

SOME ECONOMIC ASPECTS OF DRUG UTILIZATION

**A study based on in - patient case records at the
Medical College Hospital, Thiruvananthapuram**

**DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF
MASTER OF PHILOSOPHY, OF
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BHANUMATHY. L

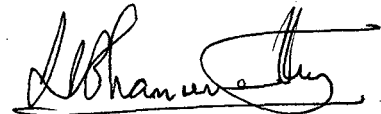
**Centre for Development Studies
Thiruvananthapuram, Kerala**

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CERTIFICATE


I hereby affirm that the research for this dissertation titled "Some Economic Aspects of Drug Utilization" being submitted to the Jawaharlal Nehru University for the award of the degree of Master of Philosophy in Applied Economics was carried out entirely by me at the Centre for Development Studies, Thiruvananthapuram.

Place: *Thiruvananthapuram,*
Date: *30.8.'94.*



Name

Certified that this dissertation is the bonafide work of Smt. Bhanumathy. L, and has not been considered for the award of any other degree by any University. This thesis may be forwarded for evaluation.


C.R. Soman
Hon. Associate Fellow


K.P. Kannan
Fellow

(Supervisors)


Director
Centre for Development Studies,
Thiruvananthapuram.

This work is dedicated to Miss.Elizabeth Joseph,
who believes that faith can heal better than drugs.

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List of Abbreviations Used

Cap.	-	Capsule.
CPC	-	Central Purchase Committee.
DHS	-	Director of Health Services.
DME	-	Director of Medical Education.
DMO	-	District Medical Officer.
DRG	-	Diagnosis Related Group.
EDP	-	Essential Drugs Programme.
HPC	-	High Power Committee.
Inj.	-	Injection.
IPD	-	In-Patient Department.
MCH	-	Medical College Hospital.
OPD	-	Out-Patient Department.
PTC	-	Pharmacy and Therapeutic Committee.
Tab.	-	Tablet.
TVM	-	Thiruvananthapuram.
WHO	-	World Health Organisation.

CHAPTER 1

INTRODUCTION

The discovery and use of powerful new drugs in the last four decades have contributed substantially to health care and an increased life span. But these new chemical and biological agents, have a capacity, both to help and to harm, as is widely known today. There has been no parallel development of scientific methods for assessing the risks and benefits to the patient. The ever increasing number of potential pharmaceutical products at the disposal of the physician has created difficulties for him in making rational therapeutic decisions. Treatable illness may go unchecked due to the use of ineffective or unreliable drugs. Moreover, irrelevant and unnecessary drug-use can eat up limited health budgets and thus deprive people of effective health care. This creates a major problem everywhere but it is more so in the developing world, because many drugs that are banned and not available in countries with high scientific and professional standards in drug regulation are freely sold in most developing countries. Evidently the improvement in health is not

proportionate to the increase in the number of pharmaceutical products marketed¹.

Many believe that multinational producers of drugs are unmindful of the health needs and health priorities of developing countries. Commercial promotion of their products among doctors has a role in distorting the demand for pharmaceutical products in these countries². The problem is further accentuated, since the drug budget represents a sizeable proportion of the total health expenditure of these countries. Whereas in the developed world, only 10% to 30 % of the total health budget is used for drugs, in the case of developing countries, it was 10% to 60% according to a report of the WHO, published in 1978³.

A rational approach to the procurement, production, supply and use of pharmaceutical products is necessary for achieving a lower figure for drug expenditure. It has been reported that this was made possible in the case of countries like Sri Lanka by devising a sound system of procurement in the international market and by restricting and regulating the number of drugs used⁴. A state pharmaceutical corporation was established for the purpose and generic names were introduced in place of brand names. Multi-ingredient preparations and vitamin preparations were

particularly checked. Other developing countries like Philippines have also attempted to improve their drug procurement and distribution systems with the help of WHO⁵. In India, the government had set itself four major objectives with a view to streamline drug use⁶. They are:

1. ensuring the availability of essential, life-saving and prophylactic medicines of good quality at reasonable prices;
2. strengthening systems of quality control of medicinal products and promoting their rational use in the country;
3. creating an environment conducive to investment in the pharmaceutical industry; encouraging cost-effective production through scaling up manufacturing capacity and introducing both new technologies and new drugs; and
4. strengthening the indigenous capability of production of drugs.

These objectives were to be achieved with the collaboration and the co-operation of Ministries of Health and Industry. Important elements of the plan included the creation of a National Drug Authority, the compulsory use

of generic names, application of pricing controls and effective licensing and regulation of both processes and products. The Drugs (Price Control) Order issued in 1979⁷ was aimed at ensuring reasonable returns to the manufacturers of 166 essential drugs and yet to keep the prices of such drugs under harness. Bulk drugs and formulations used in specific programmes against T.B., Trachoma, Malaria, Filariasis, Leprosy and Oral Rehydration Salts were included in the list besides those required for the National Health Programmes. The first category was allowed a maximum mark-up of 100% and for the latter, it was 75%.

In order to utilise available resources optimally, it is essential to monitor and control the pattern and spectrum of drugs used in a country. Regulation of the range of drugs used can serve real social needs rather than induced market demands, So also irrational combinations and exaggerated claims have to be scrutinized because the literature has emphasised the influence of the drug industry in determining the prescribing habits of doctors⁸. Drugs prices have become a nightmare for the common man because the patient does not have the right to choose what suits his pocket as in the case with other commodities.

Large sections of the population depend upon health facilities provided by governmental organisations. As the drug prices increase, drugs that can be procured within the limited budget of these institutions get severely restricted. In this context, it is interesting to note the impact of 'brand names' on medical practice and drug pricing⁹. Selling drugs under brand names rather than 'generic names' is related to drug patents, irrational drug combinations, the proliferation of multi-ingredient preparations and corrupting influence on the medical profession.

Any comprehensive health-care system should aim at ensuring the availability of safe and effective drugs to meet the health needs of the population¹⁰. The developing countries have now awakened to the fact that drugs cannot be viewed from a purely biochemical and technical view point. They have to be looked at in the wider perspective of health priorities and other social dimensions¹¹. By introducing rationality into drug management, the limited resources available to the health services can be made use of in a more efficient manner. This will also increase the ability of the poor to afford drug treatment¹².

The Essential Drugs Concept and Programme

In the seventies, the World Health Organization (WHO) turned its attention to the aspects of drug-policies and management, essential components of health planning¹³. The Twenty Eighth World Health Assembly, held in 1975, thus considered a comprehensive report of the Director General, that analysed these particular aspects of drug-policy¹⁴. Accordingly, the Essential Drugs Programme (EDP) was initiated by the WHO in the same year¹⁵. It is worth remembering that around the same time, in India, the Hathi Committee had recommended similar steps, which were only partially implemented in the Drug Policy of 1978¹⁶.

WHO published an Essential Drugs List in 1977, in order to help countries in managing their own problems in the rational use of drugs¹⁷. This initial model list of essential drugs was established after wide consultation among an international group of experts and their collective views were summarised in the report. This was subsequently revised and updated¹⁸⁻²².

Under the essential drugs programme of WHO, each country was to select the priority pharmaceuticals needed by its people. There could be several criteria for the selection of such drugs including:

- a) Diseases morbidity data,
- b) Diseases of public health significance,
- c) Drugs having a single ingredient rather than multi-ingredient formulations,
- d) Drugs with the highest benefit/risk ratio,
- e) Drugs that are economical,
- f) Drugs that are easy to manufacture within the country and
- g) Drugs that are non-patented.

Unless the pharmacological and chemical data justified such combinations and drugs, fixed ratio combinations and patented drugs were to be avoided in favour of drugs with a single ingredient and/or unpatented drugs.

The National Drug Formulary

A drug formulary literally means a collection of formulae or recipes with additional information on dosage and methods of administration²³. They serve to inform the medical practitioner, what drugs were available and to assist the practitioner with writing the prescriptions. At

the time when drug formularies came into existence, the hospital pharmacies were a major producing unit for finished medicines and it was common practice for doctors to write out the recipe in full when writing a prescription. Thus a recipe became identified with a monograph in the formulary and was named. This gave the clinicians the advantage of prescribing a medicine by title. In the beginning of this century, this situation prevailed in many of the larger hospitals in western countries. But during the years of Second World War, these formularies became less significant or even extinct. Their disappearance from the hospital pharmacies were to a great extent due to the introduction of National Formularies. The rapid growth of a large number of medicines with approved and/or brand names from the pharmaceutical industry also contributed to the eventual disappearance of hospital formularies.

Eventhough most developing countries had their national formularies, it became necessary to remodel these after the introduction of the essential drugs programme by WHO. The drugs had to be categorised as 1) the most essential for mass consumption; 2) those to be used in primary health care, and 3) those for patients referred to bigger hospitals for treatment. Some 200 to 400 drugs were

to be included in the final list. These drugs should have been well tried and with clinical documentation of a high benefit/risk ratio, corresponding to health needs of the country.

The initial list prepared and published by WHO in 1977 as a model contained 177 essential drugs along with 32 complementary drugs. These were classified by their international non-proprietary names²⁴ and organised into standard pharmacological and therapeutic groups. Emphasis was placed upon the impossibility of constructing a model list of global relevance. The list also provided renewed challenge and incentive to pharmaceutical companies to remain vigilant to global health needs. This list was to be modified according to health priorities and epidemiological considerations of different regions as well as with the development of new and better drugs of proven efficacy and safety. By the fifth revision in 1987, the number of drugs in the model list had risen to 279. Thus the list was not to be a static one, but to be periodically revised, at least biannually. The list could also change depending on factors such as disease prevalence, health infrastructure, financial resources and the stage of development of the pharmaceutical industry.

National Drug Policies in relation to EDP

There is no disagreement on who is primarily responsible for the rational use of drugs. It is the duty of the government to frame a national health policy based on the essential drugs concept in order to attain the goal of "Health for all by the year 2000"; In framing such a policy, the governments should be inspired by the principle of social equity to ensure the constant availability of efficacious drugs of assured quality and safety to all in need of them²⁵. Thus the concept of essential drugs become universally applicable but the interpretation of what is essential is a national responsibility. Beginning with drug registration, good manufacturing practices and quality control are also to be integral part of drug regulation. The system can also be equipped to provide impartial objective information on drugs for prescribers, patients and policy makers²⁶. WHO has issued model data sheets and formularies for those drugs included in the WHO model list of essential drugs for governmental use²⁷. The use and limitations of drugs can form part of the information provided to the public as a measure for health promotion. More effective dissemination of knowledge can thus improve

the health status of the people²⁸. The health services and health programmes of governments can be successful only if the people have the awareness to make use of such facilities. The high health status of Kerala and Sri Lanka as indicated by lower than average figures of infant mortality and higher life expectancy, are clear evidence of this²⁹. All those concerned with making drug use more rational have certain responsibilities to shoulder as pointed out at the Conference of Experts, organised by WHO, at Nairobi in November 1985³⁰.

The focus of this study being drug utilization in a teaching hospital, it would be appropriate to discuss the evolution and present status of hospital formularies, the need and significance of which had diminished during the post world war years.

Hospital Formularies

Since the introduction of the EDP, there have been a world wide reemergence of interest in hospital formularies. This new generation of formularies provide information and guidance not only on selection and safe usage of drugs, but also serve to promote cost effective use of prophylactic and therapeutic agents³¹. Compliance of

prescribers with these formularies is mostly voluntary and requires the development of a strong involvement and commitment by clinicians. Their involvement is vital to formulary production and review besides prescribing. Thus the hospital formulary system is an ongoing process to assist doctors, pharmacists and nurses who will respectively prescribe, dispense and administer drugs to the patients. An appropriate response, should be influenced by an acceptance of the freedom of choice of others, concern for the welfare of the patient, interprofessional respect and confidentiality.

Preparation and review of a hospital formulary is the responsibility of the Pharmacy and Therapeutic Committee or its equivalent in a hospital setting. It is essential that such a formulary is complete in content, concise and easy to use. The information contained therein, should include :

1. drug products approved for use in the hospital;
2. basic therapeutic information about each approved item;
3. hospital policies and procedures governing the use of drugs; and
4. special information such as drug dosing rules, approved abbreviations, etc.

Thus the formulary system forms an essential part of total drug management in the hospital. Economical drug usage is the primary consideration, but it cannot be separated from the objectives of safety and efficacy.

The organisational requirements for developing and sustaining an effective formulary system are crucial and depends to a large extent on monitoring and compliance³². A hospital formulary will not be generally accepted unless it is supported by an eminent and authoritative group of consultants. Acknowledgement of the objectives of the formulary system by such a respected group of doctors will undoubtedly lead to its acceptance by junior doctors and fresh hands.

Drug Utilisation Studies

The formation of drug-expenditure monitoring groups in hospitals was a common phenomenon in the early seventies in Europe and United States. As a result, there was an improved organisation of hospital pharmacy and data on hospital drug policies were available and useful for a number of issues in health administration³³. In our country health care services are provided primarily through

hospitals. The changing nature of health care delivery has expanded the role of hospital to include out-patient clinics, intermediate care facilities and in-patient care. Besides the three basic essentials of human existence - food, clothing and shelter - the hospital has become a necessary instrument for providing a fourth basic element of survival - health. It is because of the increasing complexity of health care - diagnostic, preventive and therapeutic - that the necessary trained personnel, facilities and equipment should be consolidated into one institution - the hospital - in order to provide the quality of care expected by the public. But while drug utilisation studies have become an integral part of health management in several developed countries and others in the developing world, such studies are almost unknown in India. Why no attempts have been made in this direction is surprising when we consider the wasteful practices followed in drug purchasing and management by departments of health. The squandering of resources associated with over prescribing and mis-management can be prevented or at least limited only if studies are conducted to monitor drug utilization. Large sections of the population depend on health facilities provided by governmental institutions. As the drug prices increase, drugs that can be procured within

the limited budget of these institutions get severely restricted. In this context, it is all the more interesting to evaluate drug use in a government hospital. As far as Kerala is concerned, there was an initiative taken in this direction by Prof.G.R.Nair, Director, College of Pharmaceutical Sciences, Thiruvananthapuram, along with some of his colleagues³⁴. The study was sponsored by the State Board of Medical Research. This study revealed that in any hospital set up, it is most necessary to maintain, review and evaluate its own drug use profile and provide for instruction of the patients, health professionals and decision making authorities, in the proper utilization of drugs.

Drug utilization, according to a definition given by WHO, includes the various aspects of marketing, distribution, prescription and use of drugs in a society with special emphasis on the resulting medical, social and economic consequences³⁵. The level at which such a study is conducted can be a particular disease condition, a hospital, a public health programme or the State Health Services as a whole. It is the process of estimating the type and quantity of drugs used in a situation as mentioned above and to monitor the way in which doctors or primary health workers prescribe them. This sort of data collection

provides valuable feedback on drug use. Such studies help to identify areas of most wasteful prescribing and timely intervention by government authorities can lead to major savings on drug expenditure. The present study is envisaged against this backdrop.

The Problem Envisaged

It is an accepted fact that the State of Kerala has achieved a high level of health status of its people compared to India as a whole and other developing countries. The basic indicators of health such as infant mortality rate and life expectancy clearly point to this fact, besides the number of hospitals, dispensaries and health centres functioning in the state under government control as well as in the private sector³⁶⁻³⁷. But these dimensions do not project a true image of the quality of health care facilities available to the common man. The figures of health status of the population do not reflect the fact that not even the largest medical institution under the State Government control is able to provide the most essential drugs, or the most inexpensive drugs for that matter, to the patients making use of its facilities. At the same time, several slow-moving items of drugs are

found stocked in hospitals and health centres where they cannot be utilised and are wasted as they become date-expired. In spite of several attempts to modify and improve the system of supply, distribution and utilisation of drugs, we still have to go a long way in the matter of rational utilisation of resources spent on drugs and other hospital supplies. This is evident from the fact that even the patients admitted to the hospital for treatment are required to buy the drugs prescribed from the market, during their stay in the hospital, let alone at the time of discharge. It is imperative to take stock of the situation to bring out the facts and to confirm the validity of the complaints made by the public.

The hospitals in the government sector in Kerala can be broadly classified as those functioning under the Director of Health Services (DHS) and those under the control of the Director of Medical Education (DME). Health expenditure along with Family Planning was Rs.29,200 lakhs for the year 1991-'92 which constituted 14.8% of the Total Developmental Expenditure³⁸. In the detailed break-up of Medical and Public Health Expenditure Rs.6,892 lakhs was spent for hospitals and dispensaries where as Rs.2,028 lakhs was the share of Medical Education Department, as per accounts.

In the year 1984, a Central Purchase Committee (CPC) was constituted by the Government with a view to monitor and regulate the purchase of drugs and other hospital supplies for the various government hospitals in the state. The Director of Medical Education, Director of Health Services and the Drugs Controller of Kerala are the members of CPC. Depending on the facility-wise status of each institution, the annual indent for drugs are prepared from a list of drugs recommended for this purpose by the High Power Committee (HPC) on Health Services (1979)³⁹. This committee had also recommended that all drugs and formulations except Mixture Sedative Expectorant and Mixture Carminative be procured in bulk from the pharmaceutical industry rather than being compounded and dispensed in the pharmacy. This was for reasons of economy and also due to the problems encountered in the quality control of raw materials for formulations in the hospital setting. The indents are submitted to the District Medical Officers in the case of hospitals under DHS and to the Principals of Medical Colleges in the case of hospitals under DME. These indents after review and processing are submitted to the CPC who settles rate contracts with firms for the supply of medicines and this information is passed on to the respective purchasing authorities, i.e. the DMO

for each district and the Principal for each medical college. Subject to the availability of budget provision, these officers could directly place orders with the firms for the purchase of the various items required for the hospitals under their jurisdiction. Some 10 to 15 percent of medicines can be directly procured outside the provision of the CPC rate contract by inviting tenders. Local purchases are also allowed in case of emergencies. The HPC had recommended that separate financial provision is required for the purchase of drugs and that 40% of the total budget provisions of the hospitals was to be utilised for this purpose. But it is observed that these recommendations were not adhered to in the purchase of drugs⁴⁰.

In the case of the five Medical College Hospitals in the State, budget allotment was for drugs and diet together and even this was less than 40 percent of the total expenditure, except in the year 1990-'91, as shown by the figures for the four consecutive years given in Table 1.1 below.

Table 1.1

**Budget allotment for Drugs and Diet
in the Medical College Hospitals**

Year	Total Expenditure (in Rs. lakhs)	Combined Expenditure on Drugs & diet (in Rs.lakhs)	Desired level of Expenditure at 40 % of Total (in Rs. lakhs)	% of the combined Expenditure to Total
1988-89	1,813	713	725	39
1989-90	2,122	762	849	36
1990-91	2,549	1,063	1,020	42
1991-92	2,732	1,012	1,093	37

Further, due to delay in submitting annual indents by the institutions, the quantities of drugs to be purchased were being fixed on an ad-hoc basis. This could lead to serious shortcomings in the whole system of purchase and distribution of drugs. Therefore, it was considered worthwhile to make an attempt to assess the requirement of drugs in a teaching hospital in the state and to compare such requirements with actual quantities indented and supplied.



The proposed study is mainly a methodological one, supported by a quantitative exercise on drug utilization at Thiruvananthapuram Medical College Hospital. The sample size is kept small and the population is restricted to the medical records of inpatients admitted to the hospital during the period 1991-92 in order to maintain the purposive nature of the study. The study involves the following components:

a) Prescription Study: A sample of prescriptions ordered by the physicians of Thiruvananthapuram Medical College Hospital are reviewed to find out:

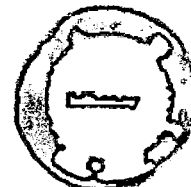
- (i) the types of drugs prescribed in relation to the nature of the illness, and
- (ii) the therapeutic categories that are most widely prescribed.

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b) Preparation of tentative estimates for the major drugs used in the MCH, Thiruvananthapuram, on the basis of the hospital's incidence of different diseases.

c) To review the price and purchasing pattern of the above drugs in the hospital and to examine whether the quantity purchased matches the estimated requirement.

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Chapter 2 gives the organisational features of the hospital selected for the study and its morbidity and mortality patterns for selection of a suitable sample.

Chapters 3 and 4 deal with the study proper, in accordance with the objectives mentioned under a, b and c above.

And finally, an attempt is made to recapitulate the findings of the study with some concluding remarks.

CHAPTER 2

ORGANISATIONAL AND FUNCTIONAL FEATURES OF THIRUVANANTHAPURAM MEDICAL COLLEGE HOSPITAL

The Thiruvananthapuram Medical College Hospital, as its name implies, is a teaching hospital owned by Government of Kerala and possessing the highest referral status. This particular hospital was chosen for the study as it represents the largest Government - owned hospital in the State, besides considerations of convenience.

2.1 Organisation

The hospital was established in 1953 with a bed strength of 200 and a capacity to train 60 medical students at a time in the clinical practice of medicine. In the past 40 years of its existence, the hospital has undergone phenomenal growth, as is evident from its present state of affairs. The first reorganization took place in 1960-'61 when the bed strength was increased to 850. Today the bed strength of the hospital is 1376, distributed into various departments and speciality units. The speciality-wise distribution of beds is given in Appendix 1.

The total inpatient admission and outpatient attendance for the year 1991-92 is as follows:

Inpatients treated	-	44,545
Out patients attended	-	220,405

The total number of admitting units in the medical and surgical specialities is 38, excluding anaesthesiology and radiology. 246 doctors are working in medical and surgical departments and in speciality units during the study period. The details are given in Appendix 2. This is exclusive of the hundreds of House-Surgeons and Post-Graduate students who render constant and invaluable service in the hospital.

Appendices 3 and 4 give the number and designations of paramedical and non-medical personnel working in the hospital respectively. The total number of paramedical and administrative staff together is 1,238 and out of that the number of employees with paramedical training is 690. It may be noted that the number of pharmacists are only 20 as against 246 doctors and more than 600 nursing staff. Besides medical students undergoing clinical training in various departments, the hospital also

provides facilities for training students undergoing nursing, pharmacy, radiography and medical laboratory technology courses conducted by the Directorate of Medical Education, Thiruvananthapuram, Kerala State.

2.2 Procurement of Drugs

The budget allocation for drugs and other pharmaceutical products together with diet is Rs.2.75 crores per annum and this amount has remained constant over the three years, 1989-90,1990-91 and 1991-92, eventhough there has been an increase in the number of patients availing of the services of the hospital, both in the O.P. and inpatient wards. The number of inpatients during the three successive years was as follows:

1990	-	40,414
1991	-	43,253
1992	-	45,922

Out of the Rs. 2.75 crore budget allotment, one third was designated to meet the expenditure on diet and the rest for procuring drugs and other medical supplies. According to a report by the Hospital Superintendent, the

amount allocated for drugs and pharmaceuticals during the study year was Rs.1.62 crores⁴¹.

The drug supplies are received by the Stores Superintendent and transferred to either the main store or general store after entry in the invoice register. Sometimes drugs or other materials for which requisitions are received from the departments or wards are directly handed over to that particular department or ward as the case may be after making entries in the stock register.

2.3 Hospital Formulary

The hospital under study has developed a formulary system mainly as a guide to the administrators, doctors, pharmacists and stores personnel who are responsible for the procurement, prescription, inventory control and distribution of drugs and related articles. This formulary contains a selected list of drugs and other supplies which is based on a therapeutic classification of the different items indicated by their generic rather than brand names. The products included therein are selected by the Therapeutic Committee which includes senior members of all clinical departments and the Director of Pharmacy. When it was first introduced in 1984, as a combined effort of the

College of Pharmacy and Medical College, the list contained 461 items divided into 39 categories. By the year 1991-1992, this number has arisen to 46 categories of hospital supplies of which only 40 were of therapeutic agents. The remaining 6 categories include surgical dressings, sutures, catheters, infusion sets, X-ray materials etc. Among the drugs, products considered to offer a therapeutic advantage or a saving in cost were listed.

The doctors working in the hospital are encouraged to prescribe the drugs included in the above list as they are more likely to be available in the hospital pharmacy. This list has been revised annually thereafter. If new drugs are to be added or old ones are to be replaced by newer ones, the Therapeutic Committee studies the advantages of the new drug in comparison with unfavourable reports of toxicity and also its cost in relation to added advantage, before taking a decision. It is interesting to note that the number of drugs added at each revision of the formulary is greater than the number of drugs deleted. The various categories of drugs included in the formulary for the year 1991-92 and the number of items under each category are given in Appendix 5. Non-prescription items like surgical dressings and diagnostic materials are not covered by the present study. On the whole, there are 870

items distributed in 46 categories, of which 351 items are surgical and diagnostic aids, and others are therapeutic and prophylactic agents, including anaesthetics.

The Central Purchase Committee is responsible for the annual indenting and procurement of items mentioned in the formulary. It is believed that every possible care is exercised to see that the best available supplies are procured at reasonable prices. But there are many loopholes and drawbacks in the system which may counteract the cost reduction and other advantages that are expected. With a view to overcome or atleast minimise these problems the Kerala Health Research and Welfare Society (KHRWS) was invited to play a greater role in the procurement of hospital supplies. KHRWS is a public body registered under the Charitable Societies Act working for the betterment of the health status of the people of Kerala State and a full-fledged pharmaceutical service is only one of their many activities. It functions in close collaboration with the hospitals. Since the middle of 1991, the KHRWS has been totally entrusted with the supply of drugs and other accessories in an attempt to curtail malpractices in drug purchasing.

In the previous years there have been repeated complaints that eventhough the hospital's requirement of

drugs are purchased every year, most of the prescribed drugs have to be bought by the patients from private pharmacies or medical stores outside the hospital. This is because drugs prescribed are reported to be out of stock in the hospital pharmacy. Therefore, monitoring the extent to which the hospital pharmacy based on formulary system is achieving its desired objectives is crucial to justify the continued efforts of the Therapeutic Committee and maintenance of a good level of compliance by the prescribers⁴². Such studies become more relevant in the face of current constraints with regard to resources. The document on National Health Policy- 1993⁴³, clearly states that a dynamic process of change and innovation are required to be brought about in the entire approach to health research, ensuring the participation of a fully integrated band of workers, functioning within a health team approach.

2.4 The Medical Records

By definition, a medical record is a clear, concise and accurate history of the patients' life and illness, written from a medical point of view⁴⁴. The purposes of the medical record are⁴⁵:

- 1) to serve as a basis for planning and for continuity of patient care;
- 2) to provide a means of communication among the physicians and any professionals contributing to the patient's care;
- 3) to furnish documentary evidence of the course of the patient's illness and treatment during his/her stay in the hospital;
- 4) to serve as a basis for review, study and evaluation of the care rendered to the patient;
- 5) to assist in protecting the legal interest of the patient, hospital and responsible practitioner; and
- 6) to provide data for use in research and education.

The medical records section of the hospital is also responsible for distributing case sheets and collecting the same from the wards after a patient is discharged. In spite of the huge volume of case records handled by this section, it is yet to be computerised. The Medical Records Officer is also responsible for classifying the case records based on diagnosis as per International Classification of Diseases by WHO⁴⁶. This data is also used for preparing the morbidity patterns and mortality rates among patients who have undergone treatment in the

hospital. The in-patient records of the hospital were used in the present study for various reasons. The advantages of using I.P. prescriptions for the study rather than O.P. prescriptions include:

1. better compliance by patients,
2. drugs available in the hospital are mostly prescribed,
3. duration of treatment is known, and
4. the prognosis is known.

In the case of hospitalised patients, the doctors's prescription is the deciding factor affecting the patients' compliance with medication⁴⁷. Here the needs of the patients are determined primarily by the clinicians preferences, which in turn are determined by the disease entities and the drugs available to treat diseases. the information on the kind, dosage form and prices of drugs and formulations required can be very important in this respect.

2.5 The Morbidity and Mortality Pattern

The morbidity pattern of the Thiruvananthapuram Medical College Hospital was arrived at by reviewing the three digit classification of diseases for the four

consecutive years 1989, 1990, 1991 & 1992. The figures for the four years were fairly comparable in that the predominant causes of illness remained the same in number and distribution. The increase in number of patients treated for a specific condition was proportionate to the increase in the total number of I.P. admissions. Appendix 6 gives the morbidity and mortality data for the year 1990, since this could have had a bearing on the drug purchasing decisions for the year 1991-92. The more prevalent diseases represented by the code numbers are given in Appendix 7.

Nine 'hundred and ninety nine (999) diseases or clinical conditions are described in the International Classification of Diseases by the three digit code system. More specific and detailed classifications based on 4 and more digits are beyond the scope of this study. Out of the 999 diseases described only 628 types have been reported among the patients admitted to the Medical College Hospital in 1990. 39,450 (Thirty nine thousand four hundred and fifty) cases are covered by this classification. This number is less than the actual number of admissions reported at the Office of the Hospital Superintendent for the year 1990 by 964 cases, which makes 2.4% of the admissions. During the study year also, it was observed that nearly 2% of the case-records are either missing or

misplaced and are not available for the study. It may be noted that cases of Gynaecology and Obstetrics and those of Paediatrics departments are not treated in Medical College Hospital, except for a few which need specialised attention or procedures that are not readily available in the Sri Avittom Thirunal Hospital for Women and Children, situated in the same campus.

Being a referral institution of prime importance, a very diverse spectrum of diseases requiring modern sophisticated facilities and specialised care, form part of the case-mix pattern of the hospital, all of which cannot be represented in a small scale study of this type. In the following chapters, we will examine what the major drugs prescribed for a selected set of conditions are and whether the hospital's drug procurement policy matches with the actual needs as estimated from the sample drawn.

CHAPTER 3**THE TYPE OF DRUGS PRESCRIBED AND THEIR
ESTIMATED REQUIREMENT**

Drugs hold a crucial role in the prevention and treatment of diseases as well as in the alleviation of clinical symptoms of illness. Choice of the right therapeutic agent is an issue that has challenged medical practitioners all the time, but it is more so now due to the proliferation of products which compete in their claims of therapeutic efficacy. In this situation it will be most appropriate to consider what types of drugs are being prescribed by doctors to their patients in a teaching hospital with an accepted drug formulary and to what extent these drugs are available to the inpatients from the hospital pharmacy. Drug utilisation data can be used to describe patterns of drug use at various levels of the health care system. The hospital under study is a health care institution of tertiary status as can be seen from its characteristics described in Chapter 2.

3.1 Selection of a Sub-population

A difficulty often met with in hospital cost studies is the problem of allocating pharmaceutical expenditures to different centres. The method most commonly employed is an estimation of the average drug expenditure per patient based on a sample of out patient prescriptions and/or in-patient medical records. Total pharmaceutical expenditure is then obtained by multiplying the average cost of treatment by the total number of patients⁴⁸. Incomplete medical records often make this method inadequate as it tends to undervalue total consumption. It is also time consuming to review medical records and it is often difficult to apply a suitable sampling frame. The hospital's case-mix pattern should be incorporated in the determination of average cost and therefore, the results obtained reflect more accurately the actual situation. The out patient department was excluded from this study because it was not only difficult to trace and review out-patient prescriptions, but the hospital supply of many drugs were mostly restricted to I.P wards due to shortage or delay in supply and considerations of resource conservation. In the case of in-patient department also, it was possible and

practical to study only a few disease conditions to give a representative pattern covering the common illnesses treated at the hospital.

From a knowledge of the pattern of diseases/ disorders treated at the hospital medically, surgically or otherwise by institutionalisation, a set of conditions were selected to include different categories like communicable diseases, non-communicable diseases or disorders and some representative conditions requiring post-surgical antibiotic prophylaxis. Accidents, injuries and cases of poisoning were excluded from the study. Besides being qualified by their representativeness of the hospital's case - mix pattern, the selected conditions also represented more than 10% of the total number of admissions in the study year. Table 3.1 gives the selected conditions along with their 3 - digit diagnostic code numbers and the number of cases with such conditions admitted during the consecutive years, 1990, 1991, 1992 and the study period, ie, 1991 - '92.

Table 3.1
Number of Admissions per year of the Diseases/Disorders
Selected for the Study

Sl. No.	Diagn- ostic Code	Disease/ disorder	No. of Admissions			
			1990	1991	1992	91-92'
1.	241	Non toxic nodular goitre	605	745	762	760
2.	250	Diabetes mellitus	1264	1389	1320	1350
3.	320	Bacterial meningitis	137	154	128	139
4.	401	Essential hypertension	558	600	601	598
5.	410	Acute myocardial infarction	766	1063	1099	1102
6.	430	Sub arachnoid haemorrhage	118	128	140	146
7.	431	Intra cerebral "	185	216	346	272
8.	481	Pneumococcal pneumonia	249	276	299	289
9.	540	Acute appendicitis	390	422	434	426
10.	560	Intestinal obstruction	223	239	349	289
Total:			4495	5232	5478	5371
Total Admissions			40423	43275	45918	44545
% of Total Admissions			11.12	12.09	11.93	12.06

3.2 Selection of Sample

Before selecting the important drugs used in the above condition, it was necessary to know the general pattern of prescribing. Therefore it was decided to collect case records by systematic random sampling to cover all the diagnostic code numbers by arranging in-patient case records in numerical order according to their register numbers and selecting samples at fixed intervals of one in eighty nine to obtain a sample of 500 case records of cross sectional nature. This sample (hereafter referred to as GS for General Sample) was categorised according to their diagnostic codes to find the proportion in which the selected conditions occurred in the sample. Table 3.2 gives the different diagnostic codes selected and the number of cases under each diagnostic code obtained in sample GS.

Table 3.2

Number of cases of each Diagnostic code occurring
in the sample G S and their percentage proportion
in the sample compared to the population

Sl. No.	Code No.	No. of cases in the sample GS	% proportion of GS	No. of cases in the Popn.	% proportion of the popn.
1.	241	11	2.2	139	1.71
2.	250	21	4.2	1350	3.03
3.	320	4	0.8	139	0.31
4.	401	12	2.4	598	1.34
5.	410	12	2.4	1102	2.47
6.	430	3	0.6	146	0.33
7.	431	2	0.4	272	0.61
8.	481	2	0.4	289	0.65
9.	540	8	1.6	426	0.96
10.	560	2	0.4	289	0.65
Total		77	15.4	5371	12.06

3.3 Selection of Drugs

The individual drugs prescribed in the case records of the sample (GS) were sorted to obtain the number of cases in which a particular drug was prescribed, either by its generic name or in the form of a branded equivalent to find out the different types of drugs that were most often prescribed. Further the dosage form of the drug, ie, whether it was prescribed in the form of a tablet, injection, syrup or any other form was also taken into account. Table 3.3 gives the names of the major drugs appearing in the prescriptions and the therapeutic classes to which these drugs belong.

Some very commonly used drugs like Paracetamol and B-complex vitamins have been excluded from the study because these are widely dispensed in the OPD. Also ophthalmic preparations and drugs for gynaecological use are not included because these Departments are not a part of the hospital under study.

Table 3.3

Therapeutic Categories of some Drugs most widely used in the I.P. Department of Medical College Hospital, Thiruvananthapuram

Sl No.	Drug	Therapeutic Category
1.	Amino phylline	- Anti asthmatic
2.	Ampicillin	- Anti infective
3.	Benzyl penicillin	- Anti infective
4.	Co-trimoxazole	- Anti infective
5.	Deriphylline	- Anti asthmatic
6.	Diazepam	- Tranquiliser
7.	Furosemide	- Diuretic
8.	Gentamicin	- Anti infective
9.	Glibenclamide	- Anti diabetic
10.	Ibuprofen	- Analgesic, Anti inflammatory agent
11.	Insulin	- Anti diabetic
12.	I/V Mannitol	- Osmotic Diuretic
13.	Metoclopramide	- Anti histamine
14.	Metronidazole	- Anti parasitic, Anti protozoal
15.	Nifedipine	- Cardio vascular
16.	Pentazocine	- Analgesic
17.	Pheniramine maleate	- Anti histamine
18.	Phenytoin Sodium	- Anti convulsant
19.	Ranitidine	- Anti peptic ulcer
20.	Isosorbide dinitrate	- Cardio vascular

3.4 Selection of sub Sample

Number of patients who received the above drugs for the selected disease conditions in different dosage forms is given in Table 3.4, along with their proportion in the total number of patients receiving the same drug in the sample G.S.

Table - 3.4
Number of Prescriptions for the Common Drugs
in Different Dosage Forms

Sl. No.	Drug Name and dosage form	I	II	III
1.	Tab. Aminophylline 100mg	2	5	40.00
2.	Inj. Aminophylline 250mg	3	26	11.54
3.	Cap. Ampicillin, 250 mg	9	131	6.87
4.	Inj. Ampicillin 500 mg	25	150	16.67
5.	Inj. Benzyl Pencillin 10 L	9	84	10.71
6.	Co-Trimoxazole DS 160/800	5	28	17.86
7.	Tab. Co-Trimoxazole 80/400	2	23	8.69
8.	Tab. Deriphyllin 100mg.	1	13	7.69

Table 3.4 Cont'd

9.	Inj. Deriphyllin 100mg.	3	27	11.11
10.	Tab. Diazepam 5mg.	20	95	21.05
11.	Inj. Diazepam 10mg.	2	10	20.00
12.	Tab. Furosemide 40 mg.	3	21	14.00
13.	Inj. Furosemide 20 mg.	5	49	10.20
14.	Inj. Gentamicin 80 mg.	18	104	17.31
15.	Tab. Glibenclamide 2.5mg.	4	12	33.33
16.	Tab. Ibuprofen 200mg.	9	74	12.16
17.	Inj. Insulin 40 Units	11	32	34.38
18.	I/V Mannitol- (20%) 100 ml	8	37	21.62
19.	Tab. Metoclopramide 10mg.	1	15	6.67
20.	Inj. Metoclopramide 10mg.	3	28	10.71
21.	Tab. Metronidazole 400 mg.	3	21	14.28
22.	Inj. Metronidazole 500 mg.	9	46	19.56
23.	Tab. Nifedipine 10mg.	9	34	26.47
24.	Tab. Nifedipine 5mg.	6	26	23.08
25.	Inj. Pentazocine 30mg.	18	100	18.00
26.	Tab. Pheniramine 22.5mg	3	40	7.50
27.	Inj. Pheniramine 45.5mg	8	44	18.18

Table 3.4 Cont'd

28. Tab. Phenytoin Sodium 100mg.	3	12	25.00
29. Inj. Phenytoin Sodium 100mg.	1	13	7.69
30. Tab. Ranitidine 150mg.	4	29	13.79
31. Inj. Ranitidine 50mg.	3	36	8.33
32. Tab. Sorbitrate 10 mg.	12	31	38.71
33. Tablet Sorbitrate S/L 5 mg.	16	40	40.00

- I - Number of prescriptions in selected diseases.
 II - Number of prescriptions in all diseases.
 III - % Proportion of prescriptions of selected diseases.

Since the sample size is small in the above categorisation it was considered appropriate to draw a second sample from a sub population in which the above drugs are predominantly used. The diseases/disorders given in Table 3.1 were taken as the characteristic of this sub population. In order to quantify the requirement of the selected drugs in these conditions a second sample was drawn from the subpopulation (hereafter referred to as S.S for Sub Sample) This sample S.S. represented 8.62% of the sub population of patients admitted under the ten

diagnostic code numbers. The communicable and non-communicable disease/disorders selected were given a 10% representation in the sub sample, but the disorders indicative of surgical intervention were given only a 5% representation because drugs are only complementary to surgical expertise. On the whole, this sub sample covered communicable diseases (2), cardio vascular disorders (2), cerebro vascular disorders(2), ENT surgery (1) and abdominal surgery (2), besides diabetes mellitus which is the single major contributing condition of many other conditions. A suitable sample was obtained by random selection of I.P. numbers from the respective diagnostic index cards, maintained at the Medical Records library of the hospital. This sample of medical records were reviewed for drug prescriptions and the data thus obtained was used for quantifying the drug requirement in the sub population.

3.5 The Equation for Preparing Estimates

The sample (G.S) drawn earlier was used to supplement the information obtained from the sub population. By calculating the total requirement of a particular drug for the sample G.S. and the requirement of the same drug for the selected diagnostic codes occurring

in sample G.S., the proportion of the total I.P.D (In Patient Department) drug requirement used for the sub-population could be obtained. At the same time, the average requirement of a drug for the sub sample was extrapolated to get the total requirement of that drug for the subpopulation. Thus from a knowledge of the proportion of a drug used for the sub population and its estimated drug requirement, it was possible to arrive at an estimate for the total requirement of that drug for the population of all patients admitted. Thus,

$$T.D = \frac{SD \times N}{n} \times \frac{ng}{sdg} \times \frac{tdg}{Ng} \quad \text{equation 3.5}$$

Where TD = Total requirement of a drug for the population.

SD = Estimated requirement of the drug for sub population.

n = Number of in-patient records in the sub population.

N = Total number of case-records in the population.

ng = The number of case records representing the sub population in the sample G.S.

sdg = Requirement of the drug for patients representing sub population in the sample G.S.

tdg = Total requirement of the drug for the sample
G.S

Ng = Total number of case records in the sample
G.S.

The estimated requirement of each drug selected was obtained by rearranging the equation as follows for ease of calculation.

$$T.D. = SD \times \frac{N}{Ng} \times \frac{ng}{n} \times \frac{tdg}{sdg}$$

3.6 Intensity of Drug use

In order to arrive at the terms used in the above equation it was necessary to scrutinize each medical record included in the sample GS and the sub sample to find out the frequency of prescribing the drugs and the number of units of a drug used per patient during his stay in the hospital, ie, from the time of admission till he/she is discharged or otherwise leaves the hospital. The number of units of the drug/patient was considered as an appropriate measure of the intensity of drug-use, rather than the number of days the patient received the drug, because, the

dosage of many drugs varied from day to day for an individual patient. The usual adult dose administered at a time was taken as the unit, but in some instances this differed from the unit dose of dispensing from the pharmacy. Therefore estimates were converted to the dosage unit purchased and dispensed from the hospital pharmacy. For example the single adult dose of capsule Ampicillin is 500mg but it was purchased only as capsules of 250mg strength. Measurement in terms of number of units/patient also facilitated the computation of the cost of the drug and the average number of units of the drug used in a sample of inpatient case-records. Table 3.6 gives the average number of units of each drug used in the different diagnostic codes of the subsample, and the sample GS as a whole.

Table 3.6

Average number of units of each drug used by different diagnostic codes in the sub sample, and sample GS as a whole

Sl. No.	Drug Name & Dosage form	241	250	320	401	410	430	431	401	540	560	G.S
1.	Tab. Aminophylline 100 mg	0.24	0.36	-	0.10	0.16	-	-	-	-	-	0.15
2.	Inj. Aminophylline 250 mg.	0.05	0.25	-	0.22	0.34	0.07	0.19	0.07	-	-	0.17
3.	Cap. Ampicillin 250 mg.	16.84	13.45	3.43	3.07	5.53	---	0.59	0.83	12.57	4.57	0.98
4.	Inj. Ampicillin 500 mg.	0.32	5.72	0.86	1.00	2.76	2.67	5.78	4.69	20.78	14.86	5.21
5.	Inj. Benzyl Penicillin 100	1.05	2.58	204.57	3.33	0.69	5.60	6.37	31.72	1.91	1.71	3.62
6.	Co-Trimoxazole D.S 160/800	0.63	0.37	--	0.63	0.24	0.40	--	--	--	--	0.46
7.	Tablet Co-trimoxazole 80/400	--	0.47	--	0.07	0.69	--	1.18	--	--	--	0.88
8.	Tab. Deriphylline 100 mg	0.63	0.29	-	0.40	1.09	-	-	1.65	-	-	0.34
9.	Inj. Deriphylline 100 mg	0.39	0.33	-	1.05	0.68	-	1.56	3.10	0.57	-	0.70
10.	Tab. Diazepam 5 mg.	0.89	2.47	-	4.00	16.35	0.13	0.52	0.76	-	-	1.77
11.	Inj. Diazepam 10 mg.	-	0.044	0.21	0.15	0.10	0.47	0.30	0.14	-	-	0.05
12.	Tablet Furosemide 40 mg	0.16	1.66	--	1.50	0.06	0.80	--	0.07	--	--	0.42
13.	Injection furosemide 20 mg	0.26	7.93	--	1.97	2.18	5.87	3.19	0.41	--	--	1.53
14.	Injection gentamicin 80 mg	3.63	2.64	--	0.50	0.49	0.80	--	8.69	14.71	8.14	3.22
15.	Tab. Glibenclamide 2.5 mg.	0.52	3.56	-	0.24	0.22	-	-	-	-	-	0.70

16. Tab. Ibuprofen 200 mg.	4.10	2.08	1.28	2.20	1.26	-	-	2.06	0.86	-	3.85
17. Inj. Insulin 40 units	0.26	11.75	1.98	0.14	0.63	0.40	-	0.08	0.07	-	0.91
18. i/v Manumitol 20% (100 ml)	0.47	0.49	4.29	1.20	0.16	9.60	9.11	--	--	--	0.64
19. Tab. Metoclopramide 10 mg.	-	0.31	0.14	0.13	0.24	-	0.30	-	-	1.86	0.20
20. Inj. Metoclopramide 10 mg.	0.11	0.33	0.14	0.07	-	-	0.19	0.24	0.14	0.50	0.25
21. Tablet Metronida- zole 400 mg	--	1.22	--	--	--	--	--	1.86	2.95	2.57	0.53
22. Injection Metroni- dazole 500 mg	--	0.60	--	--	--	1.60	--	0.41	10.71	8.79	1.46
23. Tablet Nifedipine 10 mg	1.18	2.69	--	0.30	1.72	4.40	12.11	0.10	--	--	1.86
24. Tablet Nifedipine 5 mg	--	0.91	--	2.75	0.55	1.00	2.67	--	--	--	0.53
25. Inj. Pentazocine 30 mg.	1.53	0.27	-	-	-	-	-	-	1.24	0.14	0.45
26. Tablet Pheniramine 22.5 mg	0.95	0.44	--	0.25	0.15	--	1.11	0.41	--	--	1.30
27. Injection Pheniramine	0.05	0.29	--	--	0.01	--	--	0.07	--	0.14	0.17
28. Tab. Phenytoin 100 mg	-	0.40	3.84	1.30	0.30	5.60	8.56	-	-	-	0.22
29. Inj. Phenytoin 100 mg.	-	0.04	0.64	0.70	0.22	4.60	2.93	-	-	-	0.20
30. Tab. Ranitidine 150 mg.	0.32	1.70	1.00	0.53	0.62	0.53	1.78	0.28	-	1.36	0.74
31. Inj. Ranitidine 50 mg.	0.53	0.55	0.14	0.40	0.47	0.93	3.41	-	-	1.43	0.72
32. Tablet sorbitrate 10 mg	0.63	4.74	--	3.67	24.62	--	--	--	--	--	1.54
33. Tablet sorbitrate 5 mg	--	1.35	--	2.15	8.25	--	0.44	--	--	--	0.81

3.7 The Total Number of Units of a Drug Used

The total number of units of a drug used for a sample of case records falling under a particular diagnostic code was required for calculating the average number of units used per patient and extrapolating to the total number of units to obtain SD, quantity of the drug required for the sub population characterised by that particular diagnostic code. The drug requirement of each diagnostic code in the subsample were summed up to reach at the total requirement of the drug for the subsample. Table 3.7 gives the total requirement of each drug for the different diagnostic codes in the subsample and the subsample as a whole.

Table - 3.7

Total number of units of each drug used in different diagnostic codes of the sub sample and the subsample as a whole

Sl. No.	Drug Name& dosage form	Total number of units for different diagnostic codes in the subsample										
No.	Dosage form	241	250	320	401	410	430	431	481	540	560	S.S
1.	Tab. Aminophylline 100 mg.	9	48	-	6	18	-	-	-	-	-	81
2.	Inj. Aminophylline 250 mg	2	34	-	13	37	1	5	2	-	-	94
3.	Capsule Ampicillin 250 mg.	640	1816	48	184	608	--	16	24	264	64	3664
4.	Injection Ampicillin 500 mg.	316	772	12	60	304	40	156	136	436	208	2440
5.	Injection Benzyl Penicillin 10l	40	348	2864	200	76	84	172	920	40	24	4768
6.	Co-Trimoxazole D.S 160/800	24	50	--	38	26	06	--	--	--	--	144
7.	Tablet Co-trimoxazole 80/400	--	64	--	04	76	--	32	--	--	--	176
8.	Tab. Deriphyllin 100 mg.	24	39	-	24	120	-	-	48	-	-	255
9.	Inj. Deriphyllin 100 mg	15	45	-	63	75	-	42	90	12	-	342
10.	Tab. Diazepam 5 mg.	34	333	-	240	1798	2	14	22	-	-	2443
11.	Inj. Diazepam 10 mg	-	6	3	9	11	7	8	4	-	-	48
12.	Tablet Furosemide 40 mg	06	224	--	90	64	12	--	02	--	--	398
13.	Injection furosemide 20 mg	10	1070	--	118	240	88	86	12	--	--	1624
14.	Injection gentamicin 80 mg	138	357	--	30	54	12	--	252	309	114	1268
15.	Tab. Glibenclamide 2.5 mg.	20	400	-	14	24	-	-	-	-	-	538

16. Tab. Ibuprofen 200 mg.	156	282	18	132	138	-	-	60	18	-	804
17. Inj. Insulin 40 units	10	1586	28	8	69	6	-	2	2	-	1711
18. 1/v Mannitol 20% (100 ml)	18	66	60	72	18	144	246	--	--	--	624
19. Tab. Metoclopramide 10 mg.	-	42	2	8	26	-	8	-	-	26	112
20. Inj. Metoclopramide 10 mg.	4	44	2	4	-	-	5	7	3	7	76
21. Tablet Metronidazole 400 mg	--	165	--	--	--	--	--	54	62	36	317
22. Injection Metronidazole 500 mg	--	81	--	--	--	24	--	12	225	123	465
23. Tablet Nifedipine 10 mg	45	363	--	498	189	66	327	3	--	--	1491
24. Tablet Nifedipine 5 mg	--	123	--	165	60	15	72	--	--	--	435
25. Inj. Pentazocine 30 mg.	58	36	-	-	-	-	-	-	26	2	122
26. Tablet Pheniramine 22.5 mg	36	60	--	15	16	--	30	12	--	--	169
27. Injection Pheniramine	02	39	--	--	01	--	--	02	--	02	46
28. Tab. Phenytoin 100 mg.	-	54	51	78	33	84	231	-	-	-	531
29. Inj. Phenytoin 100 mg.	-	6	9	42	24	69	79	-	-	-	229
30. Tab. Ranitidine 150 mg	12	230	14	32	68	8	48	8	-	19	439
31. Inj. Ranitidine 50 mg.	20	74	2	24	52	14	92	-	-	20	298
32. Tablet sorbitrate 10 mg	24	640	--	220	2700	--	--	--	--	--	3592
33. Tablet sorbitrate 5 mg	--	182	--	129	908	--	12	--	--	--	1231

3.8 Drug Requirement for the Subpopulation

For each diagnostic code in the subsample, the total number of units of a drug used was extrapolated to the number of similiar patients in the subpopulation. The figures so obtained for each diagnostic code in the subsample were summed up to get the total requirement of that particular drug for the sub population, ie, S.D. Table 3.8 gives estimates of the requirement of each drug for the subpopulation of in-patients in different dosage forms. The sub population was kept variable for each drug depending on whether such drug was used for a particular disease condition in the subsample or not, because some of the drugs selected for the study are specifically indicated in certain diseases/disorders and may be contra-indicated in some other conditions.

Table 3.8

Estimates of the requirement of each drug
for the sub - population

Sl. No.	Drug Name and dosage form	I	II	III	IV	V
1.	Tab. Aminophylline 100mg	4	81	343	3810	900
2.	Inj. Aminophylline 250mg	7	94	414	4517	960
3.	Cap. Ampicillin 250 mg	9	3664	448	5225	46438
4.	Inj. Ampicillin 500 mg	10	2440	463	5371	34257
5.	Inj. Benzyl Pencillin 10 L	10	4768	463	5371	48494
6.	Co-Trimoxazole DS 160/800	5	144	358	3956	1677
7.	Tab. Co-Trimoxazole 80/400	4	176	332	3322	1763
8.	Tab. Deriphyllin 100mg.	5	255	372	4099	2790
9.	Inj. Deriphyllin 100mg.	7	342	420	4797	3697
10.	Tab. Diazepam 5mg.	7	2443	414	4517	24795
11.	Inj. Diazepam 10mg.	7	48	390	3896	479
12.	Tab. Furosemide 40 mg.	6	398	387	4245	4035
13.	Inj. Furosemide 20 mg.	7	1624	414	4517	8161
14.	Inj. Gentamicin 80 mg.	8	1266	422	4508	18412
15.	Tab. Glibenclamide 2.5mg.	4	538	343	3810	5580
16.	Tab. Ibuprofen 200mg.	7	804	407	4664	9780

17. Inj. Insulin 40 Units	8	1711	422	4810	17227
18. I/V Mannitol- (20%) 100 ml	7	624	399	4367	6394
19. Tab. Metoclopramide 10mg.	6	112	360	3750	1398
20. Inj. Metoclopramide 10mg.	8	76	338	4123	906
21. Tab. Metronidazole 400 mg.	4	317	199	2354	4189
22. Inj. Metronidazole 500 mg.	5	465	214	2500	8267
23. Tab. Nifedipine 10mg.	7	1491	414	4517	15352
24. Tab. Nifedipine 5mg.	5	435	347	3468	4347
25. Inj. Pentazocine 30mg.	4	122	208	2825	2088
26. Tab. Pheniramine 22.5mg	6	169	399	4371	2052
27. Inj. Pheniramine 45.5mg	5	46	326	3790	501
28. Tab. Phenytoin Sodium 100mg.	6	531	361	3607	5299
29. Inj. Phenytoin Sodium 100mg.	6	229	361	3607	2276
30. Tab. Ranitidine 150mg.	9	439	442	4945	4713
31. Inj. Ranitidine 50mg.	8	298	413	4656	3396
32. Tab. Sorbitrate 10 mg.	4	3592	343	3810	36202
33. Tablet Sorbitrate S/L 5 mg.	4	1231	332	3322	12324

-
- I. Number of diseases/disorders
 II. Number of units of the drug used for the subsample
 III. Number of case records in the subsample
 IV. Number of case records in the subpopulation
 V. Estimated drug requirement SD in number of units
 of the single dosage

3.9 Estimates for the Total Drug Requirement of I.P.D

The sample GS, representing a cross-section of cases admitted to the hospital under any of all the different diagnostic code numbers, was used for determining the proportion of a particular drug used for the subpopulation. For this purpose the number of case-records representing the subpopulation, n_g , were picked up from the sample G.S containing N_g number of case records and the number of units of a particular drug used in these cases, s_{dg} , was calculated as a proportion of the total requirement of the drug for the sample G.S, i.e. t_{dg} . The quotient of these two ratios was expected to give a good approximation of the total requirement of the drug for the population, giving due weight to the intensity of the drug's use in the subpopulation.

From the values of SD for each drug, obtained as described in section 3.8, estimates for the population were obtained using the equation given in section 3.5. Table 3.9 gives the values of TD for each drug.

Table 3.9

Estimates of Individual drugs for the I.P. Department

Sl. No.	Drug Name and dosage form	n	ng	sdg	tdg	TD
1.	Tab. Aminophylline 100mg	3810	56	27	75	3274
2.	Inj. Aminophylline 250mg	4517	63	4	86	25653
3.	Cap. Ampicillin 250 mg	5225	74	288	4488	912668
4.	Inj. Ampicillin 500 mg	5371	77	472	2604	241333
5.	Inj. Benzyl Pencillin 10 L	5371	77	400	1812	280513
6.	Co-Trimoxazole DS 160/800	3596	59	42	230	13424
7.	Tab. Co-Trimoxazole 80/400	3322	47	44	440	22222
8.	Tab. Deriphyllin 100mg.	4099	58	15	168	39385
9.	Inj. Deriphyllin 100mg.	4797	68	102	348	15930
10.	Tab. Diazepam 5mg.	4517	63	244	886	111872
11.	Inj. Diazepam 10mg.	3896	56	2	24	7364
12.	Tab. Furosemide 40 mg.	4245	61	58	208	18528
13.	Inj. Furosemide 20 mg.	4517	63	136	764	56970
14.	Inj. Gentamicin 80 mg.	4508	71	318	1611	130875
15.	Tab. Glibenclamide 2.5mg.	3810	56	88	352	29228
16.	Tab. Ibuprofen 200mg.	4644	70	162	1926	155494

17. Inj. Insulin 40 Units	4810	73	146	454	72427
18. I/V Mannitol- (20%) 100 ml	4367	65	72	321	37800
19. Tab. Metoclopramide 10mg.	3750	53	12	102	14968
20. Inj. Metoclopramide 10mg.	4123	62	11	124	13684
21. Tab. Metronidazole 400 mg.	2354	33	27	267	51748
22. Inj. Metronidazole 500 mg.	2500	36	129	729	59953
23. Tab. Nifedipine 10mg.	4517	63	180	933	98890
24. Tab. Nifedipine 5mg.	3468	50	93	267	16030
25. Inj. Pentazocine 30mg.	2825	42	26	225	23945
26. Tab. Pheniramine 22.5mg	4371	60	30	651	54435
27. Inj. Pheniramine 45.5mg	3790	48	15	85	3203
28. Tab. Phenytoin Sodium 100mg.	3607	54	39	111	20113
29. Inj. Phenytoin Sodium 100mg.	3607	54	06	102	51626
30. Tab. Ranitidine 150mg.	4945	69	26	370	83340
31. Inj. Ranitidine 50mg.	4656	67	28	360	56032
32. Tab. Sorbitrate 10 mg.	3810	56	336	772	108927
33. Tablet Sorbitrate S/L 5 mg.	3322	47	181	404	34674

N = 44545; Ng = 500 for all the drugs above.

TD is given in number of units of the single dosage.

Calculation of TD as given in the above table can be illustrated by the following example of Injection Ampicillin.

Of the 500 case records (Ng) included in the sample G.S, 150 cases contained prescriptions for Injection Ampicillin. Of these 500 cases in G.S, 77 cases (ng) represented the subpopulation selected for the study, identified by 10 specific code numbers. The total number of units (in 500 mg vials) required for the 150 cases was 2604 (tdg) out of which only 472 units (sdg) were required for the cases representing the subpopulation. At the same time the subpopulation, included 5,371 case records (n) of only the selected disease code numbers. Of these, 463 case-records were randomly selected for the sub sample. In these 463 cases together, the requirement of Injection Ampicillin was 2,440 units. But the intensity of use of the drug varied according to the disease. Therefore, for each of the ten disease codes, the requirement of the drug in the subsample in number of units, was divided by the number of cases of such diseases in the subsample and multiplied by the number of such cases in the subpopulation. These values were added to get SD, the requirement of the drug for the

subpopulation. For instance, the disease code number 241 (non toxic nodular goitre) required 316 units of injection ampicillin for prophylactic use in 38 cases of this type included in the subsample. Therefore, the 760 cases in the subpopulation admitted for the same condition would require

$$316/38 \times 760 = 6320 \text{ units.}$$

Such values for the 10 code numbers were added to get 34,257 units for the subpopulation as a whole. This value represents SD in equation 3.5. The total number of inpatient admissions N is equal to 44,545. Therefore,

$$T.D = SD \times \frac{N}{Ng} \times \frac{ng}{n} \times \frac{tdg}{sdg}$$

$$\text{ie.} = 34257 \times \frac{44545}{500} \times \frac{77}{5371} \times \frac{2604}{472} = 241,333 \text{ units}$$

Whether these estimates tally with the actual quantities of drugs issued to the In-patient Department of Medical College Hospital, Thiruvananthapuram shall be discussed in the next chapter.

CHAPTER 4

THE PRESENT SYSTEM OF PURCHASING DRUGS IN THE LIGHT
OF THE ESTIMATES PREPARED

One of the uses of drug utilization data is to assess drug procurement and pricing policies. This provides a basis for continuous adjustment depending on the number of in-patient admissions, outpatient discharges and the morbidity pattern from year to year⁴⁹. The matching of drug supplies to local health needs has to be based upon a variety of socio-economic and clinical considerations especially when resources for procurement of drugs are scarce and under increasing pressure.

With a sound health care infrastructure and sufficient number of trained personnel, as is the case with Kerala as a whole, and the Medical College Hospital, Thiruvananthapuram in particular, the availability of safe and effective drugs of adequate quality is often taken for granted. But there are many factors that compromise access to drugs, including the rising cost of health services, lack of an efficient distribution system and the lack of

commitment to ensure the most effective use of available resources. Wherever controls are deficient, time-expired and degraded products are likely to pass unnoticed through the distribution system. Degradation of drugs and chemicals during transportation and storage is also a major problem in the hot and humid climate of a state like Kerala. In order to exclude gross degradation or adulteration, some basic tests may be performed in the storage premises of the pharmacy proper or an attached laboratory, to verify the identity of the pharmaceutical products⁵⁰, but these are often not undertaken. These tests cannot replace the requirements of pharmacopoeial monographs, but can be performed with a limited range of easily available reagents and equipment⁵¹.

4.1 Regulatory Measures in Drug Purchasing

Expenditure on drugs have been identified as a significant and potentially negotiable element in the overall cost of health-care expenditure⁵². Several crucial steps in this direction were found to be taken by the authorities of the hospital under study to curtail wasteful practices. These include preparation of a Hospital formulary containing a restricted number of drugs and the

promotion of prescribing drugs by their generic names*, as included in the formulary. Also the Central Purchase Committee which is responsible for the procurement of drugs invites quotations for drug supplies by their generic names, except in a few cases of drugs for which a brand name has become synonymous with the common name in use. But the reduction in drug expenditure expected as a result of these measures, should not be allowed to interfere with the standards prescribed for drugs⁵³.

Generic names⁵⁴ help to maintain rationality in the labelling and advertising of medicinal products besides facilitating communication in medical sciences. In spite of these advantages, the quality, efficacy and safety of generic products and their interchangeability with one another and also with the branded equivalents have been viewed dubiously. Their therapeutic equivalence is often questioned, even though they comply with the same

* The therapeutically active ingredients of a drug preparation are only identifiable by their scientific names, given according to international nomenclature. Such names being too long and inconvenient to use, internationally accepted shorter names are used to indicate the active ingredients of dosage forms, and are designated as generic names. For example, Aspirin for Acetyl salicylic acid, Paracetamol for p-Acetamino phenol, etc. The W.H.O. has designated and recommended international nonproprietary names for drug substances, as a means of identifying each drug substance by a unique, globally applicable and accepted generic name.

pharmacopoeal standards as the patented products. The main argument against generic products is that differences in manufacturing techniques may affect their stability and bioavailability* 55.

The Central Purchase Committee had resorted to chemical analysis of samples of drugs whenever the quality of a batch was reported to be doubtful. The services of the analytical laboratory attached to the College of Pharmaceutical Sciences was used for this purpose. The multisource generic products were thus reported to be nominally equivalent in content and quantity of active ingredients. The doctors were requested and encouraged to prescribe the drugs included in the Hospital Formulary by their generic names. This also facilitated stocking of only a restricted number of drugs included in the formulary.

The Pharmacy and Therapeutic Committee (PTC) in co-ordination with the Central Purchase Committee, decides the list of drugs to be purchased under each therapeutic category. When new drugs are to be included in

* The term bioavailability means the rate and extent of absorption of a drug from its dosage form. Variation in physical characteristics or excipients can result in variation of the drug delivery system as a whole and consequently its bioavailability determined by drug concentration in systemic circulation.

the formulary or drugs already in the list are to be replaced by newer therapeutic agents, the Therapeutic Committee studies the advantages of the new drug and also its cost in relation to added advantage, before taking a decision. The requirement of each drug is assessed by the Heads of various departments and submitted to the Hospital Superintendent who prepares the final list of drugs to be purchased along with their quantities for the hospital as a whole. This list is then reviewed by the C.P.C. and alterations if any are made depending on the availability of resources and considerations of price.

Quotations are invited from the firms included in the list accepted by C.P.C. and contracts are settled with manufacturers/distributors for supply of these drugs on an annual basis, by January every year. The cost is not given prime importance in accepting the quotations so as not to compromise quality. Only when different manufacturers or distributing agencies offer the same quality product at different prices, then the lower priced product is accepted. But as per the rules of the C.P.C., the products of the manufacturing units in the government sector have to be accepted if they quote a drug product. Quite often it is

found that the prices quoted by the public sector companies are higher than that quoted by firms in the private sector. There are thirteen public sector units regularly responding to the C.P.C. These include Kerala State Drugs and Pharmaceutical Ltd (KSDP); Indian Drugs and Pharmaceuticals Ltd., Hindustan Antibiotics Ltd., Maharashtra Antibiotics Ltd., Bengal Immunity Co. Ltd., and Bengal Pharmaceuticals and Chemicals besides others. Kerala State Drugs & Pharmaceuticals Ltd. is given the prime share of hospital drug supplies; i.e. if K.S.D.P. and another public sector unit happen to quote the same price for a drug, then KSDP is given preference. On the other hand if another public sector unit quotes a price lower than that of KSDP, then KSDP is given a chance to decide if it can supply the product at the lower quoted price. If they are willing, then half the quota for supply of the product is given to KSDP and the other half to the lower quoting firm. In case, KSDP declines the offer, the lower quoting firm is given the full quota. Sometimes it happens that several manufacturers quote the same price for a product of uniform quality with regard to content of active ingredients. In such instances, each manufacturer is given an equal quota for the supply of the product. No weight is attached to the

trade names in accepting quotations. With all these procedures for regulating the activities of the C.P.C., it is not a fool-proof system as evidenced by several reported incidences of stocking products of undesirable quality and periodic shortage of even life-saving drugs.

Frequently it was necessary to procure medicines not covered by the C.P.C. rate contract by inviting tenders. These include newer antibiotics, I.V. infusions like Mannitol, steroidal drugs, vaccines, etc. Another loophole was the possibility of local purchase of medicines in so called emergencies. Table 4.1 gives the variation in stock of each drug over the twelve months period as recorded in the stock register on the last issue day of each month.

Table 4.1

Variation in stock of the Drugs over the study period from
March 1991 to March '92

Sl. Drug.Name No. & Dosage form	March 1991	April '91	May '91	June '91	July '91	Aug. '91	Sept. '91	Oct. '91	Nov. '91	Dec. '91	Jan. '92	Feb. '92	March '92
1. T. Aminophyll- ine 100 mg	Nil	49750	43750	37750	37750	37750	33750	104750	140750	137750	160750	163750	153750
2. I. Aminophyll- ine 250 mg	13000	11300	10300	9300	6800	4300	2000	000	4500	6500	5200	3200	1200
3. C. Ampicillin 250 mg	120000	70000	85000	38120	3120	109875	229375	163375	116375	55375	10375	Nil	Nil
4. I. Ampicillin 500 mg	15000	Nil	5000	14355	8355	29555	4355	0000	17900	17700	17700	0000	Nil
5. I. Benzyl Pen- icillin 10L	00000	96000	79000	64000	52000	79000	85000	105400	91000	60000	51000	26000	7000
6. Co-Trimoxazole D.S 160/800	10500	2500	2000	9300	Nil	1000	11000	8500	10500	20000	13000	3000	2000
7. T. Co-Trimoxa- zole 80/400	Nil	0	0	0	Nil	0	0	0	0	0	0	0	Nil
8. T. Deriphylline 100 mg	Nil	0	0	0	Nil	0	0	0	0	Nil	12000	37000	31000
9. I. Deriphylline 100 mg	10000	6000	2000	1000	3250	2500	Nil	Nil	2350	Nil	1000	1000	Nil
10. T. Diazepam 5 mg	Nil	Nil	5000	3500	Nil	18750	11350	17250	10900	215750	210750	193750	178750
11. I. Diazepam 10 mg	7600	4100	3100	1600	1100	1600	240	Nil	Nil	4300	3300	1300	1200
12. T. Furosevide 40 mg	28400	55400	53400	45900	40900	30900	30900	25900	22900	17900	12900	8900	900
13. I. Furosevide 20 mg	21400	32000	24000	22500	16000	3500	8100	9585	4585	Nil	5100	500	2300

14.I. Gentamicin 80 mg	Nil	779	Nil	2750	12800	16085	17951	12125	9800	Nil	42093	41293	31710
15.T. Glibenclamide 2.5mg	37000	34000	32000	30000	27000	23000	21000	19000	17000	14000	10000	6000	2000
16.T. Ibuprofen 200 mg	2000	46000	28000	8000	Nil	Nil	14000	Nil	Nil	Nil	37000	28000	13000
17.I. Insulin 40 units	5000	4180	3520	2860	2200	860	1170	456	300	Nil	1944	1344	604
18.I. Mannitol 20% (100ml)	Stock Registrar 5 D is not available for data collection; reported missing.												
19.T. Metoclopramide 10 mg	Nil	Nil	400	200	200	200	14200	12200	9200	8200	5200	4200	1200
20.I. Metoclopramide 10 mg	9892	5892	4892	3892	2892	1892	892	892	Nil	Nil	7500	11700	10700
21.T. Metronidazole 400 mg	47000	44000	39000	44000	39000	34000	53500	48500	38500	33500	30500	23500	19500
22.I. Metronidazole 500 mg	Stock Registrar 5 D is not available for data collection; reported missing.												
23.T. Nifedipine 10 mg	Nil	Nil	600	4120	3920	3920	3920	3533	1133	1353	98733	97233	87933
24.T. Nifedipine 5 mg	Nil	Nil	Nil	4000	4000	4000	3000	Nil	12050	2810	12000	6900	6900
25.I. Pentazocine 30 mg	9900	7100	5100	2700	Nil	Nil	Nil	Nil	100	Nil	25560	23160	20160
26.T. Pheniramine 22.5 mg	Nil	Nil	58000	132000	103000	169000	230000	199000	178000	143000	110000	79000	39000
27.I. Pheniramine 45.5 mg	22400	17900	16900	14900	10900	7000	11500	10000	10750	9750	8950	7250	6250

28.T. Phenytoin 100 mg	63000	53000	53000	48000	48000	47000	37000	27000	12000	Nil	185000	170000	150000
29.I. Phenytoin 100 mg	17000	14750	11950	11950	9750	6150	6250						
30.T. Ranitidine 150 mg	5000	Nil	1700	Nil	Nil	250	120	Nil	Nil	Nil	19500	10000	24500
31.I. Ranitidine 50 mg	17500	13500	10000	9000	65000	3500	2000	Nil	Nil	Nil	Nil	Nil	Nil
32.T. Sorbitrate 10 mg	30000	20000	10000	Nil	Nil	Nil	3200	Nil	45500	82700	224700	216700	205200
33.I. Sorbitrate 5 mg	Nil	0	0	0	0	0	Nil	0	0	0	0	0	0

4.2 Annual Indents for Drugs During the study period

With all the precautions and shortcomings, how well the hospital requirements of drugs were met by the authorities and how efficiently with respect to resources is a matter that needs to be looked into. This was attempted with respect to the twenty representative drugs for which annual requirements in the I.P.D. were estimated in Chapter 3.

The annual indents of these drugs for the year 1991-92 is given in Table 4.2, along with the balance of stock as shown in the indent. The sum of these two figures is taken as the expected requirement of the drug for the year 1991-'92, in all the departments of the hospital taken together.

Table 4.2
Annual Indent of the Selected Drugs
for the year 1991-'92

Sl. No.	Drug Name and dosage form	I	II	III
1.	Tab. Aminophylline 100mg	Nil	250000	250000
2.	Inj. Aminophylline 250mg	5000	15000	20000
3.	Cap. Ampicillin 250 mg	Nil	1000,000	1000,000
4.	Inj. Ampicillin 500 mg	Nil	400,000	400,000
5.	Inj. Benzyl Pencillin 10 L	50000	300,000	350,000
6.	Co-Trimoxazole DS 160/800	10000	100,000	110,000
7.	Tab. Co-Trimoxazole 80/400	Nil	Nil	Nil
8.	Tab. Deriphyllin 100mg.	Nil	50,000	50,000
9.	Inj. Deriphyllin 100mg.	Nil	30,000	30,000
10.	Tab. Diazepam 5mg.	Nil	100,000	100,000
11.	Inj. Diazepam 10mg.	5000	10,000	15,000
12.	Tab. Furosemide 40 mg.	Nil	100,000	100,000
13.	Inj. Furosemide 20 mg.	Nil	100,000	100,000
14.	Inj. Gentamicin 80 mg.	Nil	150,000	150,000
15.	Tab. Glibenclamide 2.5mg.	20000	20,000	40,000

16. Tab. Ibuprofen 200mg.	25000	200,000	225,000
17. Inj. Insulin 40 Units	5000	12,000	17,000
18. I/V Mannitol- (20%) 100 ml	5000	37,500	42,500
19. Tab. Metoclopramide 10mg.	Nil	25,000	25,000
20. Inj. Metoclopramide 10mg.	5000	15,000	20,000
21. Tab. Metronidazole 400 mg.	40,000	100,000	140,000
22. Inj. Metronidazole 500 mg.	Nil	50,000	50,000
23. Tab. Nifedipine 10mg.	3000	125,000	128,000
24. Tab. Nifedipine 5mg.	Nil	Nil	Nil
25. Inj. Pentazocine 30mg.	8000	30,000	38,000
26. Tab. Pheniramine 22.5mg	Nil	Nil	Nil
27. Inj. Pheniramine 45.5mg	Nil	Nil	Nil
28. Tab. Phenytoin Sodium 100mg.	40,000	250,000	290,000
29. Inj. Phenytoin Sodium 100mg.	5,000	5,000	10,000
30. Tab. Ranitidine 150mg.	8,000	50,000	58,000
31. Inj. Ranitidine 50mg.	15,000	15,000	30,000
32. Tab. Sorbitrate 10 mg.	25,000	300,000	325,000
33. Tablet Sorbitrate S/L 5 mg.	Nil	Nil	Nil

I - Balance of Stock
 II - Quantity Indented for 1991-92
 III - Total Expected Requirement

It can be noticed from Table 4.2 that indents were not placed for certain dosage forms of the drugs included in the study. They are Tablet Co-Trimoxazole (80/400), Tablet Sorbitrate (5 mg) and Tablet Nifedipine (5 mg). Both tablets and injection of Pheniramine maleate (Avil) were not indented. Capsule Ampicillin, Tablet Ibuprofen and Tablet Glibenclamide eventhough prescribed in 500 mg, 400 mg and 5 mg dose for adults respectively, were indented only in 250 mg, 200 mg and 2.5 mg strength. 20% Mannitol for intravenous infusion is available in bottles of 250 ml and 340 ml. The indent was placed for bottles of 250 ml capacity, but was supplied in 340 ml bottles too, and it is therefore converted in the Table 4.2 to 100 ml units, which is the unit dose of administration, so that comparison of the indent with the estimate prepared, will be easier.

4.3 Actual Receipt of Drugs During the year 1991-92

Table 4.3 gives the actual balance on 31st of March 1991 as entered in the stock registers along with the total quantity of drug supplied during the year. The last column gives the balance as on 31st March 1992.

Table 4.3

Stocks of the Selected Drugs at the

Beginning, During and at the end of the Study Period

Sl. No.	Drug Name and dosage form	I	II	III	IV
1.	Tab. Aminophylline 100mg	Nil	213,750	213,750	153,750
2.	Inj. Aminophylline 250mg	13,800	9,000	22,800	1,200
3.	Cap. Ampicillin 250 mg	120,000	359,995	479,995	Nil
4.	Inj. Ampicillin 500 mg	15,000	156,731	171,731	Nil
5.	Inj. Benzyl Pencillin 10 L	88,000	158,000	246,000	7,000
6.	Co-Trimoxazole DS 160/800	10,500	86,300	96,000	2,000
7.	Tab. Co-Trimoxazole 80/400	Nil	Nil	Nil	Nil
8.	Tab. Deriphyllin 100mg.	Nil	45,000	45,000	31,000
9.	Inj. Deriphyllin 100mg.	10,000	20,600	30,600	Nil
10.	Tab. Diazepam 5mg.	Nil	308,000	308,000	178,750
11.	Inj. Diazepam 10mg.	7,600	10,280	17,880	1,200
12.	Tab. Furosemide 40 mg.	28,400	32,500	60,900	900
13.	Inj. Furosemide 20 mg.	21,400	57,825	79,225	Nil

14. Inj. Gentamicin 80 mg.	Nil	123,058	123,058	31,718
15. Tab. Glibenclamide 2.5mg.	37,000	Nil	37,000	2,000
16. Tab. Ibuprofen 200mg.	2,000	126,000	128,000	13,000
17. Inj. Insulin 40 Units	5,088	3,002	8,090	684
18. I/V Mannitol- (20%) 100 ml	9,288	4,068	13,356	Nil
19. Tab. Metoclopramide 10mg.	Nil	15,500	15,500	1,200
20. Inj. Metoclopramide 10mg.	9,892	15,000	24,892	10,700
21. Tab. Metronidazole 400 mg.	47,000	24,500	71,500	19,500
22. Inj. Metronidazole 500 mg.	Nil	40,888	40,888	600
23. Tab. Nifedipine 10mg.	Nil	102,200	102,200	87,933
24. Tab. Nifedipine 5mg.	Nil	31,000	31,000	6,900
25. Inj. Pentazocine 30mg.	9,900	28,960	38,860	20,160
26. Tab. Pheniramine 22.5mg	Nil	365,000	365,000	39,000
27. Inj. Pheniramine 45.5mg	22,000	11,850	34,250	6,250
28. Tab. Phenytoin Sodium 100mg.	63,000	200,000	263,000	150,000

29. Inj. Phenytoin Sodium 100mg.	17,000	Nil	17,000	6,250*
30. Tab. Ranitidine 150mg.	5,000	32,470	37,470	24,500
31. Inj. Ranitidine 50mg.	17,500	15,000	32,500	Nil
32. Tab. Sorbitrate 10 mg.	30,000	249,000	279,000	205,200
33. Tablet Sorbitrate S/L 5 mg.	Nil	Nil	Nil	Nil

* Date expired in August 1991 and discarded.

I - Balance on 31-3-1991. II - Supply during 1991-92
 III - Total stock 1991-92. IV - Balance on 31-3-1992

It is indeed a surprise that some dosage forms not indented have been received. For example, even though Nifedipine tablets of 5mg strength was not indented, nearly one fourth of the Nifedipine tablets supplied are of 5 mg strength as against 10 mg tablets indented. The number of 5 mg tablets issued from the store is also nearly double of the number of 10 mg tablets issued, the stock of which is lagging at 87,933 at the end of the year.

Another interesting point evident from Table 4.3 is that supplies of Pheniramine maleate were received in

the form of both injection and tablets in spite of not having been indented. An examination of the stock-register revealed that the item entered under "Avil" injection and 'Avil' tablets were Chlorpheniramine maleate injection and Chlorpheniramine maleate tablets respectively. 'Avil' is the brand name of 'Hoechst Pharmaceuticals' for Pheniramine maleate in different dosage forms. Eventhough these two compounds are chemically related antihistamines, there are differences in dosage resultant to a difference in potency and also in therapeutic use due to variation in action. Whether Chlorpheriramine maleate was issued on receiving a requisition for 'Avil' should be a matter of concern for the doctor who prescribed it, because 'Avil' is of value in emergency allergic disorders whereas Chlorpheriramine maleate is often an ingredient of cough preparations. Chlorpheniramine maleate was indented as both injection and tablets. None of the case records reviewed contained a prescription for chlorpheniramine maleate, whereas pheniramine maleate was often prescribed, by its trade name "Avil" without exception.

The annual list of indent for drugs showed nil stock of Ampicillin capsule and Ampicillin injection while vast reserves of the drug especially capsule were lying in the store. The life period of drugs and drug preparations

being a factor of crucial importance in maintaining their safety and potency, it is mandatory that the date of expiry* of each batch received is entered in the stock register. But there were many entries of receipt without mention of date of expiry. There were instances in which a whole lot of a particular drug had to be condemned as unsuitable for use and shifted to the godown. Thus more than 5000 ampoules of "Injection Avil", or Chlorpheniramine maleate, wrongly entered as Avil and overstocked as already discussed, became date expired and was discarded in April 1992, ie, just after the study period. 6250 ampoules of Injection Phenytoin Sodium also had to be condemned in this manner in September 1991, as this lot became date expired in August 1991. This has to be viewed in the light of the fact that only 20.8% of the estimated requirement of the Injection could be met by issue from the Hospital Pharmacy.

In another instance, 20 mg tablets of Sorbitrate Retard purchased in December 1991 and earlier, were not issued for use till January 1993. These incidents point to severe laxity in inventory control, since the actual

* The period for which the drug is expected to retain its potency under the conditions of storage notified by the Drugs Control Authority is indicated by the date of expiry.

picture will be magnified several fold compared to a small sample of only twenty drugs. Scarce resources could be tied up in stocking drugs which are not regularly prescribed.

4.4 Drug Distribution to I.P. Department

The quantity of a particular drug issued to the I.P. Department was obtained by reference to the stock and distribution registers. A drug is first issued from the main store/central store to the pharmacy from where it is distributed to the various departments. Table 4.4 gives the details of issue to the pharmacy and from there to IPD, for the various drugs, being studied.

Table 4.4

Stock and Issue of Drugs from the
Mainstore to the Pharmacy and I.P. Department

Sl. No.	Drug Name and dosage form	I	II	III	IV
1.	Tab. Aminophylline 100mg	213,750	153,750	60,000	37,945
2.	Inj. Aminophylline 250mg	22,800	1,200	21,600	17,130
3.	Cap. Ampicillin 250 mg	479,995	Nil	479,995	476,715

4.	Inj. Ampicillin 500 mg	171,731	Nil	171,731	169,481
5.	Inj. Benzyl Pencillin 10 L	246,000	7,000	239,000	225,250
6.	Co-Trimoxazole DS 160/800	96,800	2,000	94,800	90,150
7.	Tab. Co-Trimoxazole 80/400	Nil	Nil	Nil	Nil
8.	Tab. Deriphyllin 100mg.	45,000	31,000	14,000	12,900
9.	Inj. Deriphyllin 100mg.	30,600	Nil	30,600	24,784
10.	Tab. Diazepam 5mg.	308,000	178,750	129,250	122,962
11.	Inj. Diazepam 10mg.	17,880	1,200	16,680	15,265
12.	Tab. Furosemide 40 mg.	60,900	900	60,000	42,945
13.	Inj. Furosemide 20 mg.	79,225	Nil	79,225	76,545
14.	Inj. Gentamicin 80 mg.	123,058	31,718	71,340	71,335
15.	Tab. Glibenclamide 2.5mg.	37,000	2,000	35,000	34,750
16.	Tab. Ibuprofen 200 mg.	128,000	13,000	115,000	113,090
17.	Inj. Insulin 40 Units	8,090	684	7,406	5,776
18.	I/V Mannitol- (20%) 100 ml	13,356	Nil	13,356	13,300
19.	Tab. Metoclopramide 10mg.	15,500	1,200	14,300	14,150

20. Inj. Metoclopramide 10mg.	24,892	10,700	14,192	13,492
21. Tab. Metronidazole 400 mg.	71,500	19,500	52,000	34,000
22. Inj. Metronidazole 500 mg.	40,888	600	40,288	40,100
23. Tab. Nifedipine 10 mg.	102,200	87,933	14,267	14,200
24. Tab. Nifedipine 5mg.	31,000	6,900	24,100	24,100
25. Inj. Pentazocine 30 mg.	38,860	20,160	18,700	17,976
26. Tab. Pheniramine 22.5mg	365,000	39,000	326,000	267,000
27. Inj. Pheniramine 45.5mg	34,250	6,250	28,000	26,470
28. Tab. Phenytoin Sodium 100mg.	263,000	150,000	113,000	53,276
29. Inj. Phenytoin Sodium 100mg.	17,000	6,250	10,750	10,740
30. Tab. Ranitidine 150 mg.	37,470	24,500	12,970	12,920
31. Inj. Ranitidine 50mg.	32,500	Nil	32,500	32,305
32. Tab. Sorbitrate 10 mg.	279,000	205,200	73,800	71,170
33. Tablet Sorbitrate S/L 5 mg.	Nil	Nil	Nil	Nil

I - Total stock 1991-92 II - Balance on 31-3-92
 III - Issued to Pharmacy IV - Issued to I.P. Department

The total quantity of a drug issued to the in-patient department was not directly available from the records of the store or pharmacy. Therefore the issues to out-patient dispensary and casualty departments were summed up and subtracted from the total issue to pharmacy. This was necessitated as a result of improper maintenance of distribution registers, raising suspicions as to the actual destiny of the drugs issued from the Pharmacy.

4.5 Comparison of Actual Issue with Estimated Requirement of the drugs for I.P. Department

The following table gives a comparison of the total issue of each drug to the Pharmacy, quantity issued to Out-Patient Dispensary and casualty department, quantity of drug issued to I.P.D. and the tentative estimates of drugs for IPD prepared by review of in-patient case records.

Table 4.5

Expected Requirement, Actual Quantity Issued and
Tentative Estimates from Case Records

Sl. No.	Drug Name and dosage form	I	II	III	IV	V
1.	Tab. Aminophylline 100mg	60,000	22,055	37,945	3,274	1158.98
2.	Inj. Aminophylline 250mg	21,600	4,470	17,130	25,653	66.78
3.	Cap. Ampicillin 250 mg	47,995	3,280	476,715	912,668	52.23
4.	Inj. Ampicillin 500 mg	171,731	2,250	169,481	241,333	70.22
5.	Inj. Benzyl Pencillin 10 L	239,000	13,760	225,240	280,513	80.30
6.	Co-Trimoxazole DS 160/800	94,800	4,650	90,150	13,424	671.56
7.	Tab. Co-Trimoxazole 80/400	Nil	Nil	Nil	22,222	0
8.	Tab. Deriphyllin 100mg.	14,000	1,100	12,900	39,385	32.75
9.	Inj. Deriphyllin 100mg.	30,600	5,816	24,784	15,930	155.58
10.	Tab. Diazepam 5mg.	129,250	6,288	122,962	111,872	109.91
11.	Inj. Diazepam 10mg.	16,680	1,415	15,265	7,364	207.29
12.	Tab. Furosemide 40 mg.	60,000	17,055	42,945	18,528	231.78
13.	Inj. Furosemide 20 mg.	79,225	2,680	76,545	56,970	134.36

14. Inj. Gentamicin 80 mg.	71,340	5	71,335	130,875	54.51
15. Tab. Glibenclamide 2.5mg.	35,000	250	34,750	29,228	118.89
16. Tab. Ibuprofen 200 mg.	115,000	1,910	113,090	155,494	72.73
17. Inj. Insulin 40 Units	7,406	1,630	5,776	72,427	7.97
18. I/V Mannitol- (20%) 100 ml	13,356	56	13,300	37,800	35.19
19. Tab. Metoclopramide 10mg.	14,300	150	14,150	14,968	94.54
20. Inj. Metoclopramide 10mg.	14,192	700	13,492	13,684	98.60
21. Tab. Metronidazole 400 mg.	52,000	18,000	34,000	51,748	65.70
22. Inj. Metronidazole 500 mg.	40,288	188	40,100	59,953	66.89
23. Tab. Nifedipine 10 mg.	14,267	67	14,200	98,890	14.36
24. Tab. Nifedipine 5mg.	24,100	Nil	24,100	16,030	150.34
25. Inj. Pentazocine 30mg.	18,700	724	17,976	23,945	75.07
26. Tab. Pheniramine 22.5mg	326,000	59,000	267,000	54,435	490.49
27. Inj. Pheniramine 45.5mg	28,000	1,530	26,470	3,203	826.41
28. Tab. Phenytoin Sodium 100mg.	113,000	59,724	53,276	20,113	264.88
29. Inj. Phenytoin Sodium 100mg.	10,750	10	10,740	51,626	20.80

30. Tab. Ranitidine 150 mg.	12,970	50	12,920	83,340	15.50
31. Inj. Ranitidine 50 mg.	32,500	195	32,305	56,032	57.65
32. Tab. Sorbitrate 10 mg.	73,800	2,630	71,170	108,927	65.34
33. Tablet Sorbitrate S/L 5 mg.	Nil	Nil	Nil	34,674	0

- I - Issue to Pharmacy II - Issue to O.P.D. + Casualty
 III - Issue to I.P.Dept. IV - Estimates for I.P.Dept.
 V - Percentage of the Estimates issued to I.P.Dept.

In the case of antibiotics like Ampicillin, Gentamicin and Benzyl penicillin the yearly issuance of the drug dosage form to in-patient department falls short of the estimates prepared. But in the case of Co-Trimoxazole tablet D.S. which is also an anti-infective agent, the issuance to I.P.D. is nearly seven times the estimate. This is probably because the requisition for Tablet Co-Trimoxazole of half the strength also had to be met by Co-Trimoxazole D.S, since the former item had not been indented or purchased otherwise. Even then the quantity transferred to I.P.D. remains more than three times the combined estimates for Co-Trimoxazole D.S. and Tablet Co-Trimoxazole. In the case of Tablet Furosemide, the quantity

dispensed to I.P.D. over the year is more than twice the estimated requirement, but with respect to Injection Furosemide the distribution is limited to 134.4% of the estimate. Reverse is the trend with Diazepam Tablet and Injection. The issuance of Mannitol infusion, Tablet Deriphyllin, Injection Phenytoin, Tablet Nifedipine and Tablet Ranitidine are found to be greatly insufficient compared to the estimate, but the greatest insufficiency was found in the case of Insulin Injection, considering the fact that the quantity of this item required in out-patient dispensary is practically nil and that issued to casualty Department is negligible. In the case of Metronidazole tablet and injection, Tablet Sorbitrate (10 mg), Injection Aminophylline, Tablet Ibuprofen, Injection Pentazocine and Injection Ranitidine, the quantity dispensed to I.P.D, is between 50 % and 75 % of the estimates prepared respectively. Tablet Nifedipine was indented only in 10 mg strength, but tablets of 5 mg strength were also supplied to the extent of 63% of the total supply of this item. The substitute received as, or wrongly entered as 'Avil' in the stock register, as mentioned earlier was issued to IPD more regularly than all the other drugs included in the study. The distribution of these two items to the IPD was to the

extent of 490% and 826% of the estimates respectively for tablet and injection. Sorbitrate was not indented as sublingual tablets of 5mg strength, eventhough it is most essential in different forms of Ischaemic heart disease. The estimated requirement of 34,674 tablets was probably met by using Sorbitrate tablets of 10 mg strength. Even otherwise the quota of tablets of 10 mg strength distributed to in-patient department was deficient of the estimate by 35%. In spite of being indented in quantities, 3 times that of the estimate, and the only other outlet being casualty department, why there was such stringency in releasing large stocks of the drug is beyond understanding. Reasonable precision in the estimates and acutal issue to I.P.D. were observed in the case of Tablet Diazepam, Tablet Glibenclamide, Tablet Metoclopramide and Injection Métoclopramide.

The estimates for drugs were prepared in this study assuming 100% rationality in the prescribing habits of clinicians. Any extent of irrationality in prescribing can be judged only by specialists in the respective fields of clinical practice, in the context of the patients' condition at the time when a drug is prescribed. Irrationality would only add to the unnecessary expenditure

on drugs. Delay in diagnosing, improper information, lack of documentation of diagnosis and unreliable results of laboratory tests often worsens the situation.

4.6 Expenditure on the Selected Drugs

At this stage it is worthwhile examining the amount spent on drugs and the extent to which such expenditure on drugs could be confined to actual needs. The quantity of drugs purchased/ received during the year were used for calculating drug expenditure as per the rates mentioned in the annual indent and compared with the actual amount spent. This disparity in price between rate contract and actual purchase was created by delay in supply or lack of supply leading to extemporaneous purchase of drugs from local medical distributors. Thus whenever supply of medicines fell short of orders placed, the hospital authorities resorted to local purchase of medicines at or near retail price. This situation led the hospital to incur an extra expenditure on drugs. On the contrary some firms supplied drugs indented in previous years at a lower rate during the current year. This led to an apparent reduction in expenditure in the current year. In order to study the extent of these anomalies, the amount payable at contract

rate and at retail price were compared with the actual amount spent on a drug over the year. This data is presented in Table 4.6.

Table 4.6
Expenditure^{*} on Individual Drugs at Rates of
Indent, Retail Price^{} and Actual Purchase**

Sl. No.	Drug Name and dosage form	I	II	III	IV
1.	Tab. Aminophylline 100mg	18,169	20,306	19,205	+5.7
2.	Inj. Aminophylline 250mg	18,450	22,500	18,450	0
3.	Cap. Ampicillin 250 mg	280,436	622,791	377,784	+34.71
4.	Inj. Ampicillin 500 mg	868,290	1183,319	930,590	+7.18
5.	Inj. Benzyl Pencillin 10 L	647,800	774,200	655,715	+1.22
6.	Co-Trimoxazole DS' 160/800	63,431	111,154	58,062	-8.46
7.	Tab. Co-Trimoxazole 80/400	Nil	Nil	Nil	Nil
8.	Tab. Deriphyllin 100mg.	5,175	7,920	5,382	+4.0
9.	Inj. Deriphyllin 100mg.	36,174	37,698	32,680	-9.66
10.	Tab. Diazepam 5mg.	4,928	118,580	20,651	+319.05
11.	Inj. Diazepam 10mg.	14,392	30,809	22,110	+53.63

12. Tab. Furosemide 40 mg.	5,720	7,605	6,643	+16.14
13. Inj. Furosemide 20 mg.	71,125	100,615	71,532	+0.57
14. Inj. Gentamicin 80mg.	566,067	774,035	588,705	+4.00
15. Tab. Glibenclamide 2.5mg.	Nil	Nil	Nil	Nil
16. Tab. Ibuprofen 200mg.	17,010	45,486	18,316	+7.68
17. Inj. Insulin 40 Units	44,280	81,955	64,568	+45.82
18. I/V Mannitol- (20%) 100 ml	32,544	38,239	51,532	+58.35
19. Tab. Metoclopramide 10mg.	2,246	6,293	2,364	+ 5.25
20. Inj. Metoclopramide 10mg.	14,040	30,450	14,040	0
21. Tab. Metronidazole 400 mg.	6,492	14,896	6,492	0
22. Inj. Metronidazole 500 mg.	367,992	547,490	400,642	+8.87
23. Tab. Nifedipine 10mg.	43,823	55,188	57,314	+30.79
24. Tab. Nifedipine 5mg.	Nil	12,694	8,680	-
25. Inj. Pentazocine 30mg.	107,152	150,062	115,332	+7.63
26. Tab. Pheniramine 22.5mg	Nil	38,690	10,439	-
27. Inj. Pheniramine 45.5mg	Nil	20,500	16,404	-
28. Tab. Phenytoin Sodium 100mg.	10,400	46,740	10,816	+4.0
29. Inj. Phenytoin Sodium 100mg.	Nil	Nil	Nil	Nil

30. Tab. Ranitidine 150mg.	51,069	61,174	53,305	+4.38
31. Inj. Ranitidine 50mg.	Nil	Nil	Nil	Nil
32. Tab. Sorbitrate 10 mg.	9,207	9,286	9,213	+0.06
33. Tablet Sorbitrate S/L 5 mg.	Nil	7,440	7,306	-

* Calculated for the quantity of drugs actually supplied/purchased during the year, 1991-'92.

** Variable, depending on the manufacturer.

- I - Drug Expenditure at the rate of Indent in Rupees.
- II - Drug Expenditure at the rate of Retail in Rupees.
- III - Actual Expenditure incurred in Rupees.
- IV - Percentage change in Actual Expenditure over Indent Rate.

It can be seen that only four of the 33 dosage forms were actually procured at the rate fixed by contract, ie, tablet Metronidazole 400 mg, Injection Aminophylline, Injection Metoclopramide and Tablet Sorbitrate 10 mg. In fact Tablet Metronidazole 400 mg was supplied at less than half the retail price. There is reason to doubt that some lots of Metronidazole Tablets supplied were of strength, 200 mg as compared to the Tablets of 400 mg strength actually indented. Tablet Co-Trimoxazole D.S had also been procured at a rate lower than that fixed by indent. But in

the case of tablet Sorbitrate, the purchasing price is not significantly different from the retail price. In two cases-I/V Mannitol infusion and tablet Nifedipine 10mg, the price paid were even higher than the retail price. These are instances where local purchasing led to an increase in drug expenditure. The highest change in purchasing price over indent rate has occurred in the case of Tablet Diazepam. Tablet Pheniramine and Injection Pheniramine had been supplied at rates fixed for Tablet Chlorpheniramine and Injection Chlorpheriramine respectively, and in the case of the tablet, this is nearly one fourth of the retail price for Tablet 'Avil'(Pheniramine).

Rate of	1	2	3	4
Indent (Rs)	-	0.018	-	1.30
Retail (Rs)	0.106	-	1.73	-
Actual (Rs)		0.028		1.38

1 - Tablet Pheniramine

2 - Tablet Chlorpheniramine

3 - Injection Pheniramine

4 - Injection Chlorpheniramine

The overall picture is one of general negligence towards a matter that needs most efficacious management. In spite of the efforts made by the Therapeutic Committee, the Central Purchase Committee had failed to ensure supply of the indented items in time, resulting in additional expenditure on drugs.

CHAPTER 5**ACTUAL AND POTENTIAL SAVINGS:****ON SOME PROBLEMS IN EFFECTIVE SUPERVISION**

The usefulness and significance of a drug utilisation review programme in reducing drug expenditure has been described by Hoffman⁵⁶. In the present study, the appropriateness of procurement of drugs used in a teaching hospital is studied in an in-patient setting. Quantification of drug-use in hospitals is necessary for justification of the large resource allocation for drugs in the government - owned health institutions and other acute care centres. Clinical indication and cost of acquisition are important aspects of drug utilization. The prescribing patterns of medical practitioners and the varying strategies and methods followed by the institution heads to control and modify prescribing behaviour also have a role in deciding the overall cost of medication. The medication use begins with the patients admission to the hospital and includes various decisions and documentations that govern drug-use till the patient is discharged. Medication use is also associated with organisational structures and processes such as Pharmacy and Therapeutic Committee,

system of recording medication errors, infra-structural facilities and information dissemination among consultants and other health workers.

The objective of this study was to carry out a descriptive, retrospective illustration of the processes of prescription, procurement and distribution of drugs at the Medical College Hospital, Thiruvananthapuram. Some major diseases treated by institutionalisation at the hospital (excluding accidents and injuries, and conditions indicative of surgical intervention, but including antibiotic prophylaxis in surgery) were selected for the study. These conditions accounted for more than 10% of the total admissions to the hospital over a 12 months period. Attempts were made to identify twenty drugs that are most commonly used in the hospital in the treatment of the above conditions besides others and tentative estimates for the annual requirement of these drugs were prepared by a review of in-patient case records. Prescription analysis required manual retrieval of medical records of patients from the documentation section where they are filed according to the in-patient register numbers. Manual review of the treatment sheets were most time-consuming. Besides drug prescription information, information on patient details, admitting diagnosis, further diagnostic procedures

employed, working diagnosis established, outcome of treatment and discharge prescriptions were available from these case records.

The system of procurement of drugs was reviewed in the light of requirement of drugs arrived at by review of case records. The methods used to detect inappropriateness, if any, in the procurement and distribution of drugs included review of pharmacy purchases, pharmacy issues and drug distribution to the in-patient department. Pharmacy purchases were determined from invoice/delivery registers and stock registers. This information, although a necessary document for general financial control was found to be incomplete. The purchases data were manually recorded in terms of number of units of drugs purchased and amount paid for such purchases at a particular rate per unit. Pharmacy issues to designated areas such as out-patient dispensary, wards, operating theatres, casualty department, blood bank and laboratories were recorded in distribution registers and the indent books of respective ward/department.

Although data were collected retrospectively from hospital records, many difficulties were encountered due to incompleteness of information, lack of specified documentation system, especially with respect to purchases and the absence of a prospective data-recording system. The

applicability of these methods were thus partially hindered by lack of computerisation of medical records and pharmacy files, and also by limitation in time available for manual review of records.

Available data on purchases and clinical medication charts were used to develop significant information on drug-use patterns that existed at the hospital. It forms a basis for planning drug purchasing decisions for the efficient use of limited resources.

Considering the scale on which modern drugs are used throughout the world, there is no disagreement that they are both necessary and beneficial. The drug use pattern is influenced by the type of health care system, the spectrum of morbidity and mortality and other organisational and administrative factors besides availability of resources. The hospital chosen for the study was one which possessed a unique position among the hospitals under government control in the state of Kerala. But at the same time, the public and media had expressed wide concern over the issue of drug procurement and distribution in the hospital. Confidence in the prescribed drugs was likely to be eroded away by repeated reports of mismanagement, and fear of drug-induced damage to human life. Therefore deployment of resources to ensure

reasonable availability of safe and effective drugs had to be justified by a deliberate attempt to take into stock, the actual situation and events that led to it.

In recent years, increased awareness of the cost of medical care has led to a major review of various aspects of health costs. The drug expenditure has often attracted attention since, unlike many other hospital expenses, it is expected to be readily identifiable in terms of cost and prescriber. A restrictive drug-list is also considered as a means whereby the economic burden of drug-prescribing can be reduced.

A major factor in the uniqueness of a hospital is its organisational structure. There is a formalised pattern of authority, responsibility and co-ordination which affects each and every department of the overall health care system. In addition to the internal forces operating within the hospital, there are some external forces which affect, in various ways, the drug procurement policies and decisions, in a hospital setting. It is within this framework that the hospital authorities have to manage men, money and materials, in order to develop a comprehensive and well co-ordinated pharmaceutical service to meet the needs of the numerous diagnostic and therapeutic departments, in the interest of better patient care. This

requires special education and training of the personnel, if they are to function with maximum effectiveness.

Effects of educational, informational and regulatory programmes in health care can be measured indirectly by drug utilisation data, as it can indicate the overuse, under-use or misuse of individual drugs or therapeutic classes of drugs⁵⁷. In this context the role of hospital formularies - their objectives and value - have come to be accepted as a result of continued debate. Their influence on prescribing has been shown to grow. The Therapeutic Committee of the hospital under study had considered and designed a recommended drug list for use of the hospital personnel. Besides continuing education of the health professionals, identification and restriction of unnecessary drug expenditure is also an objective of the formulary system as it can discourage the development, procurement and use of "me-too" drugs thus directing the practitioners attention to therapeutic needs rather than commercial innovations. At the same time, the doctor preserves his right to prescribe what is appropriate for his patient. Compliance of the prescribes with the hospital formulary was optional, but the survey of prescriptions pointed to a high rate of response to this informational as well as regulatory programme.

Experience of the Thiruvananthapuram Medical College Hospital leaves no doubt that initiating and sustaining a hospital formulary with a limited number of drugs is of vital importance in optimising drug use. There can be little argument with the recommendation that the cheaper of two drugs should be selected where compounds are similar in terms of efficacy and adverse reactions. Likewise generic substitution is also advisable provided there is bio-equivalence. It has become increasingly difficult for hospitals to stock all the drugs currently available, and here again a limited drug list can produce significant savings by restricting the stock held. This will also enable to reduce purchasing costs by competitive tendering. These measures have had an influence on containing drug costs although these savings have often been lost by local purchasing in emergencies and when doctors prescribed newer agents available in the market. The combined efforts of the clinicians and administrators were rendered partly futile by a defective system of supply which could not ensure regular availability of drugs, thus necessitating the local purchasing of drugs at much higher price than the prices fixed by the Central Purchase Committee⁵⁸. The Comptroller and Auditor General of India in his report for the year ending March 1993 has firmly

criticised the procedure and practice of purchase of drugs, their distribution and stores control* in the medical college hospitals in the state.

The insufficiencies of the present system of purchasing has made a persuasive case for the adoption and stringent adherence to a shorter list of drug supplies, as other basic needs compete for available resources. It is also important to ensure that local pharmaceutical production and formulation plants, especially in the government sector, operate in consonance with regional needs⁵⁹. Technical norms and training programmes have to be geared up to promote effective quality control. The use of generic drugs has to be motivated, primarily for economic reasons, but this should not be achieved at the expense of adequate treatment. There has been a controversy as to whether the bioavailability of generic drugs are equivalent to that of branded products. But the exponents of the view that generic drugs are inferior have not been able to produce convincing evidence to sustain their arguments.

*

No regular system of physical verification of medicines with reference to book balance existed in the stores during the period covered by the review. The date of expiry of medicines was also not noted in the stock registers and no periodical verification was conducted to segregate time-expired medicines. In the Medical College Hospital, Thiruvananthapuram, verification of medicines in medical stores conducted in December 1992 revealed huge stock of time-expired medicines dating back to 1954.

Estimates for the total requirement of selected drugs for the IP departments of the hospital were prepared by reviewing two samples of the in-patient case records - one of a cross sectional nature and the other pertaining to ten selected disease conditions representing a sub population of in-patients. The actual pharmaceutical costs were also compared by item series with the costs that the Hospital would have incurred if the suppliers had fulfilled their contracts with respect to time of supply and quantity supplied. Table 5.1 gives a comparison of the quantity indented and that actually supplied or purchased during the year.

Table 5.1

**Comparison of the Quantities of Drugs Indented and
that actually Supplied / Purchased**

Sl. No.	Drug Name and dosage form	I	II	III	IV
1.	Tab. Aminophylline 100mg	250,000	75,000	213,750	35.09
2.	Inj. Aminophylline 250mg	15,000	9,000	9,000	100.00
3.	Cap. Ampicillin 250 mg	1000,000	250,000	359,995	69.45

4.	Inj. Ampicillin 500 mg	400,000	33,000	156,731	21.06
5.	Inj. Benzyl Pencillin 10 L	300,000	42,000	158,000	26.58
6.	Co-Trimoxazole DS 160/800	100,000	22,500	86,300	26.07
7.	Tab. Co-Trimoxazole 80/400	-	-	-	-
8.	Tab. Deriphyllin 100mg.	50,000	45,000	45,000	100.00
9.	Inj. Deriphyllin 100mg.	30,000	15,100	20,600	73.30
10.	Tab. Diazepam 5mg.	100,000	80,000	308,000	25.97
11.	Inj. Diazepam 10mg.	10,000	6,000	10,280	58.37
12.	Tab. Furosemide 40 mg.	300,000	30,000	32,500	92.31
13.	Inj. Furosemide 20 mg.	100,000	21,600	57,825	37.35
14.	Inj. Gentamicin 80 mg.	150,000	17,816	123,058	14.48
15.	Tab. Glibenclamide 2.5mg.	20,000	Nil	Nil	0
16.	Tab. Ibuprofen 200mg.	200,000	60,000	126,000	47.62
17.	Inj. Insulin 40 Units	12,000	Nil	3,002	0
18.	I/V Mannitol- (20%) 100 ml	37,500	Nil	4,068	0
19.	Tab. Metoclopramide 10mg.	25,000	15,000	15,500	96.77

20. Inj. Metoclopramide 10mg.	15,000	15,000	15,000	100.00
21. Tab. Metronidazole 400 mg.	100,000	24,500	24,500	100.00
22. Inj. Metronidazole 500 mg.	50,000	Nil	40,888	0
23. Tab. Nifedipine 10mg.	125,000	3,780	102,200	3.70
24. Tab. Nifedipine 5mg.	-	-	31,000	0
25. Inj. Pentazocine 30mg.	30,000	27,500	28,960	94.96
26. Tab. Pheniramine 22.5mg	-	-	365,000	0
27. Inj. Pheniramine 45.5mg	-	-	11,850	0
28. Tab. Phenytoin Sodium 100mg.	250,000	200,000	200,000	100.00
29. Inj. Phenytoin Sodium 100mg.	5,000	Nil	Nil	-
30. Tab. Ranitidine 150mg.	50,000	29,500	32,470	90.85
31. Inj. Ranitidine 50 mg.	15,000	Nil	Nil	-
32. Tab. Sorbitrate 10 mg.	300,000	99,000	249,000	39.76
33. Tablet Sorbitrate S/L S/L 5 mg.	-	-	-	-

- I - Quantity Indented
 II - Quantity Supplied at rate of Indent
 III - Total Quantity Supplied / Purchased
 IV - The percentage supplied at rate of Indent

The cost of pharmaceutical supplies to IPD could also be allocated based on patient utilisation data and a suitable weighting scheme as given in Chapter 3. Table 5.2 gives the cost of purchasing the selected drugs at the rate of indent and retail price based on the estimates for the inpatient department. The table also indicates the percentage saving on retail price that could be achieved if the estimated quantity was supplied solely at the rate of indent.

Table 5.2.

**Cost of Purchasing Estimated Drug Requirements
at the rate of Indent and at Retail Price**

Sl. No.	Drug Name and dosage form	I	II	III	IV
1.	Tab. Aminophylline 100mg	3,274	278	311	10.51
2.	Inj. Aminophylline 250mg	25,653	52,589	64,133	18.00
3.	Cap. Ampicillin 250 mg	912,668	710,968	1578,916	54.97
4.	Inj. Ampicillin 500 mg	241,333	1336,985	1822,064	26.62
5.	Inj. Benzyl Pencillin 10 L	280,513	1150,103	1374,514	16.33

6.	Co-Trimoxazole DS 160/800	13,424	9,867	17,290	42.93
7.	Tab. Co-Trimoxazole 80/400	22,222	-	15,778	100.00
8.	Tab. Deriphyllin 100mg.	39,385	4,529	6,932	34.65
9.	Inj. Deriphyllin 100mg.	15,930	27,973	29,152	4.00
10.	Tab. Diazepam 5mg.	111,872	1,790	43,071	95.84
11.	Inj. Diazepam 10mg.	7,364	10,310	22,070	53.28
12.	Tab. Furosemide 40 mg.	18,528	3,261	4,336	24.79
13.	Inj. Furosemide 20 mg.	56,970	70,073	99,128	29.31
14.	Inj. Gentamicin 80 mg.	130,875	602,025	823,204	26.87
15.	Tab. Glibenclamide 2.5mg.	29,228	1,827	3,654	50.00
16.	Tab. Ibuprofen 200mg.	155,494	20,992	56,133	62.60
17.	Inj. Insulin 40 Units	72,427	1068,298	1977,257	45.97
18.	I/V Mannitol- (20%) 100 ml	37,800	302,400	355,320	14.89
19.	Tab. Metoclopramide 10mg.	14,968	2,169	6,077	64.31
20.	Inj. Metoclopramide 10mg.	13,684	12,808	27,779	53.89
21.	Tab. Metronidazole 400 mg.	51,748	13,713	31,463	56.42

22. Inj. Metronidazole 500 mg.	59,953	539,577	802,771	32.79
23. Tab. Nifedipine 10mg.	98,890	42,404	53,401	20.59
24. Tab. Nifedipine 5mg.	16,030	-	6,564	100.00
25. Inj. Pentazocine 30mg.	23,945	88,597	124,076	28.59
26. Tab. Pheniramine 22.5mg	54,435	-	5,770	100.00
27. Inj. Pheniramine 45.5mg	3,203	-	5,541	100.00
28. Tab. Phenytoin Sodium 100mg.	20,113	1,046	4,700	77.75
29. Inj. Phenytoin Sodium 100mg.	51,626	41,300	65,565	37.00
30. Tab. Ranitidine 150mg.	83,340	131,077	157,013	16.52
31. Inj. Ranitidine 50mg.	56,032	98,056	168,096	41.67
32. Tab. Sorbitrate 10 mg.	108,927	10,130	10,217	0.85
33. Tablet Sorbitrate S/L 5 mg.	34,674	-	1,720	100.00

- I - Estimated requirement for I.P.D.
- II - Expenditure for the Estimate at the rate of Indent in Rupees.
- III - Expenditure at retail price in Rupees.
- IV - Percentage saving possible by Indenting

These drugs account for 22.6 percent of the total expenditure on Pharmaceutical supplies during the year 1991-'92.

In this study we have not taken into account the severity of disease for each case record studied as it is indirectly reflected in the number, quantity and type of drugs prescribed⁶⁰, assuming a reasonable extent of rationality in prescribing. Many of the cases admitted to the hospital being of a complicated nature, consistent with the referral status of the hospital, the use of standard treatment protocols⁶¹ for analysis of drug expenditure was considered inappropriate due to wide deviations often necessitated in the pattern of prescribing. The number of drugs used for individual patients can be reduced to some extent by improving the patients' compliance with what is prescribed. Non compliance was considered to be minimum in the case of in-patients as the drugs are administered by health workers on duty.

The number of prescriptions for anti infective agents were quite alarming. Many prescriptions for antibiotics were not justified by therapeutic indications but were for prophylactic use or empirical treatment. Development of antibiotic resistance by pathogenic

bacteria, being a major concern for health professionals the world over⁶²⁻⁶⁴, the unrestricted use of antibiotics have to be viewed with alarm. It is also necessary to ensure that hospital acquired infections are kept to a minimum by adopting proper standards of cleanliness, because antibiotics are not the alternative to effective sterilization of hospital equipment and proper maintenance of operation theatres.

Trading in counterfeit medicines is often reported and it is more so when it comes to drug supplies to government hospitals. Complaints about products from the public sector undertakings are as common as those from private manufacturers. Many of these products can be rapidly weeded out if health professionals develop a higher index of suspicion. Shortcomings in the standards of product labelling and packaging errors can be easily revealed by routine checking of samples, from lots supplied. But on several occasions the complaints of poor quality of government sector products were just conjured up due to some prejudices as to their efficacy. An example cited is that of Diazepam Tablets, but chemical analysis as well as bio-availability studies proved that the complaints were invalid. In any case supply of drugs not conforming to the standards specified by the Therapeutic Committee has to

be prevented by tightening the necessary administrative and control measures.

Eventhough information obtained through such studies can be useful for decision making, it is not unusual to encounter some methodological stumbling blocks. It is especially so when the study sites are government hospitals and the research is done by non-medical personnel. For some reason or other, the medical records of patients, though incomplete in several cases, were more easily accessible than the details of drug procurement and distribution. Drugs being one of the largest components of recurrent cost in a hospital, drug expenditure needs particular attention, and the allocation of drug expenditure is more difficult than the allocation of other costs. The records of drugs and other items supplied to the store and dispersed to the various departments and wards were not properly maintained, making it all the more difficult to assess drug utilisation. The study envisaged on a much larger scale had to be restricted to this present form due to this incompleteness of information, rendering the time spent on much data collection futile.

Evidence of financial benefits or losses are more evasive. Analysis of trends in drug-expenditure is notoriously unreliable as they may be influenced by many

extraneous factors such as delays in processing invoices, variation in stock levels, changes in specialities of the hospital, number of in-patients in each unit and even the appointment of new staff or substitution of the existing ones. It is difficult to compensate for all these variables unless the drug expenditure statements of the hospital are sufficiently detailed. Nonetheless timely evidence of inefficient management of resources is imperative for the initiation of necessary steps to curtail wasteful practices.

Certain features of the current system of drug procurement point to losses for the government. These include:

1. lack of a suitable quality assurance system,
2. prices higher than as per purchase order of the CPC,
3. disparity between the type of drugs prescribed and those purchased, as in the case of Pheniramine maleate and Chlorpheniramine maleate, and
4. delay in supply or only partial fulfilment of the contract for supply of drugs by the firms.

Inefficiency of inventory control and absence of periodic stock verification and monitoring adds to these losses.

On the other hand the system of competitive tendering and bulk purchasing are found to be advantageous, as there is a difference between the price paid by the hospital and the retail price. This constitutes a saving as far as the patients are concerned, and a net saving for the society as a whole. Even when local purchasing had to be resorted to as supplies fell short of indented quantities, a gap was maintained between the retail price and average price actually paid, for most of the drug dosage forms studied. This represents a reduction in health expenditure for the State.

Some indication of the financial benefits or otherwise can be inferred by examining expenditure on selected drugs as done in this study. Special inventory attention can be directed towards items that account for a large proportion of the funds spent- as in the case of anti-infective drugs. Since the studies of drug expenditure and utilization in a developing country like India are handicapped by poor data, it is necessary to use methods that permit the analysis to continue in the face of imperfect information, but at the same time reflect as precisely as possible, the real state of affairs. In the small scale, descriptive study carried out here, all

efforts were placed on getting relevant information from a single large representative hospital. The results obtained can provide valuable feed back on drug use that is self evident. Identification of areas of most wasteful management or lack of management and timely intervention to correct such practices can lead to major savings in drug expenditure.

As far as Kerala is concerned, the quatitative expansion of health care facilities has been phenomenal and it is far ahead of India as a whole (106 institutions/1000 sq.km of area as against 12 for all India in 1989, and 257 beds per lakh of population as on 1989 as per 1991 population, compared to 74 beds per lakh for all India). With such expansion of facilities and greater awareness resulting from a high rate of literacy (greater than 90% in 1990) public attention has turned to the quality of health care provided.

The state government has been spending between 11 and 16% of its revenue on the provision of health facilities, free of cost to its population which is assessed as 291 lakhs according to the 1991 census. The increase in population over the years have necessitated an increase in the health expenditure, in addition to the inflationary tendency of medical care. The trend in

developmental expenditure of the Medical and Public Health Department is as follows:

Table 5.3

**Trend in Developmental Expenditure of the Medical
and Public Health Department.**

Year	Population (lakhs)	Expenditure (Rs. lakhs)	% to Total Expenditure
1985-86	275	12,055	11.63
1986-87	280	14,375	12.89
1987-88	285	16,653	14.32
1988-89	289	21,420	15.76
1989-90	294	23,956	16.40
1990-91	298	27,850	15.45
1991-92	291	29,200	14.83

Source:- Government of Kerala, Budget in Brief (1993-94)

This escalation in health expenditure, added to the demand for better facilities, has put the state government in a difficult position. Besides, the fact that the government is going through a fiscal crisis has made it necessary to devise a system of cost-recovery of the services rendered from its beneficiaries, based on their ability to pay. The revenue thus yielded can be directly utilised by the Hospital Development Committee for further

improving the system of supply of drugs. This will also help to decentralise the system of procurement of drugs one step further, as the hospitals become capable of purchasing life-saving drugs and other essential items with this income.

The High Power Committee appointed by the Government of Kerala had recommended a charging system for hospital services other than drugs, which the government is trying to enforce at present. Resistance from political parties and public was inevitable but contained. The same concept of cost-recovery can be extended to the supply of drugs from government hospitals in an attempt to lighten the burden on drug expenditure. It has become evident that even a nominal charge can reduce the tendency of the public to make wasteful use of services rendered⁶⁵. A similar system of differential pricing can be formulated and applied depending on the type of drug and its essentiality in addition to the paying capacity of the patient⁶⁶. The people may be classed into four or more groups for this purpose based on some criteria that indicates their ability to pay. The poorest of the classes can be allowed complete exemption from payment where as the most well to do class will have to pay the full cost of medication. The intermediate classes can be charged in a graded manner on a

zero to one scale. User fees will become acceptable as resultant improvement in facilities begin to manifest itself. A less crowded hospital and greater availability of drugs and other hospital supplies will be appreciated, as indicated by a greater tendency of even the poorer sections of the people to avail the facilities offered by private hospitals in the state. The study by Kannan et al.(1991),has revealed that only 30% of the poor of the population make use of the services rendered by government hospitals. This points to the fact that quality of care is what is expected by the public at present, and even the poorer classes will offer little resistance to a nominal pricing for improved care.

The wasting of society's resources on unnecessary care represents a welfare loss and any policy that reduces this waste through the elimination of such care represents a welfare gain. A system of charging for drugs supplied can be considered as welfare enhancing for the same reason. The differential pricing, will at the same time ensure equality of access to medical care, from a distributive point of view.

Such a study can be extended to other teaching hospitals in the state under the control of the DME and to the hospitals under DHS in a district-wise manner, as the

drug supplies are indented and purchased for each district by the respective District Medical Officers. Routine verification of stocks and continuous monitoring of the distribution system will also necessitate proper maintenance of records and issue registers. Greater transparency and public accountability of the system can be achieved only by imposing stringent control measures. The firms affiliated to the Central Purchase Committee will also become more alert if greater competition is allowed by including more firms in the C.P.C list of firms as envisaged by the government at present. This will itself lower the prices quoted and also reduce the incidence of failure of the firms to supply drugs in time. This is necessitated by the fact that there was a sharp decline in supply of drugs by the CPC firms year by year. In the study year, ie, 1991-'92, six CPC firms had supplied only 36 to 64% of the orders placed for the five Medical College Hospitals, under DME.

The methodology used in this study can be modified and adapted depending on the morbidity data of patients treated in a hospital and the extent and type of drugs prescribed. It is especially useful in the case of large hospitals with a wide spectrum of morbidity or a group of hospitals having a uniform pattern of morbidity and

similar organisational features. The entire range of in-patient/out-patient diagnoses can be compressed into a manageable, yet medically meaningful number of categories based on various patient attributes. This method called DRG (Diagnosis Related Group) takes into consideration attributes such as age, primary diagnosis, primary surgical procedure, secondary diagnosis (if present) and secondary surgical procedure if present. Thus it is possible to describe a hospital's case-mix on a common basis, and to compare drug therapy for the major categories of diagnoses. A system of continuous monitoring of drug utilization will be more meaningful than isolated studies and therefore, drug utilization study-groups can be set up in major hospitals⁶⁷.

Finally, it should be made mandatory for any hospital to maintain detailed records of drugs and other material expenses so that it will become easy to arrive at the figures required by the budget. It is also highly desirable to accumulate upto date statistical data for obtaining the base figures. Purchasing information can also be adapted by governments in assisting them to develop National Formularies and in formulating drug-licensing systems.

APPENDIX - 1

The Distribution of beds in MCH, Trivandrum.

Sl. No.	Speciality / Ward	No. of Beds
1.	Medicine	240
2.	Surgery	240
3.	Orthopaedics	120
4.	E N T	30
5.	Dermatology	38
6.	Cardiology	30
7.	Cancer	122
8.	Medical Gastroenterology	20
9.	Surgical Gastroenterology	20
10.	Medical Neurology	28
11.	Surgical Neurology	20
12.	Urology	24
13.	Thoracic IC	4
14.	Dental	10
15.	Endocrinology	10
16.	Casualty	20
17.	Plastic Surgery	20
18.	Thoracic Surgery	35
19.	Psychiatry	20

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Sl. No.	Speciality / Ward	No. of Beds
20.	Physical Medicine	30
21.	Nephrology	20
22.	Infectious Diseases	16 + 4 for AIDS
23.	Tetanus	2
24.	Cell Room	5
25.	Staff Room	8
26.	Student Room	5
27.	Nurses Room	4
28.	Neuro I.C.	6
29.	Radiology	10
30.	Haematology	15
31.	Medicine Pay Ward	15
32.	Surgery Pay Ward	15
33.	KHRWS Pay Wards	150
34.	I C C U	10
35.	N C I C U	10
		1376

APPENDIX - 2

Number of Doctors working in various Departments

Sl. No.	Department/Speciality	No. of Doctors
1.	General Medicine	31
2.	Haematology	2
3.	Infectious Diseases	3
4.	Cardiology	7
5.	TB and Respiratory Diseases	7
6.	Neurology	7
7.	Gastroenterology	6
8.	Dermatology & Venerology	11
9.	Psychiatry	8
10.	Radio-diagnosis	9
11.	Nuclear Medicine	1
12.	General Surgery	31
13.	Orthopaedics	13
14.	Thoracic Surgery	7
15.	Neuro Surgery	7
16.	Plastic Surgery	6
17.	Genito-urinary Surgery	5
18.	Gastro Surgery	4
19.	E N T	11
20.	Physical Medicine	7

Sl. No.	Department / Speciality	No. of Doctors
21.	Nephrology	5
22.	Endocrinology	2
23.	Radio Therapy	11
24.	Anaesthesiology	28
25.	Ophthalmology	14
26.	Blood Bank	2
27.	Central Research Lab	1

		246
		=====

Note: The Departments of Ophthalmology, and TB & Respiratory diseases are separate from the main hospital and situated away from the Medical College Campus.

APPENDIX - 3

Number and Designation of Para-medical Staff

Sl.No.	Designation	No. of Posts
1.	Superintendent	1
2.	Deputy Superintendent	2
3.	R M O	1
4.	A R M O	1
5.	Nursing Superintendents	5
6.	Head Nurse	105
7.	Staff Nurse	275
8.	Dietician	1
9.	Radiographer	10
10.	X-ray Technician	10
11.	Lab Technician	23
12.	Nursing Assistants	225
13.	Blood Bank Technician	3
14.	Junior Lab Assistants	10
15.	Pharmacists	20
16.	Chemist	1
17.	Treatment Organiser	1
18.	Urban Health Educator	1
Total Number		695-
Medical Administrators		5

		690
		=====

APPENDIX - 4

Number and Designation of Non- Medical Staff

Sl. No.	Designation	No. of Posts
1.	Lay Secretary & Treasurer	1
2.	Junior Superintendent	3
3.	Cashier	1
4.	U D Clerk	10
5.	Typist	5
6.	Confidential Assistant	1
7.	Lower Division Clerk	15
8.	Peons	16
9.	Hospital Attendant, Gr-I & II	330
10.	Enquiry Officer	1
11.	Receptionist	1
12.	Sargeant	2
13.	Theatre Mechanics	6
14.	Driver	7
15.	X-Ray Attendants	12
16.	Hospital Attendant Gr- III	40
17.	A C Operator	14
18.	Power Laundry Attendants	15
19.	Telephone Operator	6

S1. No.	Designation	No. of Posts
20.	Stores Superintendent	1
21.	Diet Store Keeper	1
22.	Foreman	1
23.	Asstt. Foreman	2
24.	Theatre Mechanics Gr-Ii	3
25.	Cook Grade-I	4
26.	Cook Grade-II	14
27.	Barber (M & F)	3
28.	Dhobi	10
29.	Painter	1
30.	Tailor	2
31.	Lift Operator	12
32.	Plumber	1
33.	Junior Operator	1
34.	Boiler Attendant	1
Total Number		543

Appendix - 5
Therapeutic Categories of Drugs Included in
the Hospital Formulary

Sl. No.	Category	No. of Items
1.	Anaesthetics	16
2.	Analgesics, Antipyretics and Anti-inflammatory agents	16
3.	Antacids & Anti-peptic ulcer drugs	5
4.	Anti-asthmatics	10
5.	Anthelmintics & Anti-parasitic Drugs	14
6.	Anticholinergic drugs	6
7.	Anticonvulsants	9
8.	Antidiabetics	7
9.	Antidiarrhoeals	4
10.	Antihistaminics & Antiemetics	9
11.	Anti-infectives	47
12.	Antileprotics	7
13.	Antineoplastic drugs	22
14.	Antiparkinsonian drugs	3
15.	Antitubercular drugs	6
16.	Cardiovascular drugs	52
17.	Chelating Agents & Antidotes	11
18.	Cholinergic drugs	4

Sl. No.	Category	No. of Items
19.	Coagulants & Anticoagulants	7
20.	Diagnostic Agents	20
21.	Diuretics	7
22.	Electrolytes & Plasma Expanders	29
23.	E.N.T. Preparations	4
24.	Hormones	4
25.	Hypnotics	5
26.	Laxatives	3
27.	Muscle Relaxants	7
28.	Ophthalmic Preparations	27
29.	Respiratory Stimulants	2
30.	Steroidal drugs	8
31.	Thyroid & Antithyroid drugs	2
32.	Topical Preparations	15
33.	Tranquilisers & Antidepressants	30
34.	Antiseptics & Disinfectants	10
35.	Urinary Antiseptics	2
36.	Uterine drugs	3
37.	Vaccines & Sera	16
38.	Vitamins	22
39.	Miscellaneous Pharmaceuticals	6
40.	Drugs & Chemicals	62

Sl. No.	Category	No. of Items
41.	Surgical Dressings	49
42.	X-Ray Materials	50
43.	Surgical Gloves Needles & Syringes	52
44.	Catheters & infusion sets	57
45.	Surgical Sutures - I	60
46.	Surgical Sutures - II	63
Total Number of Items		870

Appendix - 6

**Morbidity and Mortality Pattern of
Trivandrum, Medical College Hospital,
during the year 1990**

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
001	3	6	9	2	7	-	-
002	184	90	274	41	214	11	8
004	44	43	87	9	74	3	1
005	6	3	9	5	4	-	-
006	290	89	379	16	338	21	4
009	126	216	342	32	274	9	27
011	184	51	235	-	170	39	26
012	42	20	62	-	56	6	-
013	48	33	81	-	49	6	26
014	32	30	62	-	54	5	3
015	29	31	60	-	52	7	1
016	13	4	17	-	15	1	1
017	30	31	61	-	60	1	-
018	7	1	8	-	6	-	2
023	2	-	2	-	2	-	-
030	105	42	147	-	136	10	1
035	-	1	1	-	1	-	-
036	-	2	2	-	-	-	2

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
037	28	13	41	2	16	1	22
038	23	32	55	2	17	1	35
039	-	2	2	-	2	-	-
040	2	1	3	-	3	-	-
047	9	6	15	1	14	-	-
048	1	1	2	-	1	-	1
049	12	6	18	2	11	-	5
052	4	2	6	4	1	1	-
053	11	5	16	4	12	-	-
054	1	5	6	-	6	-	-
055	2	2	4	1	3	-	-
070	299	143	442	7	363	32	40
071	5	3	8	-	-	5	3
072	6	-	6	1	5	-	-
075	2	-	2	-	2	-	-
079	275	152	427	47	367	10	3
084	46	-	46	4	37	5	-
085	1	-	1	-	1	-	-
091	3	6	9	-	9	-	-
094	4	-	4	-	3	1	-
097	1	-	1	-	1	-	-
098	5	-	5	-	4	1	-

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
099	10	3	13	1	12	-	-
100	29	4	33	3	26	1	3
110	4	1	5	2	3	-	-
112	1	1	2	-	2	-	-
117	115	26	141	19	115	7	-
122	4	-	4	1	2	-	-
123	1	-	1	-	-	1	-
125	14	16	30	1	28	-	-
127	-	2	2	-	2	1	-
128	3	10	13	1	12	-	-
132	-	1	1	-	1	-	-
133	20	10	30	-	29	1	-
136	4	2	6	-	5	1	-
138	26	37	63	-	58	5	-
140	17	9	26	5	17	2	2
141	35	8	43	2	34	5	2
142	3	-	3	1	2	-	-
143	5	3	8	-	6	-	-
144	2	1	3	-	3	-	2
145	36	27	63	3	52	2	6
146	7	2	9	-	9	-	-
147	10	5	15	-	9	4	2

Code No.	Male	Female	Total	Cured	Relieved	Otherwise	Death
148	15	1	16	-	11	4	1
149	4	-	4	-	3	1	-
150	66	31	97	-	67	18	12
151	93	46	139	-	99	15	25
152	1	2	3	-	2	-	1
153	35	16	51	-	40	7	4
154	45	31	76	-	56	16	4
155	80	27	107	-	44	47	16
156	11	2	13	-	7	2	4
157	32	20	52	-	34	9	9
158	1	2	6	-	3	3	-
159	1	-	1	-	1	-	-
160	5	2	7	-	5	2	-
161	90	6	96	-	73	18	5
162	84	12	96	-	47	33	16
163	7	8	15	-	5	3	7
164	1	-	1	-	-	-	1
170	33	21	54	-	43	10	1
171	15	4	19	-	14	5	-
172	12	5	17	-	15	2	-
173	51	26	77	-	70	5	2
174	-	305	305	-	283	13	9

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
180	-	20	20	-	14	3	3
181	-	1	1	-	-	1	-
182	-	2	2	-	2	-	-
183	-	18	18	-	16	1	1
184	-	1	1	-	1	-	-
185	84	-	84	-	78	5	1
186	5	-	5	-	4	1	-
187	20	-	20	-	15	4	1
188	37	11	48	-	40	6	2
189	13	11	24	-	22	-	2
191	66	36	102	-	82	8	12
192	1	-	1	-	1	-	-
193	30	92	122	24	88	6	4
194	1	1	2	-	-	2	-
195	8	10	18	-	9	3	6
196	20	17	37	-	34	-	3
197	5	8	13	-	8	3	2
198	10	9	19	-	14	5	-
199	10	2	12	-	8	1	3
201	11	4	15	-	10	1	4
202	53	21	74	-	41	24	9
203	29	19	48	-	34	7	7

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
204	48	33	81	-	56	9	16
205	63	70	133	-	82	13	38
207	1	-	1	-	-	1	-
208	8	10	18	9	9	2	7
210	45	25	70	64	64	6	-
211	26	12	32	31	31	4	3
212	19	8	27	-	23	4	-
213	36	32	68	-	65	3	-
214	25	25	50	12	38	4	-
215	25	29	54	12	38	4	-
216	4	9	13	1	12	-	-
217	-	68	68	16	52	-	-
218	-	4	4	-	2	2	-
219	-	10	10	-	9	1	-
222	2	-	2	-	2	-	-
223	4	2	6	1	3	2	-
224	2	-	2	-	2	-	-
225	42	41	83	7	57	3	16
226	27	182	209	47	146	15	1
227	8	8	16	2	13	-	1
228	19	28	47	4	39	4	-
229	9	10	19	-	17	2	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
236	5	3	8	2	4	1	1
237	7	5	12	-	6	3	3
238	3	12	15	1	14	-	-
239	-	1	1	-	1	-	-
240	3	7	10	1	9	-	-
241	66	539	605	137	442	26	-
242	19	60	79	9	60	8	2
244	8	21	29	-	26	1	2
245	7	5	12	-	12	-	-
250	765	499	1264	20	1046	61	137
251	41	6	47	2	40	2	3
252	1	-	1	-	1	-	-
253	5	2	7	-	6	1	-
255	5	3	8	1	6	1	-
256	-	1	1	-	1	-	-
257	2	-	2	1	1	-	-
262	1	-	1	-	1	-	-
263	1	-	1	-	1	-	-
265	1	-	1	-	1	-	-
270	-	1	1	-	1	-	-
272	4	-	4	-	4	-	-
275	21	17	38	-	31	4	3

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
277	5	1	6	-	0	6	0
278	3	9	12	-	9	2	1
279	1	-	1	-	-	-	1
280	13	11	24	-	21	3	180
281	13	10	23	-	20	3	-
282	-	21	30	2	21	1	6
284	15	29	44	-	32	5	7
285	55	86	141	-	114	14	13
286	20	-	20	-	18	1	1
287	16	40	56	-	52	-	4
288	2	6	8	-	6	-	8
289	31	19	50	-	44	5	1
290	1	1	2	-	2	-	2
291	14	-	14	-	14	-	-
292	1	-	1	-	-	1	-
293	1	1	2	-	2	-	-
294	1	-	1	-	1	-	-
295	14	201	215	3	195	16	1
296	5	69	74	-	69	5	-
297	-	1	1	-	1	-	-
298	7	13	20	-	19	1	-
300	25	92	117	4	104	9	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
301	-	2	2	-	2	-	-
303	79	1	80	1	72	4	3
305	31	1	32	1	24	4	3
306	1	-	1	-	1	-	-
307	2	3	5	2	3	-	-
308	-	4	4	-	3	1	-
309	1	-	1	-	1	-	-
310	-	1	1	-	1	-	-
311	7	30	37	1	33	3	-
312	1	-	1	-	1	-	-
315	1	-	1	-	1	-	-
319	6	9	15	-	14	1	-
320	95	42	137	14	87	3	33
322	32	10	42	3	29	2	8
323	67	59	26	4	89	12	21
324	7	4	11	1	9	-	1
328	4	6	10	2	8	-	-
330	-	1	1	-	-	1	-
331	7	3	10	1	9	-	-
332	14	11	25	1	21	2	1
333	11	5	16	14	2	-	-
334	-	1	10	-	7	3	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
335	17	9	26	19	4	3	-
336	56	31	87	-	64	20	3
337	1	-	1	-	1	-	-
340	3	1	4	-	4	-	-
341	3	1	4	-	4	-	-
342	76	44	120	1	93	17	9
343	1	1	2	-	-	2	-
344	60	23	83	-	60	19	4
345	57	46	103	2	81	11	30
346	8	4	12	-	11	1	-
347	1	-	1	-	1	-	-
348	35	32	67	3	38	11	15
349	4	3	7	-	4	2	1
350	3	2	5	-	4	1	-
351	8	6	14	-	14	-	-
352	1	4	5	-	5	-	-
353	-	1	1	-	1	-	-
354	-	3	12	-	12	-	-
355	6	6	12	-	10	2	-
356	3	2	5	-	4	1	-
357	23	13	36	1	32	3	-
358	6	3	9	-	8	1	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
359	14	8	22	-	21	1	-
364	2	1	3	-	3	-	-
365	-	2	2	-	1	1	-
368	1	-	1	-	1	-	-
372	-	1	1	-	1	-	-
373	1	-	1	1	1	-	-
374	2	1	3	-	3	-	-
376	4	4	8	-	8	-	-
377	2	6	8	-	8	-	-
378	9	6	15	-	14	-	1
380	14	5	19	-	19	-	-
381	1	1	2	1	1	-	-
382	284	211	495	61	411	22	1
383	3	3	6	1	4	1	-
385	2	3	5	1	4	-	-
386	10	13	23	2	20	1	-
387	22	19	41	6	29	6	-
389	-	2	2	-	2	-	-
390	30	22	52	-	52	-	-
391	13	11	24	2	20	1	1
392	-	2	2	-	2	-	-
394	268	487	755	22	646	40	47

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
395	17	10	27	-	22	3	2
396	16	16	32	-	28	2	2
398	3	6	9	-	7	-	2
401	289	269	558	9	472	30	47
402	78	41	119	-	108	3	8
403	7	3	10	-	7	2	1
410	660	106	766	-	550	40	176
411	44	10	54	1	52	1	-
412	87	11	98	2	85	7	4
413	65	20	85	1	74	7	3
414	792	217	1009	8	828	61	112
416	41	32	73	-	45	7	21
417	-	2	2	-	2	-	-
420	1	5	6	-	6	-	-
421	3	4	7	-	4	-	3
422	-	2	2	-	1	-	1
423	8	6	14	1	8	-	5
424	53	41	94	4	79	4	7
425	54	63	117	2	103	4	8
426	31	29	60	-	47	8	5
427	77	59	136	2	105	3	26
428	55	49	104	2	62	6	34

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
429	1	2	3	-	2	-	1
430	62	56	118	4	41	20	53
431	95	90	185	1	31	12	141
432	30	17	47	11	30	-	6
434	174	91	265	2	203	30	30
435	50	41	91	4	79	5	3
436	527	296	826	10	572	72	169
437	52	29	81	-	66	8	7
438	32	6	38	-	31	4	3
440	7	2	9	-	7	2	-
441	7	5	12	1	9	2	-
442	3	3	6	1	3	1	1
443	134	2	136	6	115	14	1
444	17	3	20	2	14	3	1
446	3	4	7	-	6	1	-
447	4	6	10	-	30	-	10
451	2	1	3	-	3	-	-
453	3	1	4	-	3	1	-
454	93	29	122	22	98	2	-
455	133	24	157	13	134	6	4
456	57	3	60	11	43	4	2
457	14	5	19	-	18	1	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
458	2	3	5	-	3	-	2
459	13	1	14	-	13	1	-
461	8	1	-	-	9	-	-
462	3	7	10	2	8	-	-
463	5	6	11	-	11	-	-
464	8	2	10	1	6	3	-
465	10	15	25	2	22	1	-
466	35	54	89	8	78	3	1
470	293	107	400	59	324	17	-
471	79	48	127	18	103	6	-
472	10	6	16	2	13	1	-
473	46	42	88	11	74	3	-
474	197	217	414	75	312	27	-
475	16	17	33	3	28	8	-
478	55	40	95	13	76	5	1
480	3	-	3	-	1	-	2
481	183	66	249	13	208	12	16
485	42	23	65	-	32	2	31
486	57	28	85	5	67	3	10
490	30	15	45	3	40	-	2
491	33	10	43	-	38	2	3
492	7	2	9	-	8	1	-

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
493	224	368	592	17	512	30	33
494	64	57	121	4	97	10	10
496	190	79	269	2	212	8	44
510	14	4	18	5	13	2	1
511	36	13	49	1	44	2	2
512	47	3	50	3	42	3	2
513	15	5	20	-	14	5	1
514	11	6	17	-	-	1	16
518	6	2	8	-	8	-	-
519	30	21	51	3	46	1	1
520	1	-	1	-	1	-	-
521	2	3	5	-	3	2	-
522	14	14	28	-	26	2	-
523	-	4	4	-	4	-	-
524	7	1	8	-	7	1	-
526	8	5	13	-	13	-	-
527	36	19	55	7	44	4	-
528	17	21	38	1	35	2	-
529	-	1	1	-	1	-	-
530	28	33	61	5	51	4	1
532	154	19	173	18	132	13	10

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
533	51	11	62	5	50	5	2
534	17	4	21	1	19	-	1
535	162	74	236	6	216	12	2
536	65	29	94	1	86	7	-
537	24	10	34	7	20	4	3
540	274	116	390	86	292	10	2
541	43	16	59	15	40	4	-
542	13	10	23	5	17	1	-
543	51	26	77	9	64	1	3
550	557	44	601	203	359	33	6
551	1	1	2	1	1	-	-
552	1	3	4	-	4	-	-
553	47	194	241	53	175	10	3
555	2	1	3	-	2	2	1
556	6	7	13	1	11	1	1
560	159	64	223	18	159	17	29
562	4	1	5	-	4	-	1
564	7	7	14	-	13	1	-
565	64	15	79	16	56	7	-
566	21	1	22	4	16	22	-
567	39	26	65	7	42	2	14
568	1	-	1	-	1	-	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
569	25	17	42	4	35	2	1
571	537	81	618	-	442	53	23
572	196	78	274	4	159	22	92
573	15	8	23	3	15	3	2
574	25	19	44	11	32	1	-
575	51	42	93	22	62	8	1
576	18	18	36	1	18	13	4
577	83	34	117	5	99	10	3
578	53	30	83	1	62	10	10
580	25	25	50	2	46	2	-
581	73	69	142	2	133	3	4
582	19	8	57	-	25	2	-
583	60	64	94	-	90	3	1
584	57	30	87	-	32	3	52
585	147	81	228	2	142	22	62
586	-	2	2	-	1	-	1
590	18	16	34	4	26	2	2
591	24	10	34	2	29	2	1
592	81	9	90	11	74	4	1
593	3	3	6	-	5	1	-
594	4	1	5	1	4	-	-
595	5	2	7	-	7	-	-

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
596	17	3	20	1	17	1	1
597	4	-	4	-	4	-	-
598	76	20	96	14	76	6	-
599	119	123	242	17	205	14	6
600	362	-	362	34	311	14	3
601	4	-	4	-	4	-	-
603	137	-	137	43	89	5	-
604	32	-	32	6	23	3	-
605	13	-	13	5	8	-	-
606	38	-	38	5	30	3	-
607	3	-	3	-	3	-	-
608	25	-	25	3	22	-	-
611	19	61	80	12	59	9	-
614	-	13	13	1	10	2	-
616	-	2	2	-	2	-	-
617	-	1	1	-	1	-	-
618	-	3	3	-	2	1	-
619	-	18	18	5	12	-	1
620	-	7	7	-	7	-	-
623	1	1	1	-	2	-	-
624	-	1	1	-	1	-	-

Code No.	Male	Female	Total	Cured	Reli-ved	Other-wise	Death
625	-	3	3	-	3	-	-
626	-	2	2	-	2	-	-
628	1	-	1	-	1	-	-
633	-	5	5	1	4	-	-
637	-	1	1	-	-	1	-
642	-	1	1	-	1	-	-
643	-	2	2	1	1	-	-
678	-	1	1	-	1	-	-
680	4	-	4	1	3	-	-
682	162	98	260	24	215	16	5
684	1	1	2	-	2	-	-
685	9	4	13	6	6	1	-
686	12	9	21	2	18	1	-
690	-	1	1	-	1	-	-
691	7	4	11	-	11	-	-
692	56	31	87	3	81	2	1
693	16	30	46	2	44	-	-
694	7	21	28	-	28	-	-
695	60	30	90	2	87	2	5
696	58	27	79	-	75	4	-
697	1	4	5	-	75	4	-
700	4	2	6	2	4	-	-

Code No.	Male	Female	Total	Cured	Relieved	Other-wise	Death
701	9	5	14	-	14	-	-
702	1	-	1	-	1	-	-
704	4	2	6	-	6	-	-
705	5	6	11	2	8	1	-
706	38	23	61	8	49	4	-
707	136	42	178	10	151	15	2
708	4	4	8	-	8	-	-
709	3	8	11	-	9	1	1
710	19	68	87	-	79	6	2
711	34	16	50	1	45	3	1
714	28	71	99	3	90	3	3
715	46	51	97	1	94	1	1
716	8	17	25	-	24	1	-
717	34	21	55	3	51	1	-
718	26	14	40	2	36	2	-
719	15	10	25	-	19	6	-
720	11	2	13	-	12	1	-
721	23	23	46	-	44	2	-
722	166	69	235	7	211	17	-
723	3	8	11	-	11	-	-
724	29	19	48	3	43	2	-
726	19	13	32	-	31	1	-

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
727	38	31	69	3	62	4	-
728	33	48	101	6	91	3	1
729	58	22	80	4	71	5	-
730	123	93	216	6	201	8	1
732	27	5	32	-	32	-	-
733	244	71	315	7	298	8	2
735	1	3	4	-	4	-	-
736	62	21	83	1	72	10	-
737	7	-	7	-	4	3	-
738	7	9	16	1	15	-	-
740	1	-	1	-	1	-	-
741	2	2	4	-	4	-	-
742	7	-	7	-	6	1	-
743	2	-	2	-	2	-	-
744	25	32	57	7	48	2	-
745	87	115	202	31	143	19	9
746	11	13	24	1	22	-	1
747	20	43	63	14	43	5	1
749	79	62	141	10	126	5	-
750	10	2	12	1	10	1	-
751	2	1	3	1	1	1	-
752	38	2	40	2	34	4	-

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
753	26	8	34	1	29	4	-
754	41	26	67	-	64	3	-
755	12	3	15	-	14	1	-
756	20	31	51	2	45	4	-
757	10	5	15	-	14	1	-
758	6	1	7	-	6	1	-
759	16	20	36	9	22	5	-
767	4	-	4	-	4	-	-
770	1	-	1	-	-	-	1
771	1	-	1	-	1	-	-
780	41	109	250	9	219	19	3
781	8	2	10	-	6	4	-
782	6	3	9	-	8	1	-
783	1	-	1	-	1	-	-
784	154	90	244	6	228	9	1
785	57	22	79	3	57	4	15
786	134	38	172	6	152	14	-
787	14	16	30	2	26	2	-
788	156	14	170	4	155	10	1
789	181	95	276	8	236	29	3
791	-	1	1	-	1	-	-
795	-	1	1	-	1	-	-

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
799	308	177	485	11	373	88	13
800	29	4	33	5	25	2	3
801	1	-	1	-	1	-	-
802	165	22	187	12	164	11	1
805	108	28	136	-	118	9	9
807	45	7	52	3	44	2	3
808	37	7	44	1	36	5	2
810	17	5	22	-	20	2	-
811	4	1	5	-	5	-	-
812	62	23	85	1	78	4	2
813	187	62	249	2	238	9	-
815	5	-	5	-	4	1	-
816	14	2	16	-	16	-	-
818	5	1	6	-	6	-	-
820	126	120	246	-	229	10	7
821	211	61	272	1	254	10	7
822	50	9	59	-	58	1	-
823	236	59	295	4	280	7	4
824	43	12	55	1	53	1	-
825	29	14	44	-	42	1	-
826	5	1	6	-	6	-	-
828	22	3	25	-	23	1	1

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
830	1	-	1	-	1	-	-
831	12	5	17	1	16	-	-
832	9	-	9	-	7	2	-
833	3	-	3	-	3	-	-
835	20	6	26	1	22	3	-
836	11	7	18	-	18	-	-
837	7	1	8	-	8	-	-
838	2	-	2	-	2	-	-
839	4	3	7	-	6	1	-
845	1	1	1	-	1	-	-
846	14	24	38	-	37	1	-
847	1	-	1	-	1	-	-
848	1	-	1	-	1	-	-
850	179	52	231	15	200	15	1
852	73	10	83	17	46	1	19
854	484	103	587	32	355	34	166
862	106	7	113	16	88	3	6
863	30	1	10	2	8	-	-
864	4	1	5	-	4	-	1
866	2	6	2	-	2	-	-
867	17	1	18	2	16	-	-
868	121	16	137	20	108	2	7

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
872	2	-	2	-	2	-	-
873	158	57	215	35	163	16	1
874	3	-	3	1	-	-	2
875	1	-	1	-	1	-	-
878	2	1	3	-	2	-	1
879	144	12	156	7	12	5	32
881	16	1	17	1	13	3	-
882	55	4	59	1	53	5	-
883	14	3	17	-	16	1	-
884	1	-	1	-	1	-	-
885	3	-	3	-	3	-	-
886	4	1	5	-	5	-	-
887	2	-	2	-	2	-	-
891	20	4	24	-	22	2	-
892	1	1	2	-	2	-	-
895	1	-	1	-	1	1	1
896	1	-	1	-	1	-	-
897	4	1	5	-	4	1	-
904	1	-	1	-	1	-	-
905	2	1	3	-	3	-	-
907	13	-	13	-	13	-	-
908	34	8	42	2	37	2	1

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
923	1	-	1	-	1	-	-
924	15	7	22	3	19	-	-
927	27	4	31	6	28	3	-
928	10	2	12	-	11	1	-
931	9	6	15	4	11	-	-
932	2	-	2	1	1	-	-
933	56	47	103	21	73	9	-
934	9	3	12	2	10	-	-
935	8	4	12	3	5	4	-
938	4	6	10	1	8	1	-
939	1	-	1	-	1	-	-
949	96	101	197	7	100	17	73
950	1	-	1	-	1	-	-
953	2	-	2	-	1	1	-
955	10	1	11	1	9	1	-
956	2	-	2	-	2	-	-
958	1	3	4	-	3	-	1
959	1551	294	1845	109	1564	165	7
960	1	3	4	1	3	-	-
961	-	4	4	-	4	-	-
965	-	1	1	-	1	-	-

Code No.	Male	Female	Total	Cured	Reli- eved	Other- wise	Death
967	24	36	60	7	51	-	2
969	21	10	31	3	22	5	1
973	2	1	3	-	1	-	2
975	-	1	1	-	1	-	-
977	52	50	102	7	86	8	1
980	3	1	4	1	2	1	-
981	8	15	23	3	17	2	1
983	60	48	108	1	63	4	40
984	1	-	1	-	1	-	-
985	3	5	8	-	6	-	-
988	50	36	86	6	59	16	5
989	612	269	881	65	634	57	125
994	37	16	53	3	44	4	2
995	3	3	6	-	6	-	-
998	35	18	53	5	45	1	2
999	14	5	19	1	16	1	1

Appendix - 7

Diseases of Some Specific Code Numbers

Sl. No.	Code No.	Disease
1.	002	Typhoid & paratyphoid
2.	006	Amoebiasis
3.	009	Ill-defined intestinal infections
4.	011	Pulmonary tuberculosis
5.	030	Leprosy
6.	070	Viral Hepatitis
7.	079	Viral infections other than classified
8.	117	Other mycoses
9.	151	Malignant neoplasm of stomach
10.	155	Malignant neoplasm of liver & intrahepatic bile ducts
11.	174	Malignant neoplasm of female breast
12.	191	Malignant neoplasm of brain
13.	193	Malignant neoplasm of thyroid gland
14.	205	Myeloid leukaemia
15.	226	Benign neoplasm of thyroid gland
16.	241	Nontoxic nodular goitre
17.	250	Diabetes mellitus
18.	285	Other and unspecified anaemias
19.	295	Schizophrenic psychoses

Sl. No.	Code No.	Disease
20.	300	Neurotic disorders
21.	320	Bacterial meningitis
22.	323	Encephalitis, myelitis & encephalomyelitis
23.	342	Hemiplegia
24.	345	Epilepsy
25.	382	Suppurative & unspecified otitis media
26.	394	Diseases of mitral valve
27.	401	Essential hypertension
28.	402	Hypertensive heart disease
29.	410	Acute myocardial infarction
30.	414	Other forms of chronic ischaemic heart disease
31.	425	Cardiomyopathy
32.	427	Cardiac dysrhythmias
33.	428	Heart failure
34.	430	Subarachnoid haemorrhage
35.	431	Intracerebral haemorrhage
36.	434	Occlusion of cerebral arteries
37.	436	Acute but ill-defined cerebrovascular disease
38.	443	Other peripheral vascular disease
39.	454	Varicose veins of lower extremities
40.	455	Haemorrhoids
41.	470	Deflected nasal septum

Sl. No.	Code No.	Disease
42.	471	Nasal Polyps
43.	474	Chronic disease of tonsils and adenoids
44.	481	Pneumococcal pneumonia
45.	493	Asthma
46.	494	Bronchiectasis
47.	496	Chronic airways obstruction, not classified elsewhere
48.	532	Duodenal ulcer
49.	535	Gastritis and duodenitis
50.	540	Acute appendicitis
51.	550	Inguinal hernia
52.	553	Other hernia of abdominal cavity without obstruction or gangrene mentioned
53.	560	Intestinal obstruction without mention of hernia
54.	571	Chronic liver disease and cirrhosis
55.	572	Liver abscess & sequelae of chronic liver disease
56.	577	Disease of pancreas
57.	581	Nephrotic syndrome
58.	585	Chronic renal failure
59.	592	Calculus of Kidney and ureter
60.	598	Urethral stricture
61.	599	Other disease of urethra and urinary tract

Sl. No.	Code No.	Disease
62.	600	Hyperplasia of prostate
63.	603	Hydrocele
64.	682	Other cellulitis and abscess
65.	692	Contact dermatitis and other eczema
66.	707	Chronic ulcer of skin
67.	710	Diffuse diseases of connective tissue
68.	714	Rheumatoid arthritis and other inflammatory polyarthropathies
69.	722	Intervertebral disc disorders
70.	728	Disorders of muscle ligament and fascia
71.	729	Other disorders of soft tissues
72.	730	Osteomyelitis, periostitis and other infections involving bone.
73.	733	Other disorders of bone and cartilage
74.	745	Bulbus cordis anomalies and anomalies of cardiac septal closure
75.	749	Cleft palate and cleft lip
76.	780	General symptoms (ill defined condition)
77.	784	Symptoms involving head and neck
78.	786	" respiratory system and other chest symptoms
79.	788	" urinary system
80.	789	Other symptoms involving abdomen & pelvis

Sl. No.	Code No.	Disease
81.	799	Other ill-defined and unknown causes of morbidity and mortality
82.	802	Fracture of face bone
83.	805	Fracture of vertebral column without mention of spinal cord lesion
84.	806	Fracture of vertebral column with spinal cord lesion
85.	813	Fracture of radius and ulna
86.	820	Fracture neck of femer
87.	821	Fracture other and unspecified parts of femer
88.	823	Fracture tibia and fibula
89.	850	Concussion
90.	854	Intracranial injury of other and unspecified nature.
91.	862	Injury of other and unspecified intrathoracic organs
92.	868	Injury of other intra-abdominal organs
93.	873	Other open wound of head
94.	879	Open wound of other and unspecified sites, except limbs
95.	933	Foreign body in pharynx and larynx
96.	949	Burn unspecified
97.	959	Injury, other and unspecified
98.	977	Poisoning by other and unspecified substances

Sl. No.	Code No.	Disease
99.	983	Toxic effect of corrosive aromatics, acids and caustic alkalies
100.	989	Toxic effect of other substances, chiefly non-medicinal as to source

REFERENCES

1. Fraser, H.S., (1985) 'Rational use of drugs', World Health Forum, Vol - 6.
2. WHO, (1972), 'International Drug Monitoring - The role of National centres' - Report of a WHO meeting, Geneva, in World Health Chronicle, Vol - 26.
3. WHO, (1978) 'Drug Policies and Management'. - Report of a seminar, New Delhi, WHO Regional Office for South East Asia.
4. Herat Gunaratne, V.J., (1980), 'Bringing down drug costs - the Sri Lankan example', World Health Forum, 1.
5. Hardon, A., and van der Geest, S., (1987) 'Hazards of self-medication', World Health Forum, Vol - 8.
6. Health & Population - Perspectives and Issues, Special issue, 'Jan - Dec' 1989.
7. India, Govt. of, (1979) 'Drugs Prices Control Order' Ministry of Petroleum, Chemicals and Fertilisers, New Delhi.
8. Bakke, O.M., (1986) 'How many drugs do we need?', World Health Forum, Vol - 7.
9. WHO, (1987) 'Revised Drug Strategy - 1986', WHO Drug Information, Vol - 1, No.1.
10. Joldal, B., (1986), 'Selecting drugs on the basis of need', World Health Forum, Vol - 6.
11. Mills, H., (1990) 'The economics of hospitals in developing countries', Part I and Part II, Health Policy & Planning, 5/2 and 5/3.
12. van der Geest, S., (1987) 'Pharmaceuticals in the Third World - the local perspective', Social Science and Medicine, 25 (3).
13. Smith, G.T., (1987), 'The Economics of Essential Drugs Programme', Social Science and Medicine, 25 (6).

14. WHO, (1975), 'WHO official records', No. 226, Annexe 13.
15. WHO, (1975), 'Resolutions & decisions of the World Health Assembly', Geneva.
16. India, Govt. of, (1975), 'Report of the Hathi Committee', Ministry of Health & Family Welfare.
17. WHO, (1977), 'The Selection of Essential Drugs', Geneva. Technical Report Series No. 615.
18. WHO, (1979), 'The Selection of Essential Drugs', Technical Report Series No. 641, Geneva.
19. WHO, (1983), 'The Use of Essential Drugs', Technical Report Series No. 685, Geneva.
20. WHO, (1985), 'The Selection of Essential Drugs', Technical Report Series No. 722, Geneva.
21. WHO, (1988), 'The Use of Essential Drugs', Technical Report Series No. 770, Geneva.
22. WHO Expert Committee, (1990), 'Report on the Use of Essential Drugs', Technical Report Series No. 796, Geneva.
23. Barret, C.W., Wilson, A.R., and Baker J.A., (1982), in Clinical Pharmacy & Hospital Management.
24. WHO, 'International nonproprietary names for Pharmaceutical Substances' - supplements to WHO Chronicle (in various issues).
25. Humayun, K.M.A., (1988), 'Essential Drugs for All', World Health Forum, Vol - 9.
26. Snell, B and Dualeh, M.W., (1988). 'Proper use of the Right Drugs - a complex task', World Health Forum, Vol - 9.
27. WHO, 'Essential Drugs', WHO Drug Information Vol - 1 to 6, various issues.
28. Gupta, J.P., and Kapoor, S.D., (1988), 'Perspectives and Issues in Health care Management', Editorial in Health & Population - Perspectives & Issues, No.4.

29. Panicker, P.G.K., (1976), 'Health Statistics in India - a case study of Kerala', Centre for Development Studies.
30. W.H.O., (1985), 'Report of WHO Meeting of Experts', Nairobi.
31. Lawrence, D.R., and Bennet, P.N., (1986), 'Clinical Pharmacology', 6th Edn.
32. Conrad, P., (1985), 'The meaning of medications - another look at compliance', Social Science and Medicine, 20,
33. Hemminki, E., (1975), 'Review of literature on the factors affecting drug prescribing', Social Science and Medicine, Vol-9.
34. Nair, G.R. et al, (1991), 'Usage of Drugs in Hospitalised Patients'- A study sponsored by the State Board of Medical Research, Thiruvananthapuram.
35. Wade, O., (1979), 'The Concept of Drug utilisation studies', Studies in Drug Utilisation, WHO Regional Office for Europe, Copenhagen.
36. Panicker, P.G.K. and Soman, C.R., (1984), 'Health Status of Kerala. Paradox of Economic backwardness and Health development', Centre for Development Studies, Thiruvananthapuram.
37. Kannan, K.P. et al, (1991), 'Health and Development in Rural Kerala', Kerala Sastra Sahitya Parishad.
38. Govt. of Kerala, (1993-94), Budget in Brief.
39. Govt. of Kerala, (1979), 'Report of the High Power Committee on Health Services', Constituted in 1977.
40. India, Govt. of, (1993) 'Report of the Comptroller and Auditor General of India', Civil, No.3, Govt. of Kerala.
41. MCH, TVM, (1991-92), 'Annual Administration Report of the Superintendent', Medical College Hospital, Thiruvananthapuram.
42. Eckert, M.G., Ionnides Demos, L.L. & Mc Lean, A.J., (1991), 'Measuring and Modifying Hospital Drug Use', The Medical Journal of Australia, Vol. 154.

43. India, Govt. of, (1993), 'Document on National Health Policy', Health and Population.
44. Jetlarned, R.N. (1968), 'Medical Terminology Made Easy', 2nd Edn. Illinois, U.S.A.
45. Clarke, W.G., Brater, D.C. and Johnson, A.R., (1992), 'Goth's Medical Pharmacology', 13th Edn.
46. WHO, (1975), 'International Classification of Diseases', 9th Revision, Vol.I.
47. Bond, W.S. & Hussar, D.A., (1991), 'Detection Methods and Strategies for Improving Medication Compliance', American Journal of Hospital Pharmacy.
48. Litvack, J., (1991), 'Hospital Cost Analysis: Allocating Pharmaceutical Expenditures', Health Policy & Planning.
49. Smith, H.A., (1986), 'Principles and Methods of Pharmacy Management', 3rd Edn., U.S.A.
50. Spradling, G.F., (1990), 'Continuous Quality Assurance Monitoring by Staff-Pharmacists', Journal of Hospital Pharmacy 25/11.
51. WHO, (1990), 'Basic Tests for Pharmaceutical Substances', Geneva.
52. Hugo, W.B., and Russel, A.D., (1987), (Ed.) 'Pharmaceutical Microbiology', 4th Edn.
53. W.H.O., (1972), 'Specifications for the Quality Control of Pharmaceutical Preparations', 24th Report on the International Pharmacopoea, Geneva.
54. Hassan, W.E., (1986), 'Hospital Pharmacy', 5th Edn.
55. Cresman, W.H. and Sugita, E.T., (1990), 'Bioavailability and Bioequivalency Testing', Gennaro, A.R. (Ed) 'Remingtons Pharmaceutical Sciences', 18th Edn.
56. Hoffman, R.P., (1984), 'A Strategy to Reduce Drug Expenditures with a Drug Utilization Review Programme', Hospital Pharmacy.

57. Nadzam, D.M., (1991), 'Development of Medication Use Indicators', American Journal of Hospital Pharmacy, Vol-48.
58. Medical College, Thiruvananthapuram, (1991-92), 'C.P.C. List of Drugs' for the year.
59. Wang'ombe, J.K., Mwabu. G.M., (1987), 'Economics of Essential Drugs Schemes: the Perspectives of the Developing Countries', Social Science & Medicine, 25 (6).
60. Brown, C.H., (1989), 'Hand Book of Drug Therapy Monitoring', Williams and Wilkins, U.S.A.
61. WHO, (1991), 'Model Prescribing Information', The Pharmaceutical Journal, 11.
62. Hoffman, R.P., (1978), 'Anti-infective Utilization Review in a Community Hospital', Hospital Pharmacy, 13.
63. Castle, M., et'al, (1977), 'Antibiotic Use at Duke University Medical Centre', Journal of American Medical Association, 237.
64. Levy, S.B., (1988), 'Microbial Resistance to Antibiotics : an evolving problem', Lancet, (2).
65. Ryan, M, and Birch, S., (1991), 'Charging for Health Care - Evidence on the utilisation of NHS prescribed drugs', Social Science and Medicine, 33/6.
66. Litvack, J.I., Shepard, D.S., and Quick, J.D., (1989), 'Setting the price of essential drugs : necessity and affordability', Lancet, 2.
67. WHO, (1986), 'Report of the 39th World Health Assembly', Geneva.

GENERAL REFERENCES

- * Mehra, B.K., (1989 - 90), (Ed) 'Chemical and Medical Formulary of India', 4th Edn.
- * Dollery C., (1991), (Ed) 'Therapeutic Drugs', Vol I and II, Churchill Livingstone.
- * Rowland, M., and Tozer, T.N., (1989), 'Clinical Pharmamokinetics: Concepts and Applications', 2nd Edn., Lea & Febiger.
- * 'Indian Pharmaceutical Guide', (1985), Annual, Pamposh Publications, New Delhi.
- * Dr.Gulhati, C.M., (1991), (Ed.) 'Monthly Index of Medical Specialities', Vol-II, No.11, New Delhi.
- * Dr.Gulhati, C.M., (1992), (Ed.) 'Monthly Index Medical Specialities', Vol - 12, No-1, New Delhi.
- * India, Govt.of, (1948), 'The Drugs and Cosmetics Act', Ministry of Health, New Delhi.
- * India, Govt.of, (1985), 'Pharmacopoea of India', 3rd Edn., Ministry of Health.
- * Todd, R.G., (1989), (Ed), 'Extra Pharmacopoea (Martindale)', 29th Edn., the Pharmaceutical Press, London.
- * Govt.of Kerala, 'Administration Report of the Kerala Health Services', various years.
- * Govt.of Kerala, (1991 - 92), 'Annual Plan.'