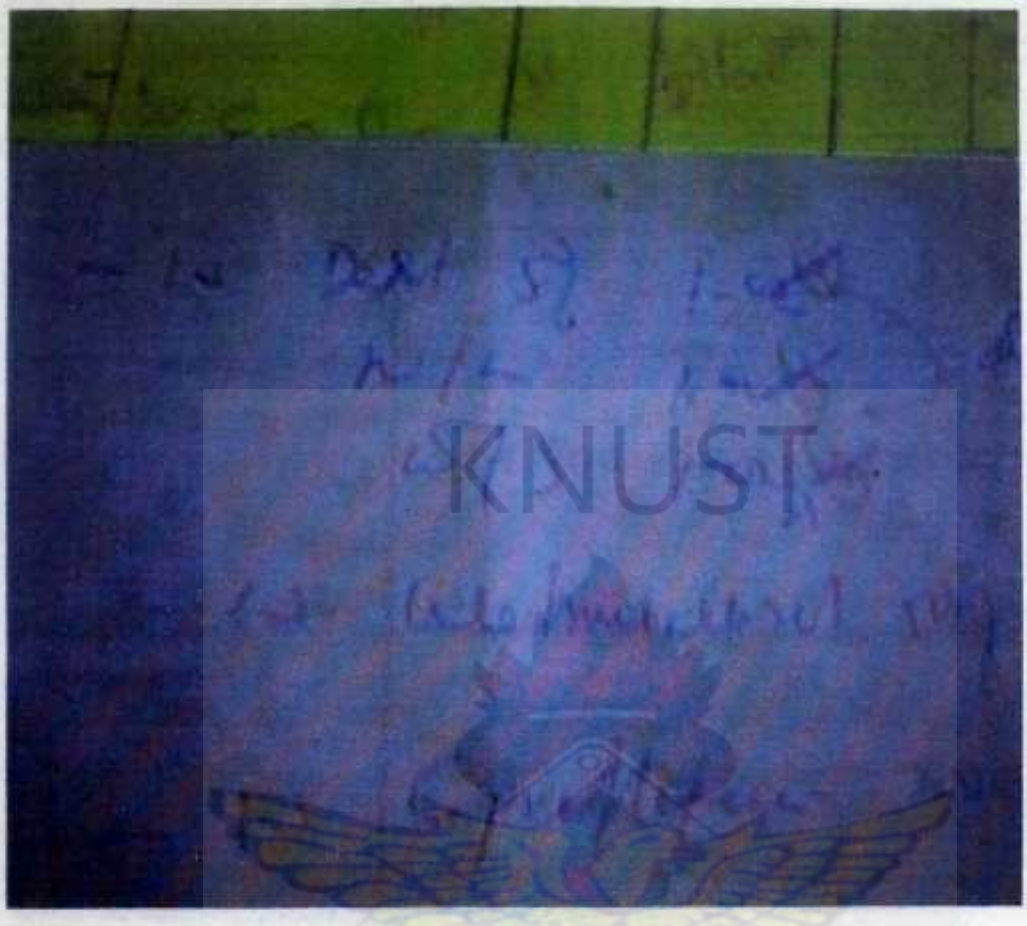


Figure 2.8 Abbreviation and illegibility problems*

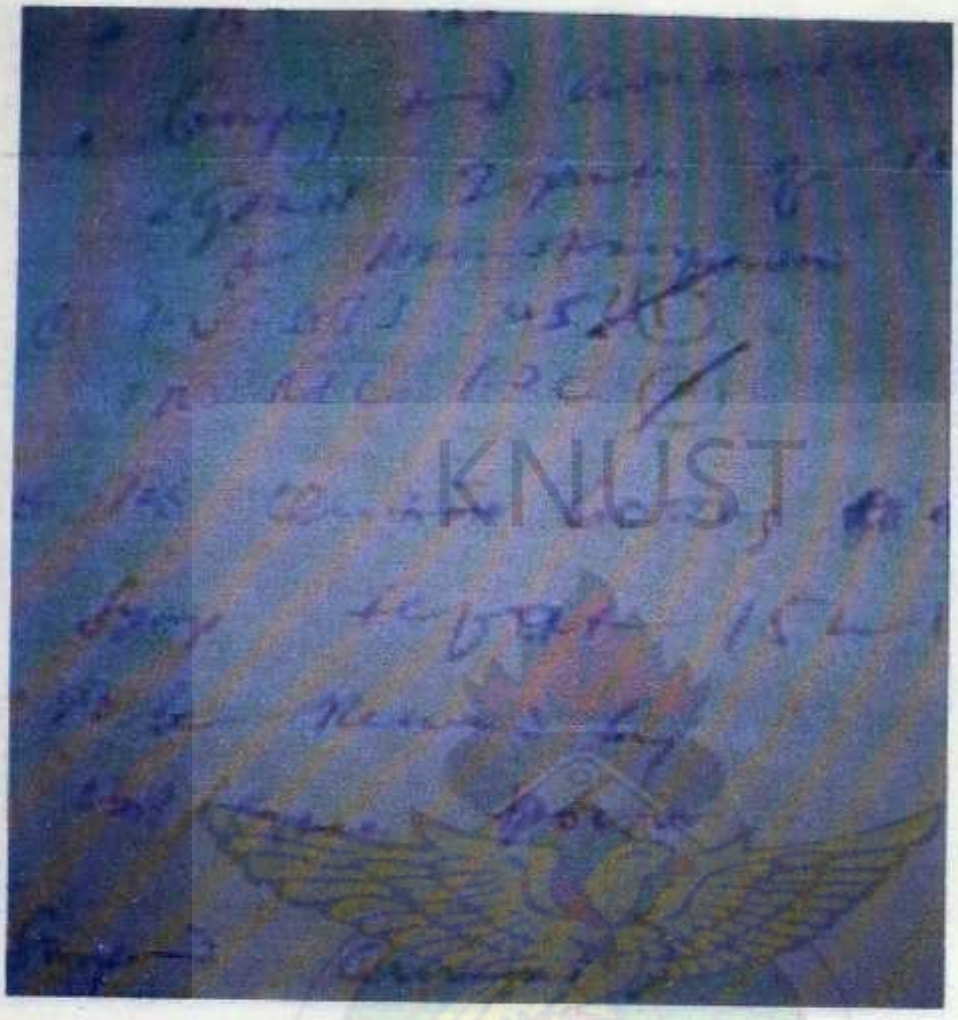


Figure 2.9 A case of inappropriate use of decimals*.

Ten-fold errors in dose could occur due to the use of a trailing zero.

Figure 2.10 Potential for selection of wrong product supply to wrong patient and, wrong preparation administered due to sound-a-like names.

The red package contains osteo and the one beside it to the right contains osteocare.

Figure 2.11 Possibility of mix-up.

The top picture at page 25 shows a trolley with patients' medications in well-labeled and closed containers. The bottom ones are of different sizes and some are left open. Chances of mix-ups are very high with the bottom containers.

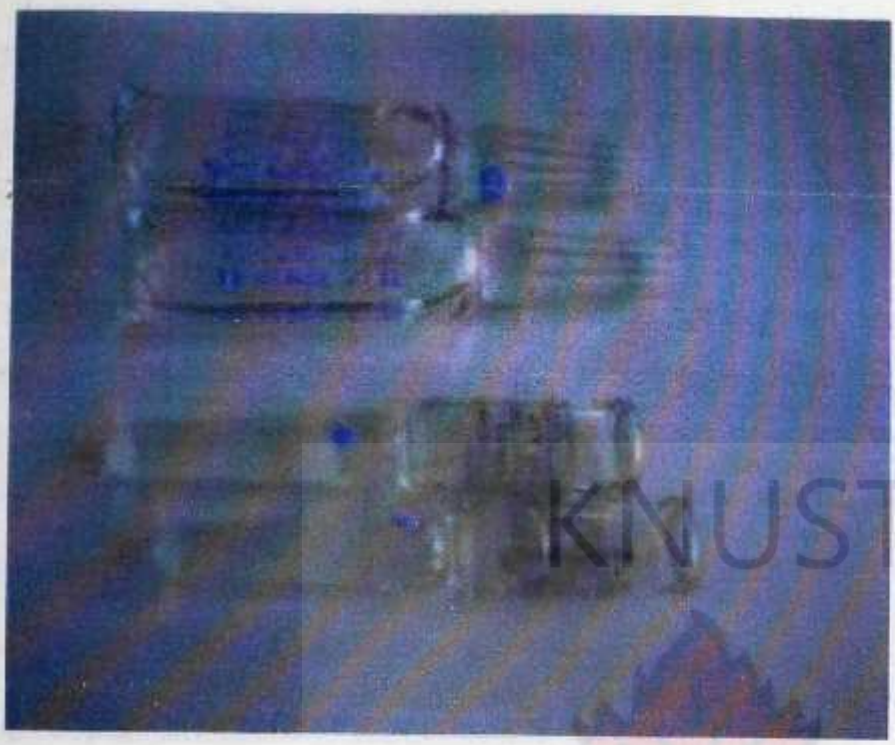


Figure 2.12 Supply of injection hyosine butyl bromide (black labeled ampoules) instead of injection furosemide (blue labeled ampoules) to a patient.

A patient who was about to be blood transfused was prescribed injection furosemide but the dispenser supplied hyoscine butyl bromide. This error was detected in the ward during administration phase.

Again, instead of injection gentamycin, a dispenser supplied injection hyoscine butyl bromide. This was also detected by a ward nurse at the pharmacy when she came for patients' filled prescription folders.

CHAPTER THREE – DISCUSSION AND CONCLUSION

3.1 DISCUSSIONS

3.1.1 FREQUENCY OF PRESCRIBING ERRORS – FIGURE 2.1

3.1.1.1 Failure to give specific instruction for use, wrong frequency and duration. The most frequently occurred error was due to the failure of prescribers to give specific instruction for the use of certain medications. Specific instruction is given by the prescriber to ensure that the intent of medication orders is clear. Some drug therapies that were not time bound and also patients not identified on doctors' treatment sheet were the next high counts. 7.2 % of errors were due to wrong dosing time intervals.

A case in point is this prescription (figure 2.7) that was meant for a nine- year -old patient. Typhoid was queried.

The dosing schedule of ceftriaxone may be once or twice daily. It is characterized by unusually long elimination half-life of approximately 8hours.

Ceftriazone is reversibly bound to albumin, and the binding decreases with the increase in the concentration, for instance, from 95% binding at plasma concentrations of less than 100mg per litre to 85% binding at 300mg per litre. Binding is also less in neonates and children. 50-60% of ceftriazone is excreted unchanged by the kidney; while 40-50% is excreted unchanged in the bile (21, 22).

Possible implication:

With eight hourly dosing intervals as shown from the prescription, the proportion of free ceftriazone in plasma and interstitial fluid of the child is likely to be unnecessarily high.

This may result in gastrointestinal tract disturbances such as diarrhoea nausea/vomiting, glossitis or stomatitis, or even in rare case, biliary sludge.

Aside the possible side effects, the parents of the patient may have their medical bills soaring.

Other problems with the prescription were that; the infusion rate was not stated and there was no time limit.

3.1.1.2 Drug indication and disease diagnosis.

The least count of errors was about drug indication and disease diagnosing. The reason to prescribe should be based on sound medical consideration. It was detected that medications indicated on four of the prescriptions for the patients did not agree with the diseases diagnosed. In other words, certain medications indicated to manage one or two cases seemed not to be appropriate under the circumstances.

A case in point was when a patient who presented with symptoms of vomiting and diarrhoea was diagnosed as a case of gastroenteritis.

The patient was managed with intravenous fluids: physiological saline and dextrose saline. Since fluid and electrolyte replacement is the cornerstone of treatment it may be more appropriate to give an intravenous fluid that would not only include sodium and chloride electrolytes, but also potassium as well (23, 24).

3.1.1.3 Contraindication. This may be defined as use of a drug for unapproved indication where the benefit: risk ratio is unfavourable. Four counts, representing 1.1% of errors were detected. This meant medicines prescribed to these patients were not appropriate. A clear case in point was when an expectant mother, diagnosed to be suffering from Malaria/Typhoid fever, was prescribed among other drugs, infusion ciprofloxacin.

3.1.1.4 Incorrect dosing. 3.8% of the errors were as a result of incorrect dosing. The prescription (figure 2.6) contains two non-steroidal anti-inflammatory drugs (NSAIDs) namely, naproxen and diclofenac. Again, diclofenac was given in two different dosage formulations so in effect; the patient was being given 3 drugs.

Possible implications: Concomitant administration of two or more NSAIDs may increase the incidence of gastrointestinal side effects, including ulceration or haemorrhage, without providing additional symptomatic relief, and it is therefore not recommended.

If there was an impairment of hepatic function, this might lead to increased risk of gastrointestinal bleeding, which could cause fluid retention. Sodium and fluid retention may result in deterioration in renal function possibly leading to acute renal failure.

Besides, in circumstances in which vasoconstrictor agents (angiotensin II, noradrenaline) are generated and released, the vasodilator prostaglandins, PGE 2 and PGI 2, modulate the effects of these agents in the kidney by causing compensatory vasodilatation.

Therefore, combinations of NSAIDs as above, may lead to unwanted renal effects since the combined NSAIDs are likely to inhibit the biosynthesis of these prostaglandins, involved in the maintenance of renal blood dynamics (21, 25).

3.1.1.5 Drug allergies. Nine patients (1.8 %) among those interviewed said they were allergic to certain drugs that were prescribed to them. The medicines were the co-trimoxazole, ciprofloxacin, aspirin and ibuprofen. These medicines mainly induce pruritus and rashes. They alleged prescribers did not ask them anything about allergies. They could not tell whether they were glucose-6-phosphate dehydrogenase (G6PD) deficient or not.

3.1.1.6 Drug interaction. The number of prescription with potential drug interaction was low (1.2%).Some examples may do. A patient presenting with gastrointestinal tract disorders was prescribed tablet ciprofloxacin and magnesium trisilicate mixture by the prescriber.

Possible implication: The administration of the magnesium trisilicate mixture with ciprofloxacin may decrease the absorption of the antibiotic, resulting in a decrease in the pharmacologic effect. This is because the antacid increase the gastric pH, rendering greater part of ciprofloxacin

ionized. In ionized form, ciprofloxacin is less readily absorbed from the gastrointestinal tract into the systemic circulation.

This interaction may be prevented by taking the antacid at least 2 hours after the ciprofloxacin dose.

In another instance, a patient was prescribed tablet loperamide, oral rehydration salts and tablet metoclopramide to manage diarrhea and nausea that were presented.

Possible implication: Metoclopramide, a prokinetic drug, may antagonize the pharmacologic effect of loperamide.

In both cases, treatment may be delayed and may lead to lost of man working hours and increase health bill.

3.1.1.7 Absence of prescriber's identity together with abbreviations and illegible handwriting. Whilst 7.6% of errors were due to a prescriber who did not identify him/herself, 10.8% and 6.8% of errors were due to abbreviations and illegible handwriting respectively. Irrespective of how accurate or complete a prescription is it may be misinterpreted if it cannot be read.

A case in point was the above prescription (figure 2.8), in rows 2& 3 it is difficult to read and understand the intentions of the prescriber. This prescription might not only lead to dispensing errors, but also may delay administration of medications.

3.1.2 FREQUENCY OF DISPENSING ERRORS –FIGURE 2.3

3.1.2.1 Wrong labeling. One hundred and eighty seven counts of dispensing errors were detected during the study. The breakdown could be seen from figure 2.3. From this analysis it is clear that most of the drugs dispensed were not correctly labeled. For example, the names of

some medicines were not written fully, instead abbreviated-paracetamol (p'mol), amoxicillin (amoxil), aspirin (ASA), just to mention a few. Illegible handwriting was also a problem.

3.1.2.2 Wrong direction for use. 35.3% of the errors were caused by the dispensing staff that did not have directions correctly written. For instance an antacid magnesium trisilicate mixture did not have direction that asked the patient to shake well before taking. In other words, advisory information was not given.

3.1.2.3 Wrong quantity of medicine.16.1% of errors was as a result of dispensing wrong quantity of medicine. Either the quantity was in excess or in deficit. For instance, at one point, capsule amoxicillin given to a patient was to last for seven days but when the dispensed medicine was counted, it could take only four days.

3.1.2.4 Medicine not prescribed. Some medications that were supplied were not authorized by a legitimate prescriber for the patient. 3.2% of the errors accounted for these. A case in point was when a nurse returned two folders with medicines to the pharmacy because those folders did not have any written prescriptions on the dispensed medicines.

3.1.2.5 Selection of wrong product and supply to wrong patient.

3.7% and 1.6% of errors accounted for selection of wrong product and supply to wrong patient respectively. From figure 2.10, the dispenser might select the wrong product because of sound-alike names. Factors like lack of knowledge on new medicines, and poor dispensing procedures with inadequate checking could be contributing to these errors.

The patient involved in Road Traffic Accident (RTA) was prescribed:

Tablet Diclofenac 100mg bd x 5

Tablet Cefuroxime 250mg bd x 7

Tablet Osteocare 1 bd x 30

A sister of the patient went to town to buy Osteocare (figure 2.10) for her brother since the hospital pharmacy did not have it in stock. She was given tablets Osteo. The patient had been given this medicine, one tablet eight hourly for the past forty-eight hours when this pharmacist, during his data collection saw the medicine. It was noticed that the osteo was not the same medicine as osteocare.

Whilst the latter which has a composition of calcium carbonate, magnesium hydroxide, zinc sulphate and vitamin D3was to serve as calcium supplements, the former had an NSAID-Nimesulide as the active ingredient.

Possible implication: From the composition above, it meant that but for the interception, the patient would have been taking two NSAIDs concomitantly (Diclofenac and Nimesulide) which may lead to not only gastrointestinal side effects, but also possibly, deterioration in renal function.

Moreover, due to both administration and dispensing errors, this patient had not taken the prescribed osteocare (mineral salts) for some days. These errors had resulted in additional cost to the patient as well.

3.1.3 FREQUENCY OF ADMINISTRATION ERRORS –FIGURE 2.4

3.1.3.1 Wrong timing. This is the most occurred administration errors (129 counts). Prescribed dose of medications were mostly administered outside the predefined time interval from its scheduled administration time (from analyses of treatment sheet chart of sampled folders).

Possible implication: What this means is that , depending on a particular time of the day, either the plasma concentration of the medicines affected may be too low to have the desired therapeutic effects or too high to lead to increased risk of unnecessary side effects.

3.1.3.2 Wrong frequency. The second highest count of administration error is the frequency at which medications are administered to patients (79 counts). These errors are mainly with medicines that should be administered 6 hourly. It was noted that most patients who were put on any of these regimens did not receive their medications as prescribed. The administration interval is either increased to eight hourly or even twelve hourly on few occasions. One typical example of such medicines is Flucloxacillin.

Possible implication of such misses: A Flucloxacillin, an antibiotic, is the most six hourly regimen prescribed drug. It is used primarily for the treatment of infections due to staphylococci resistant to benzyl penicillin. Flucloxacillin has a plasma half-life of approximately one hour. About 50% of a dose by mouth and up to 90% of an intramuscularly dose is excreted in the urine within six hours. After an oral dose in fasting subjects, peak plasma concentrations in about one hour are usually in the range of 5 to 15 micrograms per ml. The minimum inhibitory concentration (MIC) is in the range of 0.25 to 0.5 microgram per ml (22, 26).

If dosing intervals are increased beyond the recommended one it is likely that the plasma concentration may fall below the MIC. This may result in the emergence of more resistant strain organisms, which hitherto were susceptible. Thus, prescribers may fall on other more expensive regimens to successfully treat the affected patient and the patient spends a longer time in the ward. The increase in hospital bills may not only be a burden to the patient and family but also to the National Health Insurance Scheme (NHIS) and the state since man working hours may be lost.

3.1.3.3 Administration of expired drugs. The expiration date means the medication will be effective until that date, if stored under the proper conditions of light, temperature, and moisture.

Possible implication: Some drugs have a narrow therapeutic index and decreases in the pharmacological activity can result in severe consequences for patients, example gentamycin, and insulin.

Drugs contain complex compounds and ingredients which will break down over time. Although they lose their potency they still have the capacity of producing toxins or causing negative reaction when consumed with other medications. Bacterial or mold may also grow in expired medicines causing harmful effect if consumed. There was no record of any *expired drug* being administered though.

3.1.3.4 *Omission errors* (wrong patient and lack of stock). 44 counts of errors were recorded. The main cause of these errors was the failure to administer an ordered dose to the patient before the next scheduled dose. The delay could go beyond 24hours. In determining if an omission error had occurred, the data collectors always sought an explanation for the omission. Contributing factor could be inexperienced staff caused by knowledge deficit.

Most of these delays were attributed to the inability of patients to afford the cost of prescribed medications.

3.1.3.5 Wrong administration technique. This has consistently been one of types of medication errors in health system. The most causes have been performance deficit, failure to follow procedure or protocol. In one instance, it was observed that, a patient prior to receiving an injection did not have the injection site wiped (disinfected) with methylated spirit. 2 counts of errors were recorded. This error type is not easily detected unless one is present at all the time of drug administration.

3.1.3.6 Contraindication and administration to wrong patient.

There was a case in which a pregnant woman in her first trimester, diagnosed to be suffering from Malaria/Typhoid fever, was prescribed among other drugs, infusion ciprofloxacin. It was to be given twelve hourly for 72 hours. This was discontinued after the first 24-hour administration. Prescriber's attention was drawn to it.

Possible implication assuming it was not detected: Ciprofloxacin crosses the placenta. Adequate and well-controlled studies in humans have not been done. However, since ciprofloxacin has been shown to cause arthropathy in immature animals, use is not recommended in pregnancy (25, 26). We may not know the long-term implication to that pregnancy.

3.1.3.7 Wrong preparation administered. This refers to a drug product incorrectly formulated or manipulated before administration. From figure 2.10, it was detected that the patient who was involved in road traffic accident was given tablets osteo instead of tablets osteocare whilst on admission.

LIMITATIONS OF THE STUDY

An interviewer-administered questionnaire, analyses treatment sheet chart of sampled folders and direct observation were used to collect data on administration errors.

However, it could be seen from figure 2.4, that administration error types that needed to be detected with the help of "direct observation method" recorded low values. Examples of these error types are: the use of wrong technique and wrong calculation when administering medications to patients. This was because direct observation method could not be used all the time during the study since it was both labour intensive and more time consuming, and therefore, cost prohibitive.

In view of these, one cannot say results from administration errors are the true reflection of what happens on the ground. The margin of errors here could be high.

Finally, since it was convenient sample method that was used for the study, one may not be able to accurately calculate the sampling error.

CONCLUSION

The study has confirmed the view held earlier that medication errors do occur at Tema General Hospital.

Results revealed that 501 medication errors, representing 48.8%, of all errors detected during the study were due to prescribing, and out of this 19.7% were drugs prescribing related.

Dispensing errors had a score of 187, representing18.3%.

338 medication errors detected, representing 32.9% was due to wrong administration of medications.

The results have also demonstrated that the errors cut across the whole spectrum of service provided, and that medication errors seldom occur because of one person.

RECOMMENDATION FOR MINIMIZING MEDICATION ERROR OCCURRENCE AT TEMA GENERAL HOSPITAL

Medication errors can be prevented by alterations in the system for ordering, dispensing and administration of drugs.

Suggested recommendation for minimizing medication errors (27):

- To determine appropriate drug therapy, prescribers, dispensers and drug administrators should stay abreast of the current state of knowledge through literature review, communicate more among each other and participate in continuing professional education programs, and other means.

Suggested recommendation for minimizing prescribing errors (28-30):

- Ensuring an accurate drug history is taken. Including all details of drug therapy i.e. name of drug, dose, directions, duration of therapy
- Appropriate use of decimals
- Avoiding the use of abbreviations
- Prescribers should include the name, the age and when appropriate, the weight of the patient. The age and weight of a patient help dispensers in their cross check of the appropriate dose.
- The prescription should include the name of the medicine, the dosage form, and the strength or concentration in the metric system, except for therapies that use standard units such as insulin, vitamins, etc. Units should be written in full and, the units specified rather than writing an abbreviation such as a "U", which could be misinterpreted as a zero.

- Written drug or prescription orders should be completely readable, not merely recognizable through familiarity.
- When possible, the prescriber should talk with the patient or caregiver to explain the medication prescribed and any special precautions or observations that might be indicated, including any allergic or hypersensitivity reactions that might occur.

Suggested recommendation for minimizing dispensing errors (31-33):

- Dispensers should never 'guess' when filling an illegible poorly written, or confusing prescription so as to avoid dispensing the wrong product.
- The use of auxiliary labels should be reviewed and used prudently. This may reduce errors on directions for medication use.
- Look-alike or sound-alike medications should not be stored adjacent to one another because of the likelihood of confusion of names.
- Orderliness and cleanliness in the work area should be maintained and one procedure be performed at a time with as few interruptions as possible.

Suggested recommendation for minimizing administration errors (34, 35):

- Patient identity should be verified before the administration of each prescribed dose. This is to prevent an error of omission (wrong patient).
- To reduce frequency and timing errors, all doses should be administered at scheduled times.
- Allergies should be checked before drug administration.

- The drug distribution system should not be circumvented by 'borrowing' medications from one patient to give to a different patient. If there are apparent missing doses, it is important that the pharmacy be contacted for explanation or correction.
- Work patterns and an environment that reduce chance for errors when administering drugs could be established.

Other suggested recommendations are:

- Names similar to those of other medicines on the market should be avoided.

Regulatory authorities like Food and Drugs Board (FDB), should consider this aspect of brand names when considering the granting of marketing authorizations.

- In the pharmacy and various wards, quality assurance programs that regularly examine all aspect of the drug use system be revamped.
- Monitoring prescribing and clinical quality of care on rational use of medicines followed by, prescribers receiving regular feedback may significantly improve prescribing patterns and result in medication error reduction.
- Conditions of service in the health sector should be improved so as to reduce the brain drain. With more hands in the system the workload may reduce.
- Emphasis should be placed on preventive medicine, which may result in a reduction in hospital attendance. This may translate into a reduction in workload at health facilities.

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APPENDICES ON SAMPLE DATA

APPENDEX 1- PRESCRIPTION ERRORS

Errors on the prescriptions were identified and recorded

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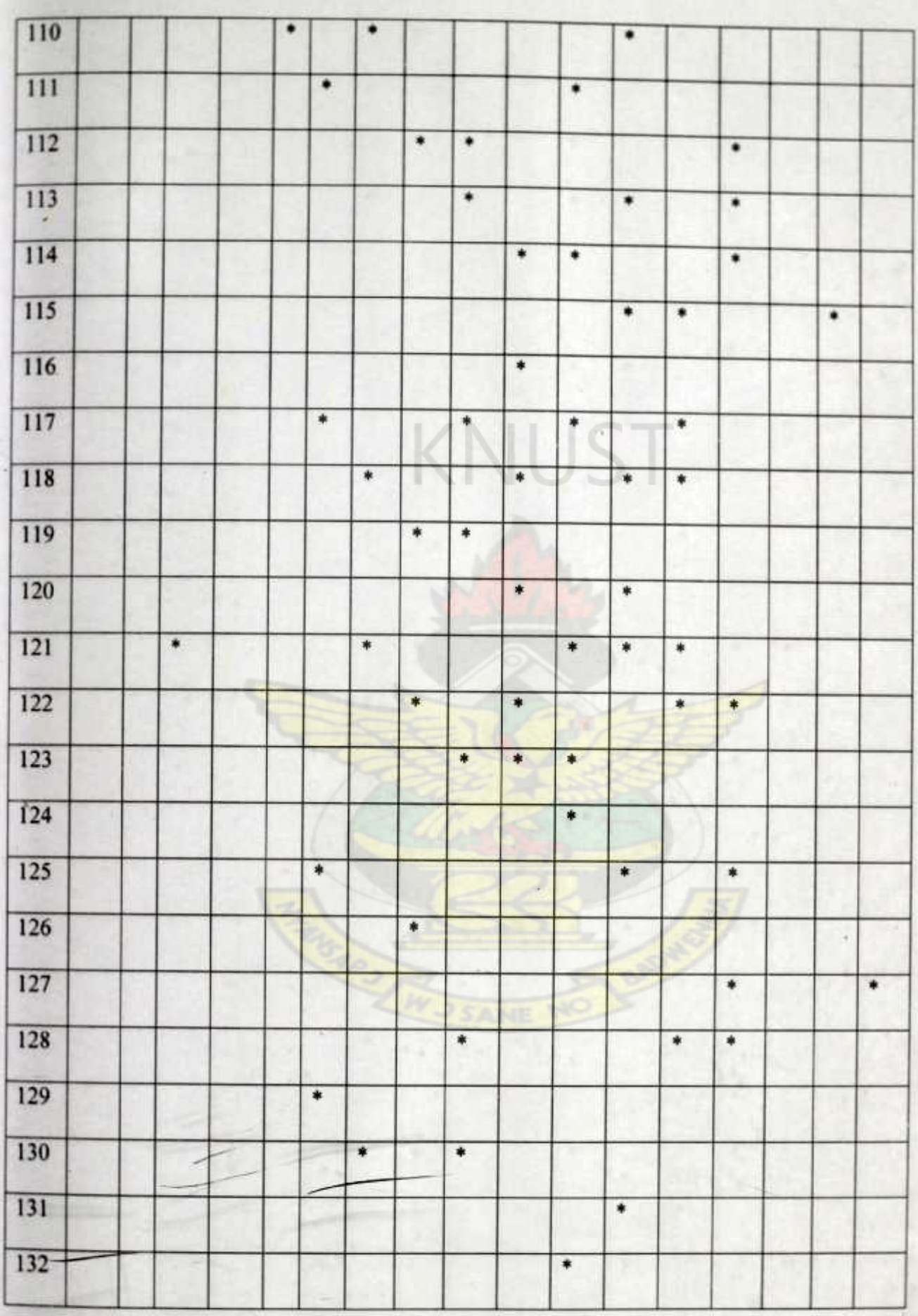

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A denotes indication

B „ contraindication

C „ incorrect dose

D „ drug allergies

E „ drug interaction

F „ strength

G „ frequency

H „ duration

I „ route

J „ legibility

K „ abbreviation

L „ patient identity

M „ specific instruction for use

N „ decimals

O „ identity of prescriber

P „ unit

Q „ diagnosis

APPENDIX II – DISPENSING ERRORS

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187						
188			•			
189			•	•	•	
190			•			
191			•	•		
192						
193			•			
194		•	•	•		
195				•		
196						
197			•			
198			•			
199			•			
200				•		
Frequency total	**8**	**3**	**70**	**68**	**31**	**7**

A denotes selection of wrong product

B „ supply to wrong patient

C „ wrong labeling

D „ wrong direction for use

E „ wrong quantity of medicine

F „ medicine not prescribed

APPENDIX III – ADMINISTRATION ERRORS

ADMINISTRATION												
								ERRORS				
S/N	A	B	C	D	E	F	G	H	I	J	K	L
1												
2						*						
3						*						
4						*					*	*
5			*			*						
6												
7						*						
8						*					*	*
9			*			*						
10			*		*	*						
11					*	*						
12												
13						*						
14												
15	*			*		*						
16					*	*						
17	*		*		*	*		*				
18	*			*	*	*						
19	*				*	*						

20	*					*						*
21				*	*	*						*
22						*						
23												
24						*						
25						*					*	*
26												
27			*		*	*						
28												
29												
30			*		*	*				*		
31			*			*					*	*
32						*						
33						*						
34			*		*	*						
35												
36					*	*						*
37						*						
38						*			*	*		
39					*	*						
40												
41											*	*
42												

43					*	*						
44												
45												
46			*									*
47			*		*	*						
48					*	*						
49			*									
50			*									
51					*	*			*			
52					*	*					*	*
53												
54					*	*						
55					*							
56									*			*
57						*						
58					*	*						
59					*	*						*
60			*		*	*						
61				*								
62						*					*	
63			*			*						
64												
65					*	*						*

66					*	*						
67												
68			*			*						
69			*		*	*						
70			*		*	*				*		
71					*	*					*	*
72			*									
73												
74					*	*						*
75						*						
76						*						
77					*	*						
78					*	*						*
79						*						
80												
81												
82					*							
83												
84												
85					*							
86		*	*		*							
87		*	*									
88												

89			*									
90												
91	*					*						
92												
93					*	*						*
94					*	*						
95					*	*						
96					*	*						
97					*	*						*
98						*						
99					*	*						
100					*	*						
101						*						
102					*	*						
103					*	*					*	
104						*						
105						*						*
106						*						
107					*	*						
108			*			*						*
109					*	*						
110	*		*		*	*				*		
111						*						

112			*									
113				*		*						
114					*							
115						*						
116			*		*						*	*
117	*											*
118						*					*	
119					*							
120						*					*	
121					*	*						
122						*						*
123						*						
124					*						*	
125			*			*						*
126						*						
127					*							
128	*					*						*
129			*			*						
130												*
131						*						
132					*							*
133					*	*						
134			*			*					*	

135	*				*	*						
136			*			*						*
137						*				*		
138												
139					*	*					*	
140						*						
141					*	*						*
142												
143		*				*						*
144				*		*						
145			*			*						
146						*						*
147			*			*						
148					*	*						
149											*	
150			*			*						
151				*		*						
152												
153					*	*						
154												*
155					*	*						
156			*			*						
157						*					*	

158						*						
159			*		*							
160					*	*						
161			*			*						*
162					*	*						
163						*						
164												
165			*		*							
166					*							
167						*						
168			*									
169												
170						*						
171					*	*						
172						*			*			
173					*							
174						*						
175						*						
176												
177			*		*				*			
178						*						
179					*	*						*
180						*						

181						*						
182						*						*
183					*	*						
184									*			
185						*						
186			*		*	*						
187	*					*						
188					*	*						
189					*							
190					*							
191												
192					*							
193			*		*							
194					*							*
195					*							
196												
197												
198				*						*		
199		*			*	*		*				
200					*	*						
freq	**11**	**4**	**40**	**8**	**79**	**129**	**0**	**2**	**6**	**6**	**17**	**36**

A denotes no record of allergies

B „ wrong patient(omission)

C „ lack of stock(omission)

D „ wrong strength and quantity administered

E „ wrong frequency

F „ wrong timing

G „ expired drug

H „ wrong administration technique

I „ wrong calculation

J „ wrong preparation administered

K „ storage of look-a-like preparations

L „ mix-up of drug during administration