DRUG SUPPLY
MANAGEMENT

In the Sudanese Medical Corps

A thesis Submitted By
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For The Degree of Master of Pharmacy
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Dedication

To the spirits of Ibrahim Shams al-Deen, Malik al-Agib and their fellows who gave their lives to save the principles. To those who are waiting. To Hiba, whom we shall never forget.
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Thanks for God firstly, then thanks are due to my supervisor Dr. El-Amin Ibrahim El-Nima.
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Thanks to the JRMS pharmacists and to the Military Liaison Officer-Sudan Embassy – Amman and to all those who gave me help, assistance and information.
Abstract

Drug logistics is the science and art of bringing the right drugs at the right places in the right time in appropriate quantities. The drug supply systems are fields of pharmacy practice that add extra knowledge to the pharmacist different from that acquired at the college. This necessitates the introduction of pharmacy practice to the pharmaceutical curriculum. In the field of military services, drugs are more valuable than weapons as diseases are more dangerous than the enemy fires.

The present work had been fulfilled at the Sudanese Medical Corps facilities in the period from 8/2000 to 2/2004, where continuous crises are common, complaints from the performance of the supply unit, financial obstacles and organizational instability are common. Lack of drugs at the regional hospitals had persisted even after introducing the health insurance program; the Takaful, which is a risk-sharing mechanism. Soldiers at the war areas suffer from the lack of drugs as their drug supplies were sorted to be on the military financial affairs budget in spite of their payment of the monthly premiums in risk-sharing program.

The objectives of the work are to study the drug supply process, to tackle the problems and to contribute to innovation of a supply model based on a scientific background. To achieve these objectives the study had focused on the systems of supply dimensions; policies, planning, organization, selection, procurement, distribution, prescribing and dispensing, financing and security.

The study had been organized as follows:
Chapter one, the introduction which contains a brief description of the drug supply dimensions, a historical background of the Sudanese Medical Corps and the pharmaceutical activities of the NFDMS.
Chapter two is the literature review which contains a comprehensive study of fourteen elements of the drug supply. They are the policies, the drug logistics planning, organizing drug supply, selection of drugs, drug quantification, procurement of drugs, small scale local production, quality assurance, drug donation, distribution, prescribing, dispensing, drug financing and managing security for the supply systems.
Chapter three is the objectives of the study.
Chapter four is the methodology.
Chapter five is the results and discussion which tackled the problems on the fourteen elements of the supply systems of the SMC, discussed and compared with the literature and other similar organizations.
Chapter six includes the conclusion and recommendations on each of the mentioned elements independently.
Chapter seven is the references and annexes.

The subject is concerned with the pharmaceutical practice, management, planning, organizations, financial and military aspects. This explains the expansion of the study.

The absence of a sound documented policy statement divers the plans. The policy statement, the clear objectives and proper planning together with workers will make the NFDMS succeed in achieving the objectives. The performance improvement was in the duties of Takaful and the military administrative area. This raises an image of duality which appears and disappears according to persons occupying the key positions. The selection of drugs is based on informal and non-scientific practices. In the absence of the Pharmacy and Therapeutics Higher Committee which is widely recommended and the existing direct purchases which are due to lack of finance, all sorts of breaches may emerge.

Distribution of drugs is a CMS old style, a pull method of requisition, in monthly and weekly intervals. This pool method burdened the Central Warehouses. The storage conditions were inappropriate where the temperature exceeds 40C in some buildings. The stores are manual type and thermometers were not there. The problems of transportation in Lorries for 6-8 days to some areas make the quality of drugs questionable. Those physicians on the housemanship and those under the National Service are 3-4 folds of the military physicians. This results in difficulties in managing the prescribing. Over prescribing of vitamins reaches 85% of drugs being prescribed. The total vitamins and haematinics expenditure is greater than the total expenditure of antimalarials and cardiovascular drugs together. Their expenditure is also greater than the summation of GIT drugs, ophthalmologic preparations and cardiovascular drugs expenditure.

The dispensing time for the prescription is one minute reflecting the heavy load of work in the day time at the casualties, referred clinics, pediatrics pharmacies; explain the absence of inventory records. The flow of prescriptions to the contracted unaffiliated pharmacies provides an outlet for security breaches. The average item price at the unaffiliated pharmacies is two to three folds of its price at the pharmacies within the system. The total drug expenditure of the drugs from the contracted pharmacies for the year 2003 is four hundred millions Dinars. This amount is twice the drug expenditure for the whole army for the year 1999.

The pharmaceutical services in the PAF need to be reorganized. The systems should be rebuilt on scientific basis; more pharmacists should be enlisted to encourage the changes. Autonomous or semiautonomous organization is recommended including the production sector, import division, sales, supply and pharmacies activities. It could be financed by the NFDMS; the contribution of Takaful is appreciated. The war areas could be supplied on cost coverage, Takaful on contract and market sales on investment basis.

The Pharmacy and Therapeutics Higher Committee is the corner stone in improving performance. Drug availability at military areas could be enhanced by the establishment of the regional warehouses. Complying with the regulations for purchases through tenders can lead to affordable prices. Wise selection, accurate quantification and implementing regulations will save the resources. The practice of work through committees provides transparency, trust in the system.
and patient confidence.
لا يمكنني قراءة النص العربي المكتوب بالخط العربي المعقد بشكل طبيعي. يرجى استخدام النص العربي الصحيح أو الإطلاع على النص العربي كي أتمكن من مساعدتك بشكل أفضل.
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<tr>
<td>ABC</td>
<td>Method of drugs classification.</td>
<td></td>
</tr>
<tr>
<td>CMS</td>
<td>Central Medical Stores.</td>
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<tr>
<td>CMSPO</td>
<td>Central Medical Supplies Public Organization</td>
<td></td>
</tr>
<tr>
<td>CoT</td>
<td>Course of Therapy.</td>
<td></td>
</tr>
<tr>
<td>CPP</td>
<td>Certificate of Pharmaceutical Product.</td>
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</tr>
<tr>
<td>DIC</td>
<td>Drug Information Centre.</td>
<td></td>
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<tr>
<td>ENT</td>
<td>Ear, Nose and Throat.</td>
<td></td>
</tr>
<tr>
<td>FATC</td>
<td>Formulary And Therapeutics Committee.</td>
<td></td>
</tr>
<tr>
<td>FEFO</td>
<td>First Expiry First Out.</td>
<td></td>
</tr>
<tr>
<td>FIFO</td>
<td>First In First Out.</td>
<td></td>
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<tr>
<td>GIT</td>
<td>Gastrointestinal Tract.</td>
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<tr>
<td>GMP</td>
<td>Good Manufacturing Practice</td>
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</tr>
<tr>
<td>GP</td>
<td>General Practitioner.</td>
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<tr>
<td>GPPP</td>
<td>Good Pharmaceutical Procurement Practice.</td>
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<tr>
<td>HC</td>
<td>Health Center.</td>
<td></td>
</tr>
<tr>
<td>HTC</td>
<td>Hospital and Therapeutic Committee.</td>
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</tr>
<tr>
<td>I</td>
<td>Inventory stock.</td>
<td></td>
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<tr>
<td>ICU</td>
<td>Intensive Care Unit.</td>
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</tr>
<tr>
<td>INN</td>
<td>International Non-proprietary Name.</td>
<td></td>
</tr>
<tr>
<td>JRMS</td>
<td>Jordanian Royal Medical Services.</td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>Sudanese Pounds.</td>
<td></td>
</tr>
<tr>
<td>LT</td>
<td>Lead Time.</td>
<td></td>
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<tr>
<td>M.A.</td>
<td>Military Area.</td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>Medical Corps.</td>
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<tr>
<td>MDS</td>
<td>Managing Drug Supply.</td>
<td></td>
</tr>
<tr>
<td>MHI</td>
<td>Military Health Insurance.</td>
<td></td>
</tr>
<tr>
<td>MO</td>
<td>Medical Officer.</td>
<td></td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry Of Health.</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 1

Introduction
1. Introduction:
1.1 Drugs improve health:
Diseases, discomfort, disability are often preventable or treatable by pharmaceuticals. Drugs promote trust in health services.
The credibility of health workers depends on their ability to bring an end to weeks of fever with treatment by chloroquine, to save dying elders by a course of penicillin or to quiet a crying child by aspirin. In most developing countries drugs are more valued than the health workers (Quick-1997).
Irregular drug supply is usually a greater constraint in any health program. Drugs are costly, they constitute a considerable percentage of health expenditures and thus a sizable percentage in the country economics. So, cost reduction by improved management is essential.
1.1.1 Substantive supply improvements are feasible:
Although systemic drug selection requires a little additional funding, skilled and trained staff and equipment and time; yet it can save substantial amount of money in a short period of time.
Improved procurement practices require minimal material resources to implement, but their efforts in reducing cost and maintaining continuous supply is quickly felt. Improved distributions may require additional fuel, vehicles, but they can yield impressive return.
Rational use of drugs, prescribing regulations and therapy prepacking are a justifiable investment.
However, good opportunities are available in rebuilding the supply system to improve supply performance but the understanding of the supply process and trained personnel remain the common pitfalls in the process.
1.1.2 The supply process:
Logistics is the science and art of bringing the right things in the right time to the right place. Maintaining and transportation of supplies, involve delivering large amounts of supplies schedule to many people in different areas.
Logistics includes all aspects of processes required to bring drugs from the supplier to the dispenser and ultimately to the individual patient. These systems require the coordinated efforts of many units inside and outside the government. When the separate tasks are performed independently and scattered, costs rise, shortages become a common complain and patients suffer.
1.1.3 The Pharmaceutical Logistics cycle:
The supply cycle starts at the selection stage which is based on the policy and the plan of the organization. Drugs are selected and quantified according to the specifications and regulations. The selected list is procured on the basis of the budget acquired. When drugs are received at the stores, the quality should be assured and stored at appropriate conditions. Then drugs are distributed to the health facilities where the health provider issue prescriptions to be filled by the dispenser who reinform the manangerial level on consumption and use of drugs. (Fig. 1)

1.1.3.1 Selection: (Quick-1997)
What drugs should be available? In what quantities?
Selection is often inefficient when:
1- There is lack of pharmaceutical knowledge.
2- There is lack of information on current therapeutics.
3- The process is irregular or haphazard.
The results will be:
(a) Purchase of too many products, unnecessarily large variety of items, which may be duplicates.
Depletion of limited inventory capital and complicating the distribution processes.
(b) Purchase of unnecessarily expensive products while there are frequently cheaper and equally effective alternatives.
(c) Purchase of inappropriate products; limited funds are spent on new drugs whose therapeutic value is questioned, and on symptoms relief products.
(d) Inappropriate quantities: over estimation of some items and under estimation of others.

1.1.3.2 Procurement:
Obtaining pharmaceuticals through purchasing or donation or production.
1- Supplier selection:
   - Characters of unreliable suppliers:
     1- Withdraw or change their offers during the tender process.
     2- Deliver substandard products or near their expiration dates.
     3- Fail to replace bad batches.
   2- Contract terms:
     1- Supplier contract should provide distinct specification.
     2- Packaging requirements, labelling.
     3- Firm prices, currency exchanges conditions.
     4- Mechanism for eliminating errors.
   3- Quality assurance problems sources:
Lack of careful monitoring at port, at warehouse, on transport and due to storage conditions.
4- Make or buy options: Feasibility studies.
5- Financing:
Procurement is limited by funds while the patients buy drugs on higher prices.

1.1.3.3 Distribution:
1- Information mismanagement:
   Too much information, little use of the consumption records, vital statistics, drug changes, increased losses from spoilage, theft and unnecessary delay.
2- Storage:
   Spoiling is hastened by over loaded disorganized warehouses, shelves, moisture, temperature, pest and inadequate security.
3- Transportation mismanagement:
   Results in increased costs and slow deliveries.
4- Stock mismanagement.
Managers are frequently unaware of supplies they have and where are they.
Supplies in one region may gather dust while it was needed in another region. Mechanisms of transferring do not exist.

1.1.3.4 Use:
1- Poor packaging and labelling:
   Containers are unreasonable and of unreadable labels.
   2- Careless dispensing practices: (Stones.& Curtis 2002)
     1- Poor sanitary conditions, dirty utensils.
     2- Creams and liquids dispensed in uncleaned bottles.
     3- Pills and capsules wrapped in dirty paper.
     4- Patients receive only verbal instructions.
   3- Irrational prescribing:
     1- Informal prescribing habits lead to under use or ran over drugs.
     2- Prescribing ineffective drugs or not indicated polypharmacy results in delivery, procurement and storage of unnecessary items.
   4- Patient use:
Inadequate instructions, quality dispensed, dosage schedules and cheating.

1.1.4 Frame work of medical supply:
  Pharmaceutical logistics systems work in a wide frame. It is in direct relations to Ministries of Health, Finance, Commerce, Foreign Affairs and Customs. The military medical supply system is in direct relation with Ministry of Defence also. The pharmaceutical supply system is concerned with various situations of the population and the emergencies that take place. The pipeline of drug supply is the health facilities and was greatly affected by the activities of the health providers and the social problems of the population.

1.2 Sudanese Military Medical Services
1.2.1 Historical Preview:
For centuries the methods of treating diseases vary with the predominant philosophies, religious believes and environments. For instance Muslims rely on the direction of Quran and Sunna to obtain reliable remedies for their ailments. Africans were influenced by magic and evil spirits causing diseases. Traditional medicine remedies were closely related to the surrounding environment.
Health problems played an important role in the armies' movements in the Sudan. While the Turkish army was moving to Sinnar, 1500 soldiers died of infectious diseases, leaders returned back because of fever and dysentery and even the governors died of health problems. Turkish army attacked Mahadi at Gadir when informed that his army was suffering from fever. Osman Digna conquered Tokur area in an outbreak of diarrhea (Shogair -1903).

Hospitals were established in Khartoum, Dongla, Sinnar and Barbar during Jaffers Basha of the Turkish period (1866-1871). (Koko. -1969).

During Mahdia, the medical services were devoid of the western medical sciences except those delivered by the Syrian and Egyptian doctors. This period was associated with many epidemics that had been aggravated by the famine of (1889-1906H). (Koko.-1969).

Cholera appeared in Dimiatt in 1883 and among the moving column in operations along the Nile (Rafie.1966). Nine military field hospitals were established between Aswan and Dongla beside 40 beds hospital at Swakin. Most doctors were Syrians (Gallwey -1886-1890). The moving column medical services were organized by P.M.O at the Headquarters (Sirdar Staff), issuing instructions directly to S.M.O. of infantry and S.M.O. of brigades. For each four infantry brigades (each of 4 battalions) there was a field hospital staffed by British M.O. as a S.M.O. and 4 native M.Os, one of them was an apothecary for dispensing and being responsible for the equipment and camels. Dysentery gave some troubles but all diseases were minor as compared with malaria which was prevalent and severe and seriously hampered the movement of the column. (Gallwey -1886-1890).

In 1897 there were 4 States: Nouba State -4 hospitals), Dongla State (9 hospitals), Barbar State (8 hospitals), East Sudan State (3 hospitals). The annual supply was received from London in bulk, then repacked and distributed to these stations in Abbassia.

After Omdurman battle in 1898, the conquering army faced struggle with an enemy more dangerous than fighters, malaria, the cause of which was not understood, and the mosquito had not been proven to carry the infection. (Gallwey-1889). The total patient admissions were 17988 fever cases, 548 deaths, while only 163 were killed in action. The field hospital at khur Shambat was transferred to Omdurman in 25/10/1898 (Gallwey -1889).

The first medically qualified doctor arrived in Sudan came with M. Ali Basha on his tour to Ghessan in the year 1821. Gordon Basha on his first period governing the Equatorial Region was accompanied with Dr. Edward Sytazer who became Dr. Amin latter on and was nominated as a governor for Lado. During his second period as a General Governor Gordon appointed Dr. Zorbakhain as a Health Inspector General. Mahadi on his last letter to Gordon, told him that, the apothecary with him could translate that letter. (Shogair–1903).

In 1903, colonel Benton established a medical services network, he had been awarded for that. Nuhur Military Hospital being located near the Blue Nile Bridge, the south of which were the stables which became the medical stores in 1918. The hospital became the Ministry of Health later on. Nuhur Hospital witnessed the battle of the first Sudanese armed revolution where A/fadeel el-Math camped and was killed (Osman.-1990).

On 17/1/1925 a command was issued for establishment of the Sudan Defense Forces, the organization of which contain in Paragraph 14, the Medical Corps and Animal Carriers (Osman.-1990).

Sudanese physicians who joined the army to the East (Ethiopia) and to the West (Libya), were the first nucleus of the Sudanese Medical Corps. The first Leader was appointed by the President in 1956 and was positioned in the Ministry of Health while the Military Hospital was in the military barracks. Then he was transferred to the Army Headquarters in 10/1956 before the Medical Corps moved to its final site in 1969. (Medical Corps Ordinance-1994)

The first organizing ordinance of the Sudanese medical corps 1974 was put in work in 1978. Till that time there were 4 pharmacists and 4 apothecaries. Supply was in complete reliance on the Medical Stores of MOH, then gradually segregated. The second Ordinance 1994 had not yet being updated.

The Military Medical Services network, now covers the whole country under the name of the Sudanese Medical Corps. Lastly named, the Medical Services Directorate.

1.2.2 The Medical Corps Responsibilities (Ordinance 1994):

1.2.2.1 Duties in Peace:

1- Maintaining and providing health to the militaries and their dependants.
2- Maintain high standards level of curative and preventive medicine.
3- Provide medical advice for the higher staff and the headquarter.
4- Regulate the Military Medical Council for the purposes of the medical examination and assessment of the personnel when required.
5- Medical and laboratory researches.
6- Academic provisions.
7- Maintain appropriate drug supply for the army units and the moving troops.
8- Train the medical support personnel of the army units.
9- Qualify the injured for the life activities.

1.2.2.2 Duties during war:
1- Provide medical advice for troops movement and camping of the army.
2- Establishing field hospitals.
3- Evacuation and treatment of injured fighters.
4- Medical preventive precautions measures essential for fighters health like vaccination and health learning.
5- Supplying the medical units by drugs and medical equipment in a military style opposite to the evacuation movement for regular supply.
6- Reports on the medical performance and conclude lessons.

1.2.2.3 National Duties:
(1) Co-operation with the national health authorities to defeat and prevent epidemic diseases.
(2) Urgent support in casualties.
(3) Medical or health missions commanded by the Higher Army Directorate.

1.2.3 Medical Corps organizational structure:
1.2.3.1 Curative medicine and hospital department:
A- Curative medicine division:
   i) Physicians and pharmacists section.
   ii) Inspection and profession section.
   iii) Nursing section.
B- Hospital affairs division:
   i) Central hospital section.
   ii) Regional hospitals section.

1.2.3.2 Operation and training department:
A. Operations division.
   i. Security in format.
   ii. Academic training.
B. Training division.
   i. Medical institute.
   ii. Evacuation section.

1.2.3.3 Administration and military supply department:
A. Administration division
   1. Administration squadron.
   2. Services squadron.
   4. Direction and moral boosting.
   5. Legal affairs.
B. Military supply division
   i) Vehicles and energy
   ii) Rehabilitation & reconditioning
   iii) Weapons
   iv) Dressing and sanitary requirements.

1.2.3.4 Preventative medicine:
- Vaccination and immunization.
- Epidemics and endemic diseases.
- Environment sanitation.

1.2.3.5 Medical supplies:

   (Fig. 2) Medical supply department
   Commander
   Central pharmacy
   Medical stores
   General Division
   Supply and
   Purchasing
1.2.4 Medical Ballatons Sites:
Juba, Malakal, Wau, Obied, Mojulad, Fashir, Fao, Demazin, Shendi, Port Sudan, headquarter reserve standby.

1.2.4.1 Responsibilities:
Establishing the medical squadrons among the brigades and camps. Injured evacuation from front squadrons to the specialist squadrons and then to the basic hospital. Health measures for habitat and environmental sanitation. Medical information and expectations before movements. Vaccination before, within, and after battles. Distribution of the health services among the forces. Drug supply, therapy and medicament and replacating the consumed quantities. Training of militaries on first aid practice. Reports, and concluded lessons.

1.2.4.2 Supply Division:
The supply division is responsible for the followings:
1. Supplying the division units with drugs, equipment etc.
2. Keeping appropriate stock.
3. Storage of drugs at optimum condition.
4. Recording consumption.
5. Replacing the consumed stock.
7. Practicing these activities in a pharmacy or a warehouse.
8. Supplying the specialist squadron and the medical squadron of the brigades. The ordinance stated that the medical ballon headed by physician brigadier, all the medical department are represented, and the pharmacist ranked as Leutenant captain. However, this ordinance became out of date due to the great changes and development made by (NFDMS) and the health insurance program (Takaful).

1.3 National Fund for Developing the Medical Services (NFDMS):

No doubt, the NFDMS took the major, if not all, the role in bringing up the medical corps to its existing situation.

1.3.1 Establishment of the NFDMS:
In 1992 when the war operations were at the maximum, the Higher National Committee for Rehabilitation and Development of the Military Medical Services was nominated after a detailed comprehensive proposal. Thirty five millions Dollars was the estimated budget. The National Council adopt the project. A successful donation week was organized. On 27/4/1993 the President issued a higher command instructing the Minster of Finance to add the injured stamp, (Taxis), in different percentages to invoices of some items. This provides adequate financial resource. The act of 1996 commissioned by the National Council gave the NFDMS together with the political support, a good opportunities for success.

1.3.2 Objectives of the NFDMS stated by the 1996 act:

1. Rehabilitation, improvement and upgrading the medical service to satisfy the continuous increase in fighters “Mojahedeen and army”, wounded and injured people due to war situation, both militatants and civilians.
2. Upgrading the service to the international levels in curative, preventive medicine and drug industries.
3. Provide appropriate and reactive medical security for the war areas to alleviate fighters spirits and to push upon the cultural program of the Nation.
4. Upgrading the states hospitals in all the country.
5. Upgrading the basic hospital at the center with high standard scientific practice to avoid medical treatment outside the country.
6. Activating the basic hospital to do its job for both civilians and militaries.
7. Attention on wounded and injured to qualify them for life movement.
8. Provide active, reactive, efficient military health facilities performance.
9. Motivate, gather activities of governmental potentials and public efforts to obtain support in order to exclude the development programs.

1.3.3 Authorities:
1/ Accepting donations,
2/ Owning money, facilities and authority of spending and establishing the required facilities to satisfy the activities.
3/ Investment in a legal behavior in trade measures.
4/ Contracting.
5/ Any other suitable authorities to fulfil needs.

1.3.4 Financial resources:
- Governmental allocation.
- Donations.
- Revenue of investment.
- Injured stamp (Taxis).
- Any other resources accepted by the council of NFDMS.

1.3.5 Fields of activities:
1. Field of the basic hospital.
2. Field of the regional hospitals.
3. Medical security for battles.
4. Wounded and injured.
5. Military demanded supply.
6. Medical supply and pharmaceutical industries.
7. Administration.
10. Investment.
11. Advertising and Dawa.
12. Motivation of internal support.

The act clears all the obstacles facing the growing up of the Medical Corps.

1.3.6 Opportunities for success :
1. Flexibility in performance and procedures.
2. Political support, supervised by the President.
3. Independent from the routine procedures.
4. Substantive financial flow and secured resources.
5. All personnel are from the field of the Medical Corps young and active, sincere and religiously motivated.
6. Good organization and scientific planning system.
7. The character of the General Secretary is accepted from all participants, and wide managerial prespection.
8. An autonomous authority, answerable only to the President.

1.3.7 The NFDMS work upon three dimensions:
1- The building (health facilities).
2- Medical equipment.
3- Skilled personnel.

The NFDMS played a major role in issuing the command for establishing the military health insurance by the Minister of Defence 1998. To provide a financial resource for providing health service and financing the drugs supply.

1.3.8 The military health facilities of NFDMS:
(1) Sudanese Center for Heart Diseases: Which is concerned with:
   i. All heart diseases.
   ii. All heart surgery.
   It is an autonomous structure, working on cost coverage policy for both militaries and civilians, (Arkawei).
   The personnel are militaries and civilians.
   The supply procedures are on private bases.
(2) Nureleyoun Hospital for Ophthalmology (Arkawei), the same as the Heart Center, concerned with all ophthalmic diseases and surgery.
(3) EL-Taheel Specialty Center: (Omdurman).
   For all medical cases, referred from different specialists for both civilians and militaries on investment basis. Private drug supply system was adopted.
(4) CT scan – (within the Taheel Building) for diagnostic purpose for all.
(5) MRI – (Omdurman) cost coverage system for all.
(6) Renal diseases: clearance, medicine and surgery.
Chapter 2

Literature Review
2.1 Drug policies

Documentation and outlining the efforts and activities to attain the specified goals and objectives stated to adhere drug availability, affordability, efficiency, and rational use. Drug policies usually formulated at the higher level of the nation involving all sectors of the population initiated by a governmental will and the mission statement formulated appropriately legislated. (Dinius -1988).

2.1.1 Contents:

NDP may outline the followings:
1) Registration and number of drugs.
2) Selection of drugs.
3) Cost calculations and pricing.
4) Production.
5) Quality assurance and laboratories.
6) Supply.
7) Storage and distribution.
8) Rational use of drugs.
9) Traditional medicine.
10) Cost coverage and financing.
11) Human resources, training, and research.
12) Monitoring and evaluation.

Storage and distribution as elsewhere in the pharmaceutical supply system, the professional skills pharmacist are vital. Particular emphasis should be placed on training in pharmacy, drug management, and clinical pharmacology (Dinius -1988). Operational researches aimed at improving selection, procurement, distribution, and use of drugs, help in the sustainability of the policy. The NDP advise the role of self-medication and OTC drugs and define the prescription, its content, and validity and patient cards. NDP should be flexible for future changes.

2.1.2 Designing NDP:
The ministry of health is the initiator of the process. The committees are as follows:

MOH (Initiator)

<table>
<thead>
<tr>
<th>Policy formulation (Technical Committee)</th>
<th>involvement committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional activities sub-committee</td>
<td>public activities sub-committee</td>
</tr>
</tbody>
</table>

2.1.3 Formulation:
The NDP could be formulated through wide discussion in workshops and seminars then a draft defining goal and objectives could be obtained. Then, circulated to various sectors to get support, revised and finalized. Finally, it could be endorsed to get the legal basis for implementation. It should be widely circulated and disseminated.

2.1.4 Implementing of NDP:
NDP could be implemented in phases according to the priorities.

Probable constraints:
1) Lack of political will.
2) Inadequate resources.
3) Opposition.
4) Population behavior.
5) The pharmaceutical sector involved in the drug policy and deals with a huge sum of money. In spite of this fact, demands generally exceed the supply, and many believe that this attributed to corruption and misappropriation of funds (Dinius -1988).

2.1.5 Sudan National Drug Policy: (SNPD-1997)

Was formulated in 1981 after an involvement of the professional sector. The pharmaceutical section in the national comprehensive strategy 1990, was established in the National Conference which accepts the philosophy of the essential drug list in drug supply.

The programs recommend by the NCS paper: (NCS-1992)

1. Purchasing through tenders.
2. Supporting the domestic production.
3. Erection of small production units at hospitals.
5. Giving attention for the personnel.
6. Innovation of distribution system to guarantee the availability of drugs in various regions.
7. Drug statistical unit to improve needs assessment.
9. Proper inspection.
10. Increase of the public pharmacies.
11. Establishment of pharmacy laboratories.
13. Quality control laboratory.
15. Medicinal plants agriculture.
16. Updating the pharmacy act.
17. Availability of equipment.

In the concept of NCS, the last renewed SNP- endorsed in 5/1997, printed and presented in a booklet, objectives of which are:
(1) Make available the needs of the population of safe, good quality, and effective essential drugs in sufficient quantities at the least possible cost.
(2) The rational use of drugs.
(3) Protect the population from the use of unsafe and low quality drugs.

For comparison, Philippines national drug policy aimed to drug production, procurement and rational use and gave a list of generics (1988 Act). The Australian NDP involved the population towards rational use of drugs similar to that of the U.K that had been in work since 1968. The drug policy is the guide and measure for the pharmaceutical sector performance. (Quick-1997)

2.2 Planning:
Planning is an essential key factor for any program to succeed. It results not only in a plan but it achieves the followings:
1- Highlighting the long term goals.
2- Facing the situation problems and needs.
3- Optimizing the use of available resources.
4- In the presence of a plan additional resources could be secured.
5- Provides a reference for evaluation.
6- Leads to respectful administration prestige.
7- Identifies the boundaries of the components.

2.2.1 Levels of planning:
Fig (4) Planning levels and responsibilities

2.2.2 Planning questions?
- Where are we now? Where do we want to go? How will we get there? How will we know that we got there? (MSH-2003)

2.2.3 Developing a pharmaceutical supply strategic plan:
1- Define the guiding framework through joint efforts of policymakers and senior staff.
2- Stating the mission; defining the main goals. The mission statement for the Church Sponsor Essential Drug Supply Service in East Africa aims at providing the church health units throughout Kenya with a reliable source of essential drugs and supplies, of proven quality at affordable cost, combined with appropriate training in clinical diagnosis and rational use of these drugs. (WHO-1995).
3- Assessment of the systems situation and resources; describing the opportunities of the selection of drug, procurement, distribution and use, describe the organization charts and resources.
4- Establish specific goals to achieve the mission and objectives to fulfill the goals (Dinius 1988).

(Fig 5) General plan for pharmaceutical supply system

<table>
<thead>
<tr>
<th>General mission statement</th>
<th>Ensure the availability of drugs, rational use at affordable prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Ensure safe, effective, good quality, low cost.</td>
</tr>
<tr>
<td>Ensure that drugs are rationally used.</td>
<td></td>
</tr>
</tbody>
</table>
5- Setting the priorities: may be done by any method but generally according the cost and impacts.
6- Selection of the specific strategy: the general criteria for selection are, the potential impact, which is expressed in financial benefits, financial feasibility, political feasibility, technical feasibility and cost effectiveness.
7- Formulation of the strategies into action plan, finally the official endorsement. Then the plan should be evaluated and adjusted in the implementation processes. Assessment could be expressed by the extent of adherence to objectives.

2.2.4 Implementing a plan: It is the responsibility of the higher managerial levels, which are interested in its success. The manpower utilized should be trained and enough funds should be available. The political, technical and social constraints should be solved. Suitable organization structure is essential, flexible technical approaches should be used; managerial and professional activities should be directed towards the targets. A timetable describing the activity, initiation date and date of commencement is a practical method for implementing the plan. The budget should be in details and accessible.

2.2.4.1 General Reasons for success in implementing a plan:
1. Reality of the plan, not hopes and wishes.
2. Considering commitments.
3. Reactivating those who were aimed to implement the plan.
4. Considerable support.
5. A plan for the right, genuine and true reasons.
6. Accessibility of enough funds.
7. Trained and expert personnel and key personnel.
8. Formulating the plan within the right level of planning.
9. Simple plans and wisely presented.
10. Follow up, monitoring, evaluation and adjustment regularly.
11. Overcome the self-interest of reluctant.

2.3 Organization:
2.3.1 definition:
Organization could be defined as the association of personnel efforts to achieve a certain established goals. (Money -1939).

2.3.2 Principles of organization: (Simon-1957)

General principle: for any group of people having to do a work, tasks could be divided upon them. Each person will be responsible for his division of work..

Principle of goals: if there are no goal, there will be no need for organization.

1-Principle of position or function: function is the basic unit of organization. Its authorities and the responsibilities should be related to the function and not to the person who is occupying it.
2-Principle of specialization: increases the efficiency, perfection and accuracy because specialist will focus only in one specific post.
3-Principle of unity of command: for every subordinate there should be one superior.
4-Principle of parity of responsibility and authority: the responsibility to achieve certain targets, there should be the authority to achieve it.
5-The principle of the span of control: the wider the span of control, the lower the control output.
6-The principle of short chain of command: efficiency and effectiveness of the organization increases on decreasing the chain of command.
7-The principle of delegation of authority: increase on delegation, increases the efficiency of the organization.
8-The principle of flexibility: to face different variables without the need for basic changes and to facilitate achievement of goals.
9-The principle of efficiency: efficient organization achieves its goals with the least possible expenditure.
10-Principle of human resources: training and development of human resources increases the productivity of organization.
11-Administrative efficiency increases by grouping workers according to purpose, place, and client. (Simon-1957)

**2.3.3 Coordination:** it contains all organization principles. It is the orderly arrangement of group of efforts to provide united action in a pursuit of a common purpose. (Moony-1939) the supreme coordinating power was known to be organized effectively in the armies.

**2.3.4 Aggregation and segregation of activities:** (Asfour -1992)
1. purpose  2. Process  3. Place  4. Person (client) according to the 4 Ps productivity and efficiency is directly proportional to the degree of speciality. Speciality diminishes expenditure and ease the control. Priorities could be distinguished coordination increases and objectives could be clear. The attitude of members, training of staff, use of technology and expert in special activity, all could be enhanced. The proper man in a proper post. It is possible to find more than one qualified expert person in a particular activity, but no one person expert in more than one activity. (El Hawari-1977). Specialist is an individual whose type of capacity is very much determined by training in a particular field of knowledge and discipline. Whenever the activity is essential and important it is better to be segregated from the other units and to be placed in a short chain of command, the higher the managerial level, is the more essential activity (Asfour-1992).

**2.3.5 Types of organization:**
Typologies according to profitable and non-profitable oriented categories contain dimension that overlap in non-predictable ways. Attempts to activities were appreciated.
1- Structural activities
2. Formalization of procedures.
3. Specialization.
5. The line control of the work flow. (Hall-1987)
   In all aspects of organization; specialty is the dominant factor.

**2.3.6 Function:** Function is the basic unit of organization, every function should receive instructions from one superior. Any kind of duality, rings the bell of danger and you should consult the upper level in the organization (El- Hawari-1977).

**2.3.6.1 Job description statement:** it describes the followings:
1. Task and duties
2. Limits of authority
3. Coordinating factors.
4. Direct superior.
5. Functions and relation.
6. Responsibilities.
A linear responsibility chart could be issued for the whole organization.

**2.3.7 Principles of management:** 14 principles could be applied in all kinds of management being political, industrial or military (El-Hawari-1977).
1) Division of work and labor.
2) Authority and responsibility.
3) Discipline.
4) Unity of command.
5) Unity of direction and aim.
6) Subordination of individual interest.
7) Incentives.
8) Centralization of authority, determination at the center.
9) Chain of authority.
10) Orderly arranged position.
11) Justice and equity.
12) Stability of workers (functional stability)
13) Initiation.
14) Team work spirit.

2.3.8 Organizing a drug supply:

2.3.8.1 Types of drugs supply organizations:
1- Fully Public: the government, supplying governmental health facilities.
2- Private sector: supplying governmental health facilities.
3- Social health insurance: pharmacy or patient reimbursement of a list of drug expenditure.
4- Private sector financing the governmental supply- (socialist economics).
5- Whole sale monopoly governmental agent supplying all facilities including the private sector.
6- Fully private financing and supplying (private pharmacies).

2.3.8.2 General constraints influencing governmental drug supply:
1- Insufficient service resulting from lack of individual incentives for good performance.
2- Bureaucracy, inflexibility and over employment.
3- Group interest pressures, political pressures and inefficient use of public resources.
4- Manipulation of supplies activities to self-interest.
5- Insufficient resources is the most common frustrating factor.
6- Stock out, shortages, expiries are the common features of governmental drug supply. (Quick-1997)

2.3.8.3 leaving drug supply to the market results in:
1) Inequity: drugs may be unaffordable to those who needed them.
2) Lack of information needed by the patient and the health professionals.
3) Lacks of potential commentator in putting down the prices.
4) Preventive medicine and vaccination and public medicine will not find the required efforts.

2.3.8.4 Basic approaches for organizing drug supply:

(1) Central medical supplies.
(2) Autonomous or semiautonomous supply system.
(3) Direct delivery system.
(4) Prime- vendor system.
(5) Fully private system.
(6) Mixed systems.

2.3.8.4.1 Central Medical Supply:
Drugs are selected, procured, financed and distributed by a central governmental unit. The system had been adapted to RDF system. **Problems related with this model:**
1. Inadequate financial resources.
2. Procurement constraints arising from the central treasury payment cycle and release of funds.
3. Transport difficulties due to lack of vehicles.
4. Political and administrative interference.
5. Ill-performance and lack of incentives.

2.3.8.4.2 Autonomous supply agency:
To overcome the constraints of CMS model in bulk procurement, quality assurance, storage, distribution and enough financial resources and management in one hand and the governmental feature in the other hand, an autonomous or semiautonomous agency is considered being either independent with a board of directors or under the government supervision, it operates as a non-profit supplying a selected list of drugs.
Principles of autonomous or semiautonomous supply agency:
1. Achieving the efficiency and flexibility of the private sector.
2. Maintaining sufficient public sector supervision. (Quick-1997)
   Difficulties arise only in inserting staff that are not professional.

2.3.8.4.3 Direct delivery system:
A central procurement office establishes the prices, but the supplier delivers drugs directly to the regions or health facilities. Financing may be regionally or centrally. Problems related to this model are, security, ordering, receiving and payment. Costs may increase due to transportation and ill managed peripheral facilities.

2.3.8.4.4 The Prime-vendor system:
Drugs are procured centrally by contracting suppliers then another contract for distribution and storage on a mark-up of 1-5%. Competition may lower the margin.

2.3.8.4.5 Fully private system:
The government leaves the supply for the market.

2.3.9 Models of management:
A-Centralized model: Central logistic unit, responsible for the selection, procurement and distribution. The individual health facilities depend upon this unit in their storage, dispensing and use by the patient and for overseeing and supervision.

Advantage:
1) Economics resulting from quality discount.
2) Staff specialization.
3) Increased opportunities of efficient storage for large quantities.

Disadvantage:
1. Good communications and transportation must be available.
2. Slowly respond to new special needs.

B-Decentralized model: Each State or even each health facility performs the supply activities individually.

Advantage:
1) Less chance for confusion. The needs are defined locally and purchased locally.
2) Rapid in action.

Disadvantage:
1) No specialty in a specific logistics function.
2) High operation cost. Less bulk purchasing.
3) Duplication of activities in different individual unit.
4) Monitoring of activities as a whole might be more difficult.
5) Problems are diffused and might be difficult to focus on.

C-Directorate model: A central coordinate division of logistic unit, maintaining the selection and procurement centrally managed, while distribution and control of use are managed peripherally.

2.3.10 Principles of management:
a) Senior staff should have sufficient status.
b) Keep close to the top governmental level, direct link and communication.
c) A manual handbook clarifying the responsibilities and procedures is essential.
d) Responsibilities should be in parity with authority and sufficient resources.
e) Relations with the private sector should be kept fruitful.
f) Well designed information systems are necessary.

2.3.11 Functions of the information system:
1. Information in drug consumption, storage facilities, vehicles, machinery and resources.
2. Shipment receipts, delivery times and performance.
3. Supervision of personnel. In-service training of staff and identifying area on which training is required.
4. Evaluation of quality of the service towards total quality.
5. Guide for further needs.
6. Aid in obtaining funds by financial documentation.
8. Aid in setting priorities.
9. Assure that patient receives safe, effective drugs in affordable prices.
10. Detect losses.
11. Identify weak areas of the supply systems. (Antezana and Velassquez-1996)

2.3.12 Personnel:
The performance of the staff could be improved when there is:
1- Recruitment of qualified individuals, who are well paid.
2- Clear written job description.
3- Adequate training and preparation.
4- Regular supervision rewarding and motivation.

The presence of qualified pharmacists and trained pharmacy assistants in the top managerial and supervision position almost improves the reliability of supply and the condition of goods supplied. Sufficiently high statuses must be granted to top-level managers and supervisors in logistics services. (Quick--1997) competition and incentives should be through checklist.
2.4 Selection of Drugs

2.4.1 Introduction:-
For the 700 existing drug entities, there are more than 100,000 pharmaceutical products circulating in the world market. 70% of which are duplicates, many are me-too drugs, others have no therapeutic benefits over the others. Some are unacceptable dangerous drugs of adverse effects, outweighs their therapeutic value (Quick-1997). Drugs comprise about 40% of the total health care budget. In European developed countries it is 13% - 37%, in South East Asia 35% - 45%, and in some African countries ranging from 50% to 70%. Registration of drugs is the first step in selection of drugs from the world market to be circulating in the country. Every country has a regulatory procedure for registration. In some countries there are up to 80,000 pharmaceutical products, some have 10,000. Most of countries have 3500 – 4000 items. In Sudan there are about 6000 pharmaceutical products. Many of these items are:

- Duplicates: the exact active ingredient from many producers.
- Minor variations of the prototype and offer no therapeutic advantage.
- Have high toxicity relative to their therapeutic benefit.
- New drugs with insufficient information on efficacy and toxicity.
- Of therapeutic indications not relevant to the basic needs of the population.
- More expensive than the existing similarly acting available drugs.
- Many are not the first choice for treatment of specific disease.

Therefore, selection is the balancing of different variables of efficacy, safety, cost, health care infrastructure and prescribers.

2.4.2 Effect on prescribing:

- The drug market is open, the availability of all kinds of products at the health facility could not be achieved.
- Prescriber could not be up to date in all varieties of drug.
- Relying on information from companies may lead to irrational prescribing.
- Inconsistent prescribing within the same health facilities.
- Over-prescribing of nonessential drugs leading to depletion of resources.
- Confusion in the drug of choice due to the increasing numbers of alternatives.
- Presence of unsafe, ineffective, expensive drugs of questionable quality.
- Concentration on a different limit of drugs, leads to irrational prescribing.
- Educational and training programs could not be achieved.
- A adverse effects of drugs could not be easily detected.
- Unknown trade name of invaluable varieties lead to patient inconvenience and distrust to the health service.

Thus, selection is the key factor for rational prescribing. (Quick-1997)

2.4.3 Impacts on the logistic process:

1- Purchasing power is highly concentrated by elimination of duplicates and non-essential irrelevant products, improving the efficiency of the entire system.
2- Allows bulk purchasing, consequently decreases the prices and saves resources.
3- Exclusion of the expensive, new drugs of uncertain safety and efficacy and of no advantage over that basically needed, will give a good opportunity for the availability of essential drugs.
4- Quality control will have a good opportunity if carried on limited items.
5- Basic health needs could be available and accessible for all.
6- Improved quantification based on either morbidity or consumption may be implemented since it is based on fewer different references.
7- Reducing transaction cost because of purchasing from few manufacturers in bulks.
8- Reduction in the stock keeping cost lead to easier stock management.
9- Distribution will be simplified easier and with equity. Limited number of generic items allows good competition, good prices and quality.

Selection is the cornerstone of any drug program to improve the pharmaceutical logistics process. (Taylor and Harding-2001)(MSH-2002).

2.4.4 Economics of selection:

1- Lack of essential drugs blocks the operation of the health care resulting in unproductive population.
2- Drug expenditure involves spending foreign currency, selection of drugs rationalize the utilization of resources, and achieving good value for money.
3- Competition on generic results in 50%-60% savings.
4- Bulk discounts and less inventory cost and less administrative cost.
5- Rational utilization of funds on essentially needed drugs to prevent or treat the prevalent diseases.
6- No drug waste or expiration.
7- Improved effectiveness and efficacy, lowers the cost of health care service and patient expending.
Selection is highly cost effective. (Antezana and Velasquez-1996)

2.4.5 Levels of selection:
2.4.5.1- Registered drugs
The process of licensing the drug to be marketed in a certain country. The approval for registration requires many steps. The criteria include efficacy, safety and quality. In some countries require the need, cost and licensing of the manufacture. The process of registration is the first step in selection of drugs. It includes all drugs in the country, public or private sectors.

2.4.5.2- Essential drugs:
This is the second stage of selection, based on registered drugs. Some are essential. It is always adopted for the public sector. All levels of use may be formulated making one levelled essential drugs. Essential drugs are considered to be the drugs of choice to satisfy the health care needs of a given population. It may be applied for a single health facility as a hospital drug list developing a hospital drug manual or a hospital drug formulary. It may also be regional making a regional list of drugs. The list can be considered as a supply list defining the range for the different levels of care. The number of drugs increases from the health worker and nurses to the medical assistants then for the medical officer and wider for specialist. From a small dispensary to the health care then to regional hospital and referred hospital.

Essential drugs lists:
W.H.O define essential drugs as those that satisfy the health care needs of the majority of the population, they should therefore be available at all times in adequate amounts and in the appropriate dosage form. (Hogerzeil-2000)

W.H.O Criteria for selection of essential drugs:
Three factors firstly studied:
1. The prevalent disease in the country.
2. Character of the patient, age, sex, genetics, environmental conditions.
3. Levels of training health personnel.

2.4.5.3 Basis of selection:
1. The proven efficacy, high safety and good quality drugs.
2. Minimum number of drugs to treat the prevalent diseases, avoiding duplicates, unnecessary, similar drugs and dosage forms.
3. New drugs would not be accepted unless it is approved to possess a distinct advantage over the products in use.
4. Combination products are accepted when they have a true benefit over the individual use of each component alone or if the cost is less than the components.
5. Drugs of choice and when other alternatives are not existing.
   a) Evaluate administrative and cost impacts of purchase, storage and distribution.
   b) Locally manufactured products are superior to those imported.
6. Select drugs that are of adequate standards and established quality.
7. Evaluate, contraindications, interactions, adverse effects, precaution to obtain benefit / risk ratios.
8. Take in consideration the cost of treatment rather than unit price.
9. Publish the list in generic names.
10. Health authority should decide the level of prescribers.
11. Infrastructure of health facility in levelling the drugs.
13. Stability upon storage and the storage facilities required.
14. Bioavailability if possible.
15. The list should be revised, addition and deletion periodically. (Quick-1997).

2.4.6 Methodology for selection at the national level:
a) Prepare a list of health problems and the prevalent diseases.
b) Evaluate the health facilities and health personnel.
c) Select the drug of choice (one or two) for the disease.
d) Assign the level of use of each drug.
e) Review the formulary.
f) Formation of a multi disciplinary committee.
g) Endorsement.

2.4.6.1 Selection Committee of National Lists: { The committee members should have no relationship to any manufacturer or distributor in order to avoid self-interest.}.
The members are:
1. Ministry of health representation.
2. Pharmacologist and university staff.
3. Representation of regional and local facilities.
4. Purchasing department representation.
5. Internist, surgeon and obstetrician.
6. Infectious disease specialist
7. Pediatrician.
8. Pharmacists.
9. Health care directors and health control programs managers.
10. Other specialists as needed.

2.4.6.2 Selection in INN (generic names):
Each drug has a chemical name and International Non-proprietary Name, beside the brand name of the manufacturer.
   a. It allow for competition among producer resulting in:
      i. Good quality products.
   b. Lower prices obtained.
   c. It offers clarity, more informative; the name can identify the class of the drug.
   d. It facilitates rational prescribing, easy dispensing and allow substitution.
   e. Generically named drugs posses approved safety, efficacy and indicate low adverse effects.
   f. The quality control methods for generic product was established on clear methodology so the quality could be controlled.
   g. As most of generically named drugs lower the prices to 50% or less as most of them are off patent.
   h. Selection in generic names is judicious.
      i. Reduces the number of items, it maintain drug supply system of appropriate and manageable size in terms of human
         and financial resources needed to monitor and control its operations effectively
         (Hogerzeil-2001).

2.4.6.3 Classification of the drugs listed:
Pharmacological therapeutic classification was widely adopted. W.H.O list of essential drugs contain 27 sections. The Sudan
national list of essential drugs 2002 contains 28 section of subdivisions. SNLED 1995 also contains 28 groups. This method
offers good education and training opportunities.
Dosage form should be specified, strength and value administration. Some classifications specify a separate list for every level
of use; others had been considered as one levelled list. A levelled essential drug list may be considered as a supply list,
defining the range of drugs for the different levels of care. National essential list of drugs is synonymous with the formulary
list which centers on drugs. The formulary list is a precursor for the formulary manual which is centered on disease. The
manual usually contain the generic names of drugs, indications and use, dosage forms, dosage schedules, contra-indication,
side effects, interactions and precautions. It may contain prices to help prescribing decisions. The process is a formulary
system which is a drug managing process, this could be national, regional, or at the health facility.
Hospital drug formulary or a list reimbursed by health assurance program follow the same procedures of the national list.
2.4.7 Classical Hierarchy of selection:
The selection of drugs at all levels requires a committee. The range of drug narrows as descending the medical professional
levels and health facilities. The involved committees are:
1. National Registration Committee.
3. Hospital Drug Committee.
4. Regional Committee.
(Table 1) Classification of the WHO list and Sudan list of essential drugs: (SNLED-1995, WHO List of essential drugs-1998).

<table>
<thead>
<tr>
<th>Group No</th>
<th>Pharmacological–therapeutic group</th>
<th>WHO list</th>
<th>SLED 1995</th>
<th>SLED 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anaesthetics</td>
<td>*</td>
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<td>2</td>
<td>Analgesics, antipyretics, non steroidal anti-inflammatory drugs &amp; drugs for gout</td>
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<td>3</td>
<td>Antiallergics and drugs used in anaphylaxis</td>
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<tr>
<td>4</td>
<td>Antidote and substances used in poisoning</td>
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<td>*</td>
<td>*</td>
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<td>5</td>
<td>Anti convulsants / ant epileptics</td>
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<td>6</td>
<td>Anti infective drugs</td>
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<td>7</td>
<td>Antimigrain drugs</td>
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<td>8</td>
<td>Antineoplastic and immunosuppressive drugs</td>
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<td>9</td>
<td>Antiparkinsonism drugs</td>
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<td>10</td>
<td>Drugs affecting the blood</td>
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<td>11</td>
<td>Blood products and plasma substitutes</td>
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<td>12</td>
<td>Cardiovascular drugs</td>
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<td>13</td>
<td>Dermatological drugs (topical)</td>
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<td>14</td>
<td>Diagnostic agents</td>
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<td>16</td>
<td>Diuretics</td>
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<td>17</td>
<td>Gastrointestinal drugs</td>
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<td>18</td>
<td>Hormones and other endocrine drugs and contraceptives</td>
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<td>19</td>
<td>Immunologicals</td>
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<td>20</td>
<td>Muscles relaxants</td>
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<td>21</td>
<td>Ophthalmologic preparations</td>
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<td>22</td>
<td>Oxytocins and antitoxins</td>
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<td>23</td>
<td>Dialysis solutions</td>
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<tr>
<td>24</td>
<td>Psychotherapeutics drugs</td>
<td>*</td>
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<tr>
<td>25</td>
<td>Drugs acting on the respiratory tract</td>
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<tr>
<td>26</td>
<td>Solutions correcting water, electrolyte and acid- base disturbances</td>
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<tr>
<td>27</td>
<td>Vitamins and minerals</td>
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<tr>
<td>28</td>
<td>Drugs used in ENT and dental care</td>
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</table>

2.4.8 Hospital drug formulary: “Hospital level selection”

2.4.8.1 Introduction: -
The key factor for the optimum therapeutic benefit of the public sector expenditure is the rational selection of drugs. At the hospital level this may involve forming a hospital therapeutic and formulary committee. The result of such selection is developing a hospital formulary list which differs from that of the national level in being restrictive to be used within that given hospital. The hospital formulary becomes the basis of developing a hospital formulary manual which is a concise reference book containing the basic drug information facilitating the rationality of prescribing, dispensing, patient and staff education to rationalize drug use.

The American society of health system pharmacists state that “the multiplicity of drugs available and the complexities surrounding their safe and effective use make it necessary for hospital to have organized, sound program for maximizing rational use of drug”. (Quick 1997). The pharmacy and therapeutic committee, or equivalent, is the organizational keystone for this program “Health system pharmacists”.

Formulary and Therapeutic Committee: -

2.4.8.2 Objectives: -

1- Developing and implementing professional policies on drug selection, procurement, evaluation, safe use and drug information.

2- Assisting in the formulation of educational programs designed to meet the needs of the staff for drug related practices. The formulary and therapeutic committee is the authoritative body who formulates the drug list circulating in that facility, and regulates the intervention concerning drug. The FATC should have a regulatory power and activity.
The committee should be launched by the first post in the organization. His first deputy, normally, is the chairman of the committee. The committee should be permanent and the order should point to the members and functions and activities regulating its work.

2.4.8.3 Members:
- Chairman – usually a physician representing the headquarter.
- Secretary – pharmacist; senior or drug information centre or pharmacologist.
- Head of main clinical department.
- Hospital pharmacist.
- Authoritative physician and specialist.
- Invited specialists to participate in certain issues, also nurses when needed with no voting privileges.

- Decisions should be made by vote.
- Members should not have any business relationship with pharmaceutical distributors or manufactures.
- Members should not be more than ten.
- One at least should attend continuing course in clinical pharmacology.

2.4.8.4 Functions of Formulary & Therapeutic Committee:
1- Developing criteria for evaluation of drugs to be included in the drug hospital list, preparing and maintaining the formulary list.
2- Developing policies and procedures for selection, procurement and use of drugs.
3- Criteria for additions and deletions from the formulary list.
4- Conducting monitoring and evaluation programs for use of drugs, management and dispensing practices.
5- Maintain an emergency drug list, approve standard ward stock list.
6- Standardizing prescribing practices through preparation of treatment guidelines.
7- Provide unbiased drug information through the development of a formulary manual.
8- Coordinate drug supply for special ongoing programs.
9- Review the leveling of drugs utilization.
10- Conduct training programs.
11- Represent the facility to drug companies’ representatives.
12- Describe the inpatient and outpatient drug schemes.
13- Coordinate drug reimbursement with the health insurance program.

2.4.8.5 Policies to be developed:
Firstly, polices developed should be approved by the chair administrator.
- Policies empower the committee to implement decisions.
- To request medical staff compliance.
- To organize its work and activities.

2.4.8.6 The policies should cover:
1) The criteria of formulary drug selections.
2) The addition and deletion procedures.
3) Meetings; on call and periodical meetings.
4) The use of generic names.
5) Prescribing requirement and ideal prescription.
6) Substitution policy. Generically equivalent or therapeutically alternatives.
7) Non-formulary drugs, allowed or not, reimbursed or not.
8) Rules governing the formulary and revising period.
9) Drug use evaluation and investigational regulations.
10) Drug promotion and company representative guidelines.

2.4.8.7 Formulating the list:
1) Classification method:
   Therapeutic and pharmacological actions, anatomical, chemical classification or alphabetical arrangement could be chosen.
2) Data collection:
3) Concerning annual morbidity report and the statistical information available.
4) Drug information available, e.g. essential list of drugs.
5) Drug consumption.
6) Analyze the data:
7) Arranging orderly the prevalent diseases.
8) Define the drug of choice for each disease. The dosage pattern.
9) Calculate the quantity of each drug required.
10) Setting priorities according to ABC / VEN. (Vital, Essential,Non-essential)
11) Conduct drug class reviews and draft the formulary.
12) Classify the drugs obtained.
13- Implement the formulary either class by class or totally. After finishing selection, drafting the formulary and widely disseminated, the deleted drugs could be eliminated and the new drugs could be added.
14- Reviewing the formulary periodically and cautiously. Evaluation and monitoring of drugs by group facilitates the improvement.
15- Endorsement by the chief of the organization.

2.4.8.8 Methods to promote formulary adherence:-
16- Take action on non-formulary drugs available
17- Provide easy access to the formulary list.
18- Involve the medical staff in preparing the list and committee decisions.
19- Provide lists for therapeutic substitution when prescribed drug is out of stock.
20- Design a request form for the use and addition of the drugs out of the list.
21- Prohibiting the distribution of drug samples of non-formulary drugs.
22- Filing the committee activities.
23- Shortly disseminate and develop the hospital drug manual.
24- The list should be open for additions and deletions.

2.4.8.9 Results required from the formulary:
   a) The formulary should be designed to maximize the use of resources. Limited to conserve resource, as there is no way to stock all drug in the national formulary. Therefore the number of drugs is limited.
   b) Formulary in generic names, rationalize the practice, concentrate on drug of choice for prevalent diseases, assures the balance of safety, toxicity, effectiveness and cost of a chosen drug and avoids duplication of unnecessary alternatives.
   c) A formulary classified in therapeutic groups allow formulary manual development to provide unbiased information resulting in improved prescribing, dispensing and appropriate use of drugs.
   d) Provide good quality drugs and eliminate unsafe and ineffective drug and newly introduced drugs of questionable efficacy drugs.
   e) Decrease the inpatient hospital stay.
   f) Leveling the list by medical occupation position, allow improved prescribing and restriction and limitation of use of certain drugs to certain specialities and certain wards and professional level verify the patient safety and health.
   g) Excluded approved products may be supplied to meet exceptional needs.
   h) The formulary should provide an important objective of selection in establishing a drug supply system that satisfies the health needs of certain community and respond positively to the exceptional circumstances. (Taylor & Harding-2001).

2.5 Procurement of drugs:
2.5.1 Definition: It is the process of acquiring supplies, (Quick-1997).

2.5.2 Objectives of procurement:
1- Making available, the right drugs, the right quantities in the right time.
2- Obtaining the lowest possible prices from a reliable supplier, (best value for money).
3- Assured quality.
4- Maintaining safety stock.
5- Achieve these objectives in a legal and ethical manner.

2.5.3 Procurement systems: procurement systems are sorted according to the type of the organization except that many organizations may practice the process collectively in one procurement office known as a pooled procurement. A worldwide belief that group purchasing through one procurement office continues to offer clear advantage over decentralized procurement in that:
   a- Reduces prices to the lowest possible rates.
   b- Reduces the cost of management.
   c- Grants payment, encourages suppliers to compete in price and performance.
But, the process is a time consuming and if one of the group members failed to fulfill his commitment, the program may fail for the group.

2.5.4 Procurement methods:
The procurement methods may compared as follows:

(Table 2) Comparison table:

<table>
<thead>
<tr>
<th>Method</th>
<th>1) Open tender</th>
<th>2) restricted tender</th>
<th>3) competitive negotiation</th>
<th>4) direct purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers</td>
<td>Open for all suppliers</td>
<td>Pre qualified suppliers</td>
<td>Limited suppliers</td>
<td>Single suppliers</td>
</tr>
</tbody>
</table>
Mixed methods could be done; large and bulk quantities for open or restricted tender, small quantities of low prices by competitive negotiation, direct negotiated purchases for emergencies and when non-profit agency exists. (Stephens M.2003)

**2.5.5 Procurement Decisions:** Procurement decisions depends upon the government laws and regulations. Public sector if professionally managed, it can preferably choose the competitive, restricted method from a limited list of reliable suppliers in annual, scheduled or perpetual basis. (Quick-1997)

(Fig. 6) The General Procurement Decisions

2.5.6 Procurement cycle
The procurement office is the directing force of the cycle, all activities are scheduled in a timetable in weeks.

(Fig. 7) The Procurement cycle:

- Review the selection list
- Feedback information on utilization
- Determine quantities
- Monitor the orders
- Receive and check
- Reconcile needs and funds
- Choose the method
- Determine suppliers
- Tender
- Orders
- Contract

Procurement office
2.5.6.1 Review the selected list of drugs:
The selection list is prepared by authorized committee specifying the generic name, dosage form, strength, basic unit, basic package size, basic package in the outer packets, specification of containers, proposed price for basic unit and any other specifications.

2.5.6.2 Quantification of Drugs:
Quantification could be centralized or decentralized. Quantities should be adjusted for:
1- Filling the supply pipeline: 12 months working stock + 2 months safety stock for the center.
   3 months working stock + 2 months safety stock for the regions, 3 months working stock + 2 months safety stock for health center, one month working stock for dispensaries, a total of 25 months stock.
2- Adjusting for lead time: should be determined for each drug. It is the time from issuing an order to receiving the goods calculated in days.
3- Adjusting for losses, damage, expiration, spoilage and theft.
4- Adjusting for the growth of the program.
5- Adjusting for the outbreaks of epidemic and emergencies.

2.5.6.2.1 Methods of quantification:
A- Morbidity method: this method requires: (Griffiths -1991)

1- Prefect, dependable accurate statistical data in diseases and health problems.
2- Treatment guideline, approved manual defining the standard treatment.
3- Percentage of each treatment regimen for diseases.
4- Number of treatment episodes, and their age scale.

Formula: 
\[ QE = \text{quantity per episode} = D_{cu} \times N \times LD \times ET \]
\[ ET = \frac{\text{number of contacts} \times \text{problem frequency}}{100} \]
\[ PT = \text{percent treated} \]
\[ QT = QE \times ET \times PT \]

Problems related with this method: (Griffiths -1991)
1- Difficulty in obtaining the required data.
2- Different treatment patterns and different prescribers and different regions.
3- Could not be applied for more than 50-100 health problem.
4- Difficult to be applied in a complex system of different health levels.
5- A very generous method facing the limited funds.
However, it is useful in budgeting and calculating the cost of treatment. It indicates the huge quantity of drugs required being useful to convince policy-makers on impossibility of free supply system.
**B-Consumption method:** This method is based on the data obtained from the bin card at the store level or at the health facility. (Quick-1997)

Calculated as follows:

Adjusted monthly consumption =

\[
\text{Adjusted monthly consumption} = \frac{\text{Total consumption in a period}}{\text{(reviewed months} - \text{stock outs in months})}
\]

\[
C_A = \frac{CT}{RM - MO}
\]

Being adjusted for the safety stock =

\[
C_A \times \text{lead time} \quad SS = C_A \times LT
\]

This formula could be adjusted for vital items.

The quantity ordered could be subtracted and also stock in hand \( S_1 \) subtracted so the quantity required for a certain procurement period \( PP \) could be represented as:

\[
Q_O = C_A \times (LT + PP) + SS - (S_1 + S_0)
\]

Then could be adjusted for changes in utilization, prescribing and seasonality, outbreaks, losses and theft.

( Fig. 8 )

**Consumption data sheet:** (Griffiths -1991)

**PP:** procurement period. **LT:** lead time.

<table>
<thead>
<tr>
<th>Drug</th>
<th>C</th>
<th>L</th>
<th>P</th>
<th>S</th>
<th>Suggested quantity to ordered in QO</th>
<th>Adjusted order quantity BU</th>
<th>Basic price</th>
<th>Value of proposed or</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**C-Adjusted consumption method:** (population or service based estimates). (Griffith -1991).

Selected a standard reference system having a good morbidity and population data. Then the annual consumption was calculated. Dominator was selected, either 1000 of inhabitants or 1000 of patient contact.

The rate of consumption will be the annual consumption divided by the number of thousands of inhabitants or number of thousands of patient contact. On extrapolation to other target system, the number of thousands of inhabitants or contacts according to reference rate multiplies the annual rate of consumption.
If the morbidity data and consumption records are available regionally and centrally, both methods of morbidity and consumption could be done and compared with the central records and a rational value could be obtained (WHO-1990).

2.5.6.3 Reconciling Needs and funds: (Quick-1997)
The total value of the cost of drugs being calculated should be reconciled with the available funds.
If the cost of drugs exceeds the available funds, many factors should be considered:
1- The selection list
2- Prescribing patterns
3- Theft and losses
4- Good procurement monitoring
Then the cost effective dosage form is selected, and if quantities should be cut, it should be systematic. Equal cut across all items is not reasonable. Disease priorities, age group priorities, health facilities priorities could be reviewed. If enforced to cut the quantities, the rational cut needs the analysis of the quantities.
1. VEN analysis
2. ABC analysis
3. Price comparison analysis
4. Therapeutic category analysis
5. Total variable cost analysis
6. Lead time and payment analysis
7. Expiry date analysis
8. Hidden cost analysis
9. Cross check with other systems or with the last year consumption.
These methods of analysis could be done according to the available data.

1/ VEN system Analysis: classification of drugs into vital, essential and nonessential is best to be done by an authorized expert committee or by the formulary committee or by the selection committee. Taking into consideration the occurrence of disease and its severity and the
therapeutic effect of the drug. The population and prevalence of patient should also be considered, together with the degree of life threat and of course the cost of therapy.

2/ ABC Analysis: categorizing the list into ABC according the value of their annual consumption. Descending sorting of the percentage of the annual consumption values is obtained and cumulative percentage is calculated plotting graphically the percentage against number of drugs.

A- (10-20%) expend 75% -80% of the total value. B- (10-20%): expend about 15-20%, C- (60-80%), expend 5-10% of the total value.

Special attention should be given to class A to protect from theft and losses and minimizing the lead time, seeking for alternatives or decreasing the prices will significantly affect the budget. (MDS-1997)

3/ Therapeutic category analysis: The same as the ABC except that drugs are grouped into therapeutic groups. Detailed therapeutic category analysis accounts for the course of therapy of a drug within the therapeutic group. Such analysis can aid in choosing the most cost effective drugs, provides pharmacy economic information and focus on the high cost therapeutic category. With the presence of morbidity data, the expenditure of each disease could be obtained.

4/ Price comparison analysis: This method focuses on the prices of the drugs within the system compared with other systems or comparing the prices obtained by different procurement methods.

2.5.6.4 Choosing the procurement method:
In spite of being regulated by the government, it is not necessary to purchase all drugs by the same method, however, the choice should achieve the objective of the lowest possible prices and reliable supplier and good quality with minimal influences. Therefore intelligent bargaining is essential. (ITC-1986)

2.5.7 Functions of the procurement committee:
(1) Choosing the method of purchasing,
(2) Defining the scope of the tender; (local or international).
(3) Estimate or fixed quantities? and decide on registration of items.
(4) The policy of selecting a single supplier for each drug or split the quantities between number of suppliers?
(5) Choose the primary/ secondary winners or primary only. If failed call for rebidding.
(6) If an international scope was decided; should the local agencies be involved?
(7) Single annual tender or multiple tenders through the year.
(8) Decide whether the domestic drugs should be in a separate process.
(9) Pre or post – qualification of bidders.
(10) Give the time- table of the activities.
(11) Give the maximum delivery time allowed.

Group purchasing agencies and east Caribbean states use the restricted tender of pre qualification of suppliers. Pre qualification is recommended by the internal pharmaceutical federation (1992). Pre qualification saves time. Efficient supply systems use registered items and pre qualified suppliers list. Scheduled delivery and scheduled payment maybe useful when there is no access to funds. It is not appreciated to tender once a year when funds released in monthly installments. (WHO-GL-1988). It is possible to use combination of two methods; e.g. negotiated fixed quantities for the bulk large single consignment and the estimated quantity
method for the other products and splitting the quantities of the critical vital items. The tender could be divided into categories, each therapeutic category in a separate tender.

**The involvement of local agencies offices may be beneficial:**
1. Speeds the receipt of emergency suppliers.
2. Improves communication with the supply system.
3. Payment could be in the local currency and the supplier is foreigner.
4. Participate in finding less expensive alternatives.
5. Advises the producer to get competitive prices.
6. Provides a legal aspects because being within one country.
7. Provides information.
8. Allowing the agency to oversee their products within the system.

**2.5.8 Pre qualification and post qualification:** (WHO-GL-1988).
Suppliers could be evaluated through:
(1) Performance records, including responses to inquiries, participation performance delivery, shipment, documentation, packaging, shelf lives, finance and information.
(2) Quality of the products: including complaint, quality assurance, packaging and certificates for new suppliers information on status, quality, inspection, personnel, clients, finance and supervision. Public reports in its performance maybe of great value.

**2.5.9 Sending the tender documents**
a. Dissemination of a fully detailed call for invitation of bidders.
b. Detailed instruction in documents submission, validity of offers, prices currency, performance and bid bonds, contract conditions, the tender time table, maximum date of delivery and the technical specification.
c. The schedules of requirements

(Fig.10) “The Tender Book”

<table>
<thead>
<tr>
<th>Code No</th>
<th>Item</th>
<th>Strength</th>
<th>Basic unit</th>
<th>Quantity in basic unit</th>
<th>Package in basic unit</th>
<th>Standards</th>
<th>Documents required</th>
<th>Basic unit price</th>
<th>CIF</th>
<th>FOB</th>
<th>Max. delivery date</th>
<th>Total value</th>
<th>Remarks</th>
</tr>
</thead>
</table>

**2.5.11 Receiving offers:**
Four to eight weeks are open period before the closing date which, should be a specific hour during the day time. Lower prices suppliers not responding, could be recalled directly. (Quick-1997)

**2.5.12 Adjudication:**
(1) A transparent, sound and written procedure should be followed. All bids should be coded and the supplier name could be hidden and kept at higher authority. Formally open the offers.
(2) Sorting out the non-complying offers and report on them, separate apart the domestic drugs.
(3) Convert the prices into one common currency, equalize the freight costs and customs.
Lastly collate in an adjudication sheet for comparison. Each item in one comparison sheet being headed by the tender number and year. The item number, description, strength, dosage form, basic unit, quantity and pallet size, the followings are the column addresses of WHO and CMS sheets

WHO: (Fig.1) Comparison sheet

<table>
<thead>
<tr>
<th>Supplier code</th>
<th>Bidder’s name</th>
<th>Country of origin</th>
<th>Lead time</th>
<th>Packs offered</th>
<th>Pack size</th>
<th>Pack price</th>
<th>Exchange rate</th>
<th>Pack price currency</th>
<th>ABC</th>
<th>Adjusted price</th>
<th>Total bid value</th>
<th>Comparison unit value</th>
<th>Remarks</th>
</tr>
</thead>
</table>

CMSPO:

<table>
<thead>
<tr>
<th>Tender No</th>
<th>Tender’s name</th>
<th>Price for unit</th>
<th>Total cost</th>
<th>Name of manufacturer</th>
<th>country of origin</th>
<th>General conditions</th>
<th>Payment</th>
<th>Delivery</th>
<th>Remarks</th>
</tr>
</thead>
</table>

(4) The lowest price bidder that has the capacity to supply a product that meets the standards required would be awarded.

(5) The procurement office staff should not have a vote in the decisions, written criteria adhere to the transparency, results should be available for all. Broadening the committee ensures that it has the final authority, enforcing transparency and rebuild credibility. A short appeal period gives confidence.

(6) Unit price CIF or CIP (CIP: purchaser warehouse) is an adequate mean of comparison, delivery date should be compared with the history of the supplier performance. The cost of shortage should be considered.

(7) Special stated criteria: The world bank state that up to 15% increase in price is allowed for local industry, splitting of ordered quantities protects against political changes or any disasters.

2.5.13 Contracting for drug supply: The contract is a binding document between the purchaser and the supplier. It should be clear, specific and detailed. Trade Terms, technical specifications and conditions, financial aspects and penalties, all should be clear.

1- Trade terms (Incoterm): it defines the exact point where the seller’s cost and responsibilities ends.

2- Quantities: if the quantities is not fixed it is better to guarantee a minimum estimated quantity.

3- Payment: the contract should specify the method of payment and currency, bidders use to add a contingency factor when the governmental payment is indefinite.

4- Validity of the contract should consider the last shipment and date of last delivery.

5- Quality standards should be stated, quality assurance requirements defined and set penalties.

6- The label is fully defined for each item and if extra labels in needed or unique identifier.
7- Packaging: clearly specify the inner container nature and contents and the package of the outer container and the cartons and pallets dimensions. Blister or strips, trays for the ampoule or cells, plastic or glass container for liquids. Neck or one end auto breakable ampoules or not-state the defaults in packaging and penalties. Insurance for spoilage.
8- Remaining period of the drug shelf life should be stated clearly. Usually 75-60% shelf life is required.
9- State the delivery dates and set the penalties on delayed deliveries.
10- Bid bonds and performance bonds: this could be stated according to the official regulations the world bank stated 10% performance to be located by cash or draft or L.C with 30 days from the date of receipt of the award. This guarantees the liability of the supplier – particularly in the open tender process.
11- The contract should state that the supplier would identify the buyer against all claims that arise on account of patent rights, trademarks, designs and royalties.
12- The contract should define the defaults in all aspects of the contract and clearly define the penalties for each default and the laws to which the supplier will be subjected.( Stephens -2003)

2.5.14 Monitoring Performance: continuous reviewing of the product card in order to facilitates tracing of the outstanding order, each order should be numbered date of order, date of delivery, shipment and payment could be stated manually or by computer.

2.5.14.1 monitoring suppliers:
1. Tracing the lead time
2. Compliance to contracts
3. Shipment
4. Shelf life
5. Labeling
6. Packaging
7. Contract value
8. Annual purchasing from a particular supplier.
9. Keeping a file for each supplier containing all documents received.
10. investigating the hidden cost.

2.5.14.2 monitoring health facilities performance:
1-Value of drugs supplied in a year, compared with the estimated quantities.
2-Compliance with the deadline qualification.
3-Quality complaints, if any testing and evaluating the results

(Fig.12) Product card side I:

<table>
<thead>
<tr>
<th>Code number:</th>
<th>Generic name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category:</td>
<td>Trade name</td>
</tr>
<tr>
<td>Form:</td>
<td>Dosage: Pack size:</td>
</tr>
<tr>
<td>Acceptable standards:</td>
<td></td>
</tr>
<tr>
<td>Technical specification:</td>
<td></td>
</tr>
</tbody>
</table>

Product card side II:

| Order number | Supplier | Quantity | Unit price | Date promised | Date of delivery | Comments |

2.5.15 Managing procurements process:
2.5.15.1 Manager requirements:
1. Political commitment.
2. Modern financial management.
3. Efficient accounting system.
4. Well designed responsibilities arrangement.
5. Regular reports.
6. Regular communication with clients and suppliers.
7. Peripheral health facilities visits.
8. Formal training.

2.5.15.2 **Procurement office responsibilities:**
1. Collate information on needs of drugs.
2. Developing a procurement list.
3. Manage the tender process.
5. Execute the decision of the selection committee.

The procurement office should not determine the supplier.

2.5.15.3 **Staff:** Director, assistant expert technical staff. Accountants, computer operators, one of them should be professional, clerks, secretaries and receptionist. Generally trained staffs at the key position are transferred just as they become competent at a position, they should be stable.

2.5.15.4 **Salaries:** usually it is more cost effective to pay reasonable salaries than to implement tough regulations. Restructuring procurement office as an independent or privatized unit may be the only way for paying adequate salaries.

2.5.15.5 **Communication and market intelligence:**
Collection of information in supplier reliability, quality and capacity, comparative price data and assessing the market needs, all these activities need communication fax, external telephone line, E. mail and web site.

2.5.15.6 **Procurement operational manual:** It states the written polices and procedures, job descriptions, contracting, bidding, receipt and deliveries.

2.5.15.7 **Financial sustainability:** strategies always tend to separate drug procurement from the annual treasury cycle. When suppliers know that they will be paid immediately after delivery, price will be much more competitive.

2.5.16 **The tender committee:**
- It managed the tender process and decide which supplier to be contracted. It negotiates suppliers and should be highly authorized, over all decisions. Members should be as follows:
  - Representation from the selection committee, the procurement office, finance, health facilities and users.
  - It may have subcommittee for the technical recommendations.
  - It should be chaired by senior highest governmental level.
  - Teaching staff maybe of great value.
  - Medical departments, nurses and technicians are consultant in specific issues.

2.5.17 **Good pharmaceutical procurement practice GPPP:** (Quick-1997)

2.5.17.1 **Procurement by Generics:**
- Using generic names for competition.
Specifying quality standards.

2.5.17.2 Procurement of a limited list:
No health program can afford to purchase all drugs available in the market. The formula list or the selection committee list should avoid duplication. Make the therapeutic category analysis and use an approved formal procurement for the non-listed drugs.

2.5.17.3 Procurement in bulk:
1/ Focusing on limited list of increased quantities to reduce the prices.
2/ Specifying the divided deliveries.

2.5.1.4 Formal supplier qualification and good monitoring:
1/ Keeping formal list for registered qualified suppliers.
2/ Qualification is based on quality, reliability, finance and check quantities. (the criteria are used by a committee).
3/ Tracing the lead time, compliance to contract, shipment, deliveries, shelf life, packaging, labeling and all conditions.

2.5.17.5 Competitive procurement:
Using competitive method for purchasing, keeping very small emergency.

2.5.1.6 Sole – source commitment: contracted drugs are only purchased from the winner.

2.5.17.7 Order according to systematic qualification:
1/ Keeping records for the actual consumption and accurate morbidity.
2/ Consumption had been adjusted for related factors.
3/ Expert technical committee had been encountered.
4/ Use ABC, VEN and therapeutic category analysis.

2.5.17.8 Reliable payment and good financial management:
1/ Prompt payment brings down prices.
2/ Separate drug accounts apart from the treasury cycle.

2.5.17.9 Transparency and written procedures:

2.5.17.10 Separation of the key functions:
1/ Different expertise for different functions.
2/ Different committees for different activities.(Quick-1997).

2.5.17.11 Quality assurance:
Maintain formal system for quality assurance (WHO certification, reporting quality problems, quality testing). Bioequivalence for new suppliers products.

2.5.17.12 Annual audit with published results:

2.5.17.13 Regular reports on: (Quick-1997)
1- Stock details report including expiry dates.
2- Out of stock report.
3- Expired stock report.
4- Nearly expired stock report.
5- Outstanding orders report.
6- Reorder quantities report.
7- Stock status reports by expiry dates.
8- Report in differences.
9- Inventory adjustment of stock.
10- Supplier performance report.
2.6 Small scale Local Production:
Although much of the pharmaceutical production activities had been shifted to pharmaceutical industrial sector, still repacking, course of therapy packaging and simple preparations are recommended to be at the level of the supply system.

**WHO list for small scale local production includes:**

A- Non-sterile Internal Preparations:
   Powders, Simple solutions, Suspensions, Emulsions, and Elixirs.
B- Non-sterile External Preparations:
   Ointments, Creams, Emulsions, Pastes, Powders, Lotions and solutions.
C-External sterile Preparations:
   Eye drops.
D-Internal sterile preparations:
   Small volume injections and large volume I.V fluids. Although these preparations require highly sophisticated techniques.

2.7 Quality assurance:
Quality assurance for drug procurement may be defined as the activities and responsibilities intended to ensure that products meet all the applicable quality specifications in the final dosage form (WHO1986). The purpose of quality assurance in a drug supply program is to ensure that the patient receives safe, effective and standard quality drugs.
Drug quality is the product of its compliance to the pharmacopoeias specifications concerning its identity, purity, potency, uniformity, bioavailability and stability.

2.7.1 Obtaining Good Quality:
Careful product selection, suppliers selection and products certificates of WHO types are satisfactory approaches for good quality. Failure of the supplier to obtain CPP, GMP and batch certificates, indicates bad performance. Well structured contract stating penalties to guarantee the quality is the product of the intelligence of the procurement unit.
2.7.2 Verifying the quality of the shipped drugs by sample testing and physical inspection. A dependable quality control laboratory will do the job.

2.7.3 Monitoring the Quality:
Through the product problem reporting system and product recall. The supplier should be notified promptly. The Product Card (Fig.13) can give a concise report on the product.

2.7.4 Maintaining Quality:
By appropriate storage conditions, appropriate transport, proper prescribing and good dispensing practices.

(Fig.13) The Product Card

<table>
<thead>
<tr>
<th>Generic, strength &amp; dosage form</th>
<th>Trade name</th>
<th>Manufacturer</th>
<th>Batch number</th>
<th>Expiry date</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical characters:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Labeling</td>
<td></td>
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</tr>
</tbody>
</table>

2.7.4 Training:
A qualified pharmacist with an experience in industrial pharmacy and drug procurement can participate in drug selection and set the technical specifications. Reviewing the offers, selecting suppliers, reviewing the storage conditions and coordinating in quality testing, can train the staff in factors affecting the quality.

2.7.5 Substances exhibiting potential bioavailability problems in conventional oral forms: (WHO/Euro –1986).

1. Aminophylline
2. Ampicillin
3. Carbamazepine
4. Chloramphenicol
5. Chloroquine
6. Chlorpromazine
7. Digoxin
8. Dihydroergotamine
9. Ergotamine
10. Erthromycin

2.7.6 Drugs having stability problems under tropical conditions: (WHO/Unicef-1994).

1. Acety salicylic acid
2. Amoxycillin
3. Paracetamol

Tetracycline degenerates in tropical climates to toxic derivatives.

It is of no value to spend money in testing samples if the storage conditions are inappropriate and it is unreasonable to invest a costly modern warehouse if selecting unreliable suppliers.

2.8 Drug donation:

2.8.1 Problems associated with donated drugs: (Bryan –1987)

Drugs are usually not sorted, difficult to identify and unknown in the receiving country. It may be irrelevant for the situation and the level of care available. Donated drugs may not comply with the country standards. Health providers may not familiar with the donated drugs. Nearly expired donated drugs, add a burden of work and represent a get rid off. Transportation fees may be higher than the cost of drugs themselves.

These problems arises from:

- Donated drugs are not based on the needs of the receiver.
- The mistaken idea that even expired drugs are better than nothing.
- The costs of the donated drugs are deductible from taxes of the donor.
- Protocols between countries may not involve the professionals.
e- Returned drugs and free samples are collected and delivered in emergencies.

2.8.2 WHO core principles:
1- Donor driven donation is not advisable.
2- Donation should be given with full respect to the receiver.
3- If varieties are not acceptable in the donor country, it will be rejected.
4- Effective communication is required between donors and receivers.

2.8.3 WHO Guidelines for donation of drugs:
- Donated drugs should be based on the recipient needs and being sent after notification.
- Donated drugs should appear in the approved list of the donor’s country or the WHO list.
- Presentation, strength, and formulation should be similar to that used in the receiver country.
- Sources should be reliable and quality should comply with the standards.
- Returned drugs and samples should not be donated.
- Remaining shelf life should not be less than one year.
- Labels should be complete in a language understood to the health professionals.
- Shipment list, packing list to be provided, in cartons not exceeding weighing not more than 50 Kg.
- Receiver should be informed on preparation and delivery of donated drugs.
- Declared value should be based on the wholesale of its generic equivalent price in the receiver country.
- Costs of transport, warehousing, port clearing and all expenses should be paid by the donor.
- In emergency situations, it is better to deliver the WHO New Emergency Health Kit.

2.9 Drug Distribution:
Distribution is the major component of the logistic systems. Logistics here, is defined as the science and art of attaining the right quantities of the right drugs to the right place at the right time.

2.9.1 Objective of drug distribution systems:
1) Maintain a constant supply of drugs “sustainability”.
2) Keep drugs at the optimum storage conditions.
3) Define rational storage points.
4) Minimize drug losses, spoilage, expiry, theft and fraud.
5) Use Cost-effective transportation method.
6) Give reliable reports on consumption and reordering.
7) Maintain accurate inventory records.

2.9.2 Distribution Cycle:
The distribution cycle starts on the end of the procurement activities by receiving the purchase orders and ends at the same point by providing feedback information.
1. Port clearing.
2. Receipt and inspection.
3. Storage.
4. Responding to requisitions.
5. Delivery.
6. Receipt at the health facilities.
7. Consumption and inventory records.
Most of the activities take place within the warehouses.

2.9.3 Types of Distribution System:
Distribution system are always designed according to the supply system. As distribution begins from the point where procurement ends, the distribution system type is strongly related to the procurement type.
A- **Centralized distribution:** Central store supplying all levels of health facilities.
B- **Decentralized distribution:** Procurement office supplying regional stores.
C- **CMS with regional stores:** CMS supplying regional stores, which supply hospitals.

2.9.4 Designing Distribution Network:-
1. Specify the type of the system.
2. Determine the levels in the system.
3. Define the storage points.
4. Define the decisions that should be made at each level.
5. Order intervals.

**Factors determining the levels:**
Geographical factors, population, working staff, availability of storage space,
Transportation, political or other related factors.
Prepare papers of:-
1. Purchase order
2. Invoice
3. Port clearing report
4. Packing list bill of lading

In
- enter stock cards
- Balance stock
- Issue approved quantities
- Receive Voucher of Receipt for facility
- Check Quantities
- Note discrepancies
- Damage
- Annotate the Invoice

Out
- Facility consumption
- Stock in Facility
- Stock in Store
- Budget

Storage
- Zoning in its location
- Enter the bin card
- FIFO /FEFO

Stock Control
- Check for quality
- Report for discrepancies
- Claim for discrepancies
- Receiving Report
- Accounting report
- Coding

Order allocation
- Issue from the bin card
- No Substitution
- Signed by store keeper
- FEFO

Picking
- Pack loose Cartons
- Seal Cartons
- Label
- Facilities representative
- driver

Packing

Shipping

Receiving

Quarantine

Inspection

(Fig 14) The distribution Cycle within the Warehouse

46

(44)
2.9.4.1 Distribution Hierarchy :

**Two levels**: Suppliers  Regional stores, Hospitals.  Suppliers  Central stores, Hospitals.

**Three levels**: Suppliers  Regional Stores, District stores  Health Facilities. Suppliers  Central Stores, Regional stores  Health Facilities.

**Four levels**: Suppliers  Central Stores, Regional stores  District stores  Health Facilities.

2.9.4.2 Methods of Ordering :

1) Push system: “kit system”.  2) Pull system: “requisition or demand system”.

**Conditions for the push system:**
- Incompetent staff of the inventory control.
- Demands greatly exceed supply.
- Disaster, emergency.
- Limited number of produced being handled.

**Conditions for the Pull system:**
- Competent staff in assessing needs and inventory control.
- Sufficient supplies, meet the program needs.
- Field staff are regularly supervised and performance is monitored.
- Large range of products being handled.

**Factors determining re-supply intervals:**
- Storage capacity of each level.
- Seasonal factors.
- Competence of staff at each level.
- Availability and cost of transportation.
- Expiration, security and other local factors in concern.

2.9.4.3 Delivery & Collection Systems: Table (3)

**Collection system**: The receiving facility takes the responsibility of collecting supplies from the warehouse.

**Delivery system**: The warehouse is responsible for delivering supplies.

**Table (3) The delivery and collection systems**

<table>
<thead>
<tr>
<th>Delivery System</th>
<th>Collection System</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Deliveries can be combined with visits, offer supervising field work</td>
<td>* Allow field officer to meet managers and discuss problems and meet other regions.</td>
</tr>
<tr>
<td>* Combined deliveries lower transport cost.</td>
<td>* Free central-level from load work.</td>
</tr>
<tr>
<td>* Efficient flow of information</td>
<td>* Incentive to get regular supply.</td>
</tr>
<tr>
<td>* Security lapses due to lack of</td>
<td>* Security a good opportunity.</td>
</tr>
</tbody>
</table>

xlv
<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Waste time waiting for assembly supplies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling of deliveries at facilities difficulty.</td>
<td>* Personality may tend to increase frequency and period of visits for other reasons rather than supplies.</td>
</tr>
<tr>
<td>Long route deliveries expose to damage of supply</td>
<td></td>
</tr>
<tr>
<td>*Hurry not to wait for feedback information</td>
<td></td>
</tr>
</tbody>
</table>

### 2.9.4.4 Communications:

Good communications are essential for the flow of information and reduce the need to travel and save the traveling cost.

### 2.9.5 Port Clearing:

Unless the program already has an experienced team on clearing and forwarding skills, it is recommended to tender for specialized agent. The unit responsibility should be specifically defined as prompt, reliable port clearance. The supplier send the bill of lading, invoice, certificate of origin, certificate of quality, insurance and packing list document.

1. The local agent of shipper announce for the arrival date, port, quay or airport, and the custom warehouse.
2. The clearance unit should prepare any charges to be paid.
3. Delivery to the CMS.

The cornerstone for successful clearance unit is communications and obtaining and regulating documents.

Claim quickly the insurance in cases of damages and shortage.

**Expected cost of delayed clearance:**

1- Reduced shelf lives of drugs and loss of potency of some drugs.
2- Theft.
3- Storage fees.
4- Longer lead-time results in stock-out, cost of shortage, emergency purchases.
5- Capital funds are tied up.

Another alternative for the port clearing unit is either:

1- Contract a private agency, or
2- The supplier can be made responsible for the port clearing process.

### 2.9.6 Stores:

#### 2.9.6.1 Types:

<table>
<thead>
<tr>
<th>Mechanized Warehouse</th>
<th>Manual Warehouse</th>
<th>Store Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pallet racks.</td>
<td>Floor pallets – shelves.</td>
<td>Shelves</td>
</tr>
<tr>
<td>Mechanical handling equipment.</td>
<td>Manual handling ,simple equipment.</td>
<td>refrigerator</td>
</tr>
<tr>
<td>Computer control.</td>
<td>Manual or computer control</td>
<td>Secured cupboard.</td>
</tr>
<tr>
<td>Primary store at the national level.</td>
<td>Primary or secondary; national or regional</td>
<td></td>
</tr>
<tr>
<td>Located to major transport routes.</td>
<td>Office attached to big hospitals * could be upgraded</td>
<td></td>
</tr>
</tbody>
</table>

#### 2.9.6.2 Location:

The stores are intermediate phase between supplier and the patient at the clinical facility; the objective in locating a warehouses is to promote the fastest and least expensive transport of supplies from the source to user.
Factors to be considered:

a) Location of supply sources.
b) Number and locations of distribution points or utilizers.
c) Transport link between the warehouse and supplying points.
d) Seasonal factors that interrupt flow of supplies.
e) Security.

2.9.6.3 Site:
The site to fulfill the medical stores requirement may be expensive, but warehouses should not be constructed in unsuitable site. Long term saving from wise selection of the site should be considered.

a- Capacity: Large enough to allow parking and free movement of vehicles.
b- Accessibility: Road is open all the year round. No seasonal cut, easy public transport.
c- Utilities: Water, electricity, fire fighting, drainage system, communication and telephone.
d- Proximity: Access to transport links, seaports, airports, highways, railways.
e- Drainage: Should not be subjected to flow.
f- Security: Enclosed yard to promote security.
g- Future: Allow future extension.

2.9.6.4 Design: (Quick-1997)
Designing is a team work, Architect is the leader. The requirements are:

1- General storage area:
   a. Main storage area
   b. Cold chain area.
   c. Secured area “controlled”.
   d. Pallets area.
   e. Protected storage area “inflammables”.
   f. Incoming goods area.
   g. Assembly and dispatch area.
   h. Handling equipment area.

2- Good circulation: - Air conditioners are sufficient.
3- Approximate volume of each zone.
4- Flow of goods.
5- Flow of papers.
6- Stock control activities.
7- Type of store required.
8- Easy movement.
9- Fire-protection measures.
10- Communication facilities
11- Easy maintenance and cleaning.
12- Computer area.
13- Training and sample testing area
14- Parking.
15- Number of staff, visitors, males and females
Sanitary facility, changing room, first-aid room, Cafeteria.
16- Access to emergency services.
17- Security and lighting, gatekeepers, accommodation.

- One-floor layouts are recommended.
- Installation of air conditioners and fans will increase the workday as well as the storage conditions.
- Fire prevention: Smoke alarms installed, fire extinguishers suited for the chemicals.
- Night watch man could respond to fire alarms and theft.

2.9.6.5 Shelving:
- Shelves are suited in rows, allowing good ventilation, according to direction of aeration, with the aid of exhaust fans.
- Shelves should be in units each of 10-20 meters. 1.75 meter before the rows to facilitate the movement of trolley.
- Shelves should be two feet away from the walls to assure adequate circulation of air.
- 1.7 meter height for floor picking. 2.7m for loader picking.
- If warehouse is more than 4.5 m high, it may be possible for a mezzanine floor to increase the storage area by 100%.
- Shelves are used when the item quantity is too small to justify pallets.
- It allows manual goods handling.

2.9.6.6 Pallets: Pallets may be in floor, block-stacked and racks.
-When products, have large stock. It is space saving, it holds the stock in good condition. often at the national level.
-Loads can be moved easily using mechanical handling equipment.
-Pallets isolate cartons from the floor which may be damp and allows circulation under the pallets.
-Easy to transship, inspection of damage and shortage could be easily detected.
-Floor pallets are suitable for warehouse height less than 3m, and when forklift is not available and for heavy and bulky item.
-Floors should be marked to indicate pallets and aisle positions. (Stacked pallets on one another for items without expiry date or fast moving is cheaper, space saving and no racks are used.
-Racking pallets; every tier need 1.5 meter height.
The benefits of shelving and pallet racking can be combined.

2.9.6.7 Handling facilities :
forklift, hydraulic hand trucks, trolleys, balance scale and …etc.

2.9.6.8 Distribution of drugs within the areas:
The basic elements are:-Temperature and Security.
Normal storage condition have been defined as “storage in dry, well ventilated premises at +15 c to 25-30 c’’ WHO 1990.Each zone should have at least one thermometer, temperature is better to be recorded at the hottest time. This temperature is assumed to be that obtained on air-conditioner. Humidity should be controlled. Temperature at the upper part of the store is usually 40C even in cold climates. (Quick-1997)

2.9.6.9 Cold storage:
Many products require cold storage ( sera, vaccines, test kit, products of natural origin ). The equipment and conditions of the cold storage differ from one level service to another and the purpose of the program to be supplied. Each level equipped. Varies from cold rooms +4C, deep freezer –20C to simple refrigerators. Cold boxes and ice packs, cold vehicle thermometers built-in and in the room, recording forms, alarms and stand by generators automatically backups on power failure are essential.

2.9.6.10 Secure Storage:-
Narcotic and controlled products should be kept in a secure safe room with red warning light and warning bell that rings when the door is unlocked. Keys with only two persons, (store keeper and pharmacist). Usually stolen items are also kept in.

2.9.6.11 inflammables:
It is better to be stored in a separate building. The flammables store must be well ventilated and fire-proof. Fuel stores should be as far as possible. It must never be near the medical stores.

2.9.6.12 Classification of stock arrangements:-
It is the principle and the basic step in performing a good storage practice. The products are arranged in order to ease stock taking, picking and control.
☼ Alphabetical by generic name: may not result in optimal use of space, used for a limited range of drugs.
☼ Therapeutic: effective in dispensaries, smaller stores, not advantage in large stores.
☼ Dosage form: smaller warehouse, the dosage form may be arranged according to therapeutic use, alphabetical or level of use.
☼ Clinical indication: for small warehouse, all related clinically sorted drugs together, drawback; some drugs possesses more than one clinical use ,also theft will increase.
☼ Level of use: this may be effective in kit distribution. Not practical for individual item stores. One drug may have more than one level.
☼ Random bin: unique storage space “cell” in the shelves horizontal x vertical this may be combined with the therapeutic grouping or alphabetical.
☼ Article coding: unique article code combined with a unique location( WHO,UNICEF stock).Codes may be according to therapeutic indication, level, clinical use, there will be no need for a pharmaceutical knowledge. It is applicable in a computerized systems. It is applicable in tenders, requisition and small units with Increased security. The code article could be corrected for special storage conditions as dosage form, pack size, the building location, security.

2.9.6.13 House keeping activities:
(1) Cleaning and pest control: cleaning 2-3 times weekly from dust and waste cartons, pest control by poison .
Inspection: senior staff, inspect to discover problems, personnel, shelving and signs of theft, pest, and deterioration.

Expired stock: should be designated in the waiting area for authority disposal, a writing report should be kept. The cost of each item, order and source details. Written off the stock as soon as destruction is authorized.

Fire precautions: flammable trash must not be allowed to accumulate in the store. Smoking is forbidden. Senior staff should obey restriction as the Junior staff. Fire-detection and fire fighting equipment inspected.

Security: the storekeeper office should be designed to observe all activities. No vehicles allowed except by permission ticket. Visitors are not allowed, business visiting accompanied by senior staff only.

Staffing and organization:
- In house training of the staff; motivation and good salaries to improve performance, avoid causal labor because of drug theft,
- An operation manual should describe all polices, structure and top description, flow of information, procedures of all tasks and activities and forms used.

2.9.7 Procedures and Paper flow:

2.9.7.1 Objectives:
(1) Provide information on consumption and inventory levels.
(2) Provide documents for safe storage and movement of supplies.
(3) Check the performance of the system.

2.9.7.2 Receiving:
Once supplies arrived the following document should be prepared:-
(a) Purchase order. (c) Port clearance report.
(b) Supplier invoice. (d) Bill of lading and Packing list.
* Arrived supplies should be quarantined, and then inspected.
1. Check the content against the invoice and purchase order.
2. Discrepancies, variations and damage noted on the invoice.
3. Through inspection according to formal checklist.
4. The annotated invoice dated and signed by the senior staff.
5. Reporting.
6. Copies of the invoice, receiving report and purchasing order are distributed to : 1)Main file 2)Warehouse. 3)Inventory control. 4) Accounting unit.
7. Supplies picked by the storekeeper with the report.
8. Coding drugs in generic.
9. Inventory control enters the quantities into stock cards.
10. Keeping in a file the invoice and the receiving report.

2.9.7.3 Storage:
1) Post each item in its bin card and the bin area
2) File the receiving report
3) Control the stock using FIFO and FEFO.

2.9.7.4 Order allocations: The designated officer reviews requests, facility consumption, quantities in stock at the facility, the warehouse stock, the facilities budgets and then allocate an order.

2.9.7.5 Issuing: The issuing tickets is sent to the inventory control and from the stock card weighing the quantities and inform the director in any observations. Again the director signs the ticket and the inventory control issue quantities and sends them to the store. Storekeeper prepares the issued item and subtracts them from the bin card. The store men pack the loose items in cartons. Issue in FEFO. However, now the computer do it simply.

2.9.7.6 Shipping:
1-Final packing, sealing and labeling of boxes, under observation of the facility representation or driver of the vehicle.
2-Prepare 3 copy voucher, signed by the receiver, two to the driver, one in the book.
3-Two copies of the issue ticket delivered with the supplies.
4-The facility representative signs the voucher and the issue ticket and returns them back to the store.
5-The shipping department sends one issue ticket and the voucher to the inventory control and retains one copy of issue ticket and the voucher. The inventory control clears the voucher for the driver.

6-The receiving facility sends a report of received supplies and balances of the stock before the next request, otherwise no supplies could be delivered later.

2.9.7.7 Stock taking: “Inventory Verification”

Taken by the audit office, physical stock counts reconciled with the inventory control records, annually, periodically and perpetually. Cyclic counts took the advantage of continuous monitoring.

**Purpose:** Enforce regulation being designed to prevent loss and wastage. Form an evaluation tool for the warehouse performance. And check the efficiency of the security measures (MSH-2001 Inventory management).

Identify surplus, expired and obsolete stock.

2.9.7.8 Promoting efficiency within the warehouse:

To promote efficiency the following issues should be regarded:

- Working conditions; ventilation, clean lines, sanitary facilities, cafeteria.
- Written operation manual; policy, procedures, job descriptions, flow of documents, problems and supposed solution.
- Postal information; no smoke, no parking, no segregation, bin cards and marking floor.
- Supervision, penalties. Training programs. Salaries and motivation.

2.9.8 Inventory Control

(Fig. 15) The inventory control activities

Inventory is the stock at hand at a given time.

2.9.8.1 Improved Inventory management results in:

- Accurate records for the stock.
- Proper reordering frequency. Systematic performance monitoring.
- No shortage nor overstock. Rational use of the financial resources.
- Increase quality of patient care.

In spite of the wide use of computers in inventory control, it did not replace trained staff, computers are additional tools.

2.9.8.2 Basic Stock records:

Two methods should be used, bin card+kardex or bin card + computer. Computers are desirable. Records should be clear, current and accurate.

2.9.8.3 Information in the records:

The information required are:


Documents

The documents to be kept are:
2.9.8.4 Reports:
The reports could be monthly or quarterly.
1-Stock on hand and on order by item.
2-Expiry before it can be used.
3–Stock in months depending on consumption.
4-Expiry status
5-Inventory holding cost.
6-Analysis of suppliers.
7-Consumption for all items.
8-ABC analysis for consumption.
9-Quantity and value of obsolete stock waiting for disposal.
10-Analysis of health facility served.

2.9.8.5 Sources of inaccurate records:
- Heavy-load of work, repetitious entries.
- Drug name and description are not the same.
- Duplicate entries for receipt or issues may be caused by duplicate of papers, provided separately.
- Obsolete stock may be discharged but had not been subtracted.
- Theft.
- Physical stock counts were rarely taken.
- Bad conditions of the warehouse may make it difficult to reconcile records and actual stock.
- Poorly paid, disqualified staff, untrained and unmotivated staff.
- Lack of supervision.
- Issued quantities not delivered.
- Receipt not recorded.
- No coding system.
- No actions for discrepancies.

* Cyclic stock counts may minimize the above conditions. The stock is divided into groups as ABC- each time a group may be counted.
In cyclic stock counts, no need for annual shut and no interruption for the supply.
Also discrepancies could be traced. And provide a nearer supervision, actions in cases of discrepancies should take place. The staff who took the stock physically, was better not to couple the results with the records. (Quick-1997)

2.9.8.6 Reasons for holding stocks:
1-To ensure availability of drugs, inventory reduces the risk of stock out.
2-To maintain confidence in the health system.
3-To reduce the unit cost of drugs by bulk purchasing.
4-To avoid shortage costs, emergency orders and client go elsewhere.
5-To minimize ordering cost; frequent ordering increase the cost.
6-To minimize transport cost, economic use of vehicles.
7-To enhance monitoring to cope with demand fluctuations.

2.9.8.7 Drawbacks of over stock:
1) Tie up the capital.
2) Cost of personnel, utilities, insurance, storage facilities.. etc.
3) Increase of losses, spoilage.
4) Expiry and obsolescence.
5) Increase of theft.

2.9.8.8 What drugs should be held in stock?
- Selection list (formulary list) or part of it.

However, from the inventory records, fast moving drugs, need to be stocked, ABC analysis provide a good tool for prioritizing drugs to be stocked. The VEN system also may be used. Not all drugs have to be stocked at each level, but the issue of local availability must be taken, if a vital drug for patient care even rarely used but cannot be obtained quickly when it is needed that drug could be kept in stock.

A catalogue for drugs in stock is recommended to be routine work. (Quick-1997).
2.9.8.9 Safety Stock

Safety stock is that stock needed to avoid stock out during the lead time. 

\[ SS = Ltx C_A \quad C_A = \text{average consumption} \]

For vital item SS may be multiplied by 1.5 for courtesy to avoid stock outs.

Lead time may not always be perfect, delaying should be calculated. Expected delivery date = contract date + delayed period.

Seasonal deviation of consumption should be calculated and adjusted.

\[ CA = \text{Consumption} + \text{adjustment} \]

All these measures tend to increase the safety stock, so it is important to monitor lead time and consumption carefully.

As the objective of the system is to provide maximum service level with minimum total safety stock, the cost of additional safety stock should be weighed against potential adverse health and political impacts of stock outs.

2.9.8.10 (Fig. 16) Reorder Inventory level:

The inventory cost can be reduced by frequent ordering smaller quantities. Reducing the safety stock can increase the chance of stock outs.

2.9.8.11 Inventory Control Models:

1-Annual purchasing: one level periodic review set once a year.
2-Scheduled purchasing: periodic review, orders placed at intervals.
3-Perpetual purchasing: two level model, stock levels reviewed each time when stock is issued or at any time and order is placed whenever stock falls below a minimum level.

2.9.8.11.1 Annual Purchasing:

Quantification was done, tender, and orders are placed annually.

**Reasons for annual purchasing:**
- Financial regulations and realities.
- Easier to manage depending on staff capacity and information availability. Bulk volume lower the prices. Traditional method.

**Disadvantage of annual purchasing:**
Actual consumption is often different from the annual forecast. Leading to shortage or surplus. High cost of storage and high cost of overstock. Difficulty to obtain a fund for single annual payment, delayed payment often increases the prices. The work load is uneven over the year. It needs a mechanism for supplementary purchases during the year.

However, in any type of system there should be some items which may be best to be purchased annually.

2.9.8.11.2 Scheduled purchasing:

Contracting supplier may be once, the order will be placed as needed or at the specified interval, or for each interval a new contract. Scheduled deliveries may be for one order in consignments. Or each delivery may go the same cycle for new contract.

**Benefits:**
Estimated quantity contracts may be suitable for local suppliers as their work may be dispersed over the year. Scheduled purchasing decreases the inventory holding cost, reduces overstocks and costly emergency purchases of variable demands. It can make use of scheduled fund allowance and the load of work will be spread over the year.

**Drawbacks:**
The purchasing cycle may not couple with the fiscal year. Low incidence of poor forecasting. Need stable consumption patterns. Prices are higher than the annual. It is the best alternative for the annual purchase where suppliers are not easily affordable.

2.9.8.11.3 Perpetual Purchasing:
After each transaction or weekly the stock is reviewed. When the item falls to the reordering level an order is placed.

It provides a lower I & SS. But still a reserve stock is required. It responds rapidly to consumption variation and changes. Suitable for hospitals and 2-3 days lead time prime vendor or one supplier. Useful to spread cash all over the year. It is not suitable for the public sector because reviewing the records adds extra load of work and there should be a large safety stocks. Vital items by the time of transactions may be out of stock.

Procedures for purchasing need time to be formally adopted, this time may make the purchase awkward. Not compatible with tender and official purchasing. High purchasing costs. High unit price drugs.

Requirements:
Current and accurate stock records. Good communication with suppliers and utilizers. Good access to funds.
Estimated-quantity contracts.

2.9.8.11.4 Mixed Methods System: Imported, low price, infrequently used drugs, may be annually purchased. Slow-moving but regularly used drugs may be purchased by the scheduled method. High volume drugs, expensive drug by perpetual purchasing method.

ABC analysis + Fast/ Slow/ Dead classification + Vital/ Essential/Non

(Fig. 17) Combined method classification of recording frequency.

<table>
<thead>
<tr>
<th></th>
<th>F</th>
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<th>A</th>
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<td>C</td>
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<td>C</td>
<td>D</td>
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</tr>
</tbody>
</table>

The most impact on the inventory cost is AF.
ASV should have a higher safety stock than AFN
CSN only ordered when needed.

2.9.8.12 Cost of inventory management:-

Total variable cost of inventory management = total acquisition cost + inventory holding cost + purchasing cost + storage cost.

Total drug acquisition cost: the total expenditure of all drugs of the warehouse. The cost is best calculated by the method of last in. Inventory holding cost represents 25-20% of the total inventory value. It is composed of opportunity cost; cost of funds tied up on the market bases and storage cost; staff salaries, electricity, maintenance, security, rental or amortization cost. Cost of transportation from level to another, vehicles and maintenance. Spoilage cost: Deterioration and spoilage of drugs (Expiry: 3-5% is a normal ratio). Obsolescence of equipment upon storage, formulary changes of drugs. Waste cost: Theft and unexplained losses. Purchasing cost: The total value of all procedures. Including staff salaries, communication cost, papers ... etc.

(MSH-Inventory Management-2001)

Shortage cost:-
- Emergency purchase: usually higher prices obtained.
- Loss of revenue: Client go elsewhere, to purchase out stock items.
- Increased mortality & morbidity due to lack of drugs.
- Loss of good-will: Loss of public confidence on the supply system.
- Political aspects.

2.9.8.13 Inventory Control at the health facilities
- Smallest picture of the inventory control at the CMS.(MSH-GL2001)
- Stock cards are essential, code numbers, description, unit of issue, expiry dates.
- Stock book may be with duplicates for recording each transaction.
- Monthly stock check could be taken, reconcile the utilization with the consumption from stock records, obtaining the monthly consumption.
- Each drug issued or received should be recorded.

2.9.8.13.1 Ordering:
Facility staff consultation on: The rate of use of each item and the safety stock required.

Topping-up ordering system: suitable for hospital wards and small facilities that receive supplies frequently. Preprinted sheet: describes each item, code, unit of issuing and top maximum stock level.(Quantity ordered = top level – quantity on hand).

Maximum against consumption system: Quantity ordered = (maximum level-stock on hand) + (monthly consumption x lead time)
Fill the requisition, - issue voucher and send to the stores.

2.9.8.13.2 Receiving:
• All deliveries should be formally received, signed by both receiving and delivering persons.
• Fill the discrepancy form if any. Expired, wrong items, different quantities and damage.
• The documents will be kept for at least 2 years.

Hospital pharmacy should have stock to dispose for outpatient, in patients, inpatient discharge, departments, ward and emergency tray.

The responsibility should be on a limited number of individuals.

Supplying community health worker in constant intervals usually every month on a basis of topping-up system may be satisfactory, and limit the selection of items.

**Staff Training**: Training in using drug control forms, setting up storeroom and good storage practice, use of different storage conditions, security and theft control, calculation of consumption (recording quantities), flow of information, good dispensing practice.

( Fig. 18 ) Reordering sheet (Quick-1997)

Health facility:
Supply period:
Date:                                    Name:
Last delivery date:                  Medical officer:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Unit of issue</th>
<th>Top-level</th>
<th>Quantity on hand</th>
<th>Monthly consumption</th>
<th>Quantity required</th>
<th>Quantity approved</th>
<th>Quantity issued</th>
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2.9.9 Managing Kit System Distribution

**Drug Kit**

Assorted drugs and medical supplies, pre-packed, closely distributed and designed to serve a given population. It is a push distribution system.

The kits may be packed at the supplies level; contracted or at the CMS level; locally.

The kits may be used as a regular supply for rural areas and as a ready delivery for emergency situations.

Drug supply programs may have different levels for the kits, one for dispensaries, another for health center and others for the out patient in a hospital.

However, any kit system should be replaced by requisition system. Rational prescribing, good inventory records and trained personnel should be brought about.

2.9.9.1 Table (5) Advantage and Disadvantage of the Kit System

<table>
<thead>
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<th>Advantage</th>
<th>Disadvantage</th>
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- Rational selection of drugs and medical supplies.
- Simple in supply activities with reduced risk of theft.
- Support for developing rational prescribing and treatment guide line.
- Equitable availability of EDs.
- Scheduled supply intervals leading to more secure deliveries to rural areas.

| * Inflexible in selection for different regions, climatic zones, and the health level. |
| * Resistance by prescribers due to limited range of drugs. |
| * Need special management skills, space and staff. |
| * Difficulty in returning quantities leading to waste and expiry. |
| * Negative effect in development of the supply management system ordering, inventory control and distribution. |
| * Lack of flexibility in quantities leads to shortage or surplus. |
| * Not compatible with cost sharing programs. |
| * Difficult to monitor expiry. |
| * Difficult to pay for drug kit |

Kit system could be useful in the following conditions:

To improve rural areas drug supply. There is a limited experience in inventory control, irrelevant ordering of health facilities and drug needed are similar all over the year. When theft is common and in emergencies.

2.9.9.2 Requirements:
1. Careful selection of essential drugs and medical supplies.
2. Quantities based on the population to be served and review the mortality data if possible.
3. Funds should be secured, political commitment.

2.9.9.3 Condition not Suitable for kit system:
1. Cost-sharing program.
2. Facilities near the warehouse or presence of good communications.
3. When the requisition system is well managed and dependable.
4. Different types of facilities and levels.
5. Different morbidity in the different zones.
6. Seasonal variation and different conditions.

If the kit system is adopted, consider the following:
1. Points to be served: determine the facility types and staff level.
2. Selection of drugs and supplies: different kits according to levels.
3. Quantities: according to the patient attendance kit per 500 or lower.
4. Number of kits required for each facility.
5. Prepare kits: enclose a packing list, signed and dated label.
6. Delivery schedule: For each facility according to the patient attendance.
7. Records: Number of kits, stock records, stock taken, quantities used.
8. Monitoring: Feed back information and supervision is essential.

Allow simple requisition for limited drugs to minimize shortage. Design a return system to prevent accumulation of unused drugs. Early note expires during packing, keep short intervals. Report on the most often used items and that accumulated. Make proposal for the content after periodical assessment. Training programs on rational prescribing, dispensing, inventory records. Keep dependable records in mortality and morbidity data. If the system works well for some time shift to requisition system.

2.9.9.6 Emergency kits: In any system an emergency kit should be ready for deliveries. Earthquakes, floods, war operations and endemic outbreaks. Each kit could be designed according to the situation. Kits should be stored in a separate room at the warehouse. The most popular kit is the new emergency health kit which is generally recommended for the basic health care (WHO 1990). A kit weighing 900 kg and measuring 4m2, it serve population of 10,000 for 3 months. Many organizations have different kits, Red cross, Medicine sans frontiers MSF.. etc (WHO-2001 Basic Kit )

Kits could be for different clinical use categorization, and laboratory.

- New emergency health kit.
- Red cross kit.
- Medicines sans frontiers kits
- Pediatric kit - Laboratory kit. - Dispensary.
- Surgical kit - Immunization kits. - Sutures kit.
- Anesthesia kit. - i.v fluids kits. - Dressing kit.
- Injection kit.

Successful survey in the Sudan in the years 1988-1992, the Dutch program cover the Nile river district and designed a kit system for the follow up of supplementary of surpluses and expiries. Good practice of inventory control records had been achieved. Consumption patterns could be obtained and a real contact supervision was held, the program was ready to shift to requisition system but funds depleted and for political aspects the donors stopped and the program was finished. (MOH)

### 2.10 Drug Transportation Management

#### Options

1. Purchase Contract
2. Contract Agency
3. Water way
4. Land Ways
5. Air Ways
6. Donation
7. Government
8. Private
9. Acquired
10. Private

- Purchase Contract (1)
- Contract Agency (2)
- Water way (3)
- Land Ways
- Air Ways
- Donation (5)
- Government (6)
- Private (4)
- Acquired (9)
- Private (10)
- Government and Regional (9)

(2) Contracted private agency as a prime vendor for only transportation of drugs for all regions upon certain contract conditions and periods.

(3) Water ways and inland may be useful in the presence of such appropriate ways and in islands, packing should be suitable and not water permeable.

(4) (5) (6) : Air ways, suitable for heat liable products, theft may be lower, suitable for emergency situation.

(7) Railways: Cheaper but need extra transportation, low security, increased opportunity for theft.

(8) Passenger buses: suitable for small quantities drugs and worker.

(9) Acquired trucks and car trailers. It the common means.
(10) Private Trucks and cars on rent basis.
(11) Governmental or regional acquired vehicles.

Drug carrier should be closed secured and cost effective. Options depend on the situation of the point to be supplied.
2.11 Rational Drug Use:

The rational use of drugs requires that patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community (WHO 1985-Nairobi).

It is the health system that holds the selection of drugs, drug supply responsibility on procurement and distribution which constitutes the basis for the rational use. Drugs provided with confirmed safety, efficacy and at affordable cost. It is the prescriber who diagnoses and prescribes the suitable drugs, defines the dosage, administration and duration of treatment.

It is the dispenser who informs the patient about the prescribed drugs.

It is the patient who adheres to treatment and properly use the drug.

2.11.1 Some forms of irrational drug use:

1. No drug needed but there is a bill for every ill.
2. Wrong drugs.
3. Ineffective drugs and drugs with doubtful efficacy e.g., vitamins.
4. Unsafe drugs e.g., use of anabolic steroid and appetizer- dipyrene.
5. Under dose of available effective drugs.
6. Incorrect use of drugs e.g., overdose of injectables, incomplete course of therapy.
7. Poly pharmacy.

2.11.2 Impacts of irrational drug use:

1. Hide the goals of treatment leading to death for untreated disease.
2. Anaphylactic shock due to excessive use of injection.
3. Overdose of drugs leads to toxicity, develops drug resistance markedly antibiotics and anti malarial drugs.
4. Increase drug expenditure for the patient, health system and the whole country.
5. Under use may add additional cost at least for prolonged treatment duration.
6. Socio-economical concept of the concept (there is a bill for every ill).
7. Non-essential drugs expend the funds of vaccines, essential and vital ones

2.11.3 Sources of irrational drug use:

(Fig. 19) Factors influencing irrational drug use:

- Short consultation time
- Cultural believes
- Patient's self interest
- Lack of information
- Prescriber attitude
- Lack of training & supervision
- Work load, shortage, lack of training & supervision
- Long waiting time
- Lack of information
- Shortage, wrong drugs, lack of reliability
- Expiry, shortage, wrong drugs, lack of reliability
- Poor regulations
- Prescription and continuous monitoring in order to reduce polypharmacy, use of antibiotic, use of injectables etc.

2.11.4 Improving Prescribing:

Irrational prescribing occurs when drugs are not prescribed in accordance to guidelines based on scientific evidence to ensure safe, effective and economic use.

After the prescribing habits had been investigated and the problems had been defined, a suitable strategy to intervene for improvement could be settled. Interventions may be through:

- Management practice, setting regulations, information conduction.

2.11.4.1 Management Practices:

(1) Selecting a limited list of drugs and other drugs may be available on different approval concept.
(2) Drug consumption review, reviewing consumption data periodically in a feedback manner from the outlets.
- Follow up the reports and continuous monitoring in order to reduce polypharmacy, use of antibiotic, use of injectables etc.

Drug utilization review program is organized by the pharmacy committee.

Indicators are:

- a) Drugs per prescription.
- b) Antibiotic percentage.
c) Injectables.
(3) Hospital drug committee: (MSH2001) - Extended activities in:
- Determining which drugs should be made available to each type of health facility “level”.
- Developing treatment guidelines.
- Establishing prescribing limitation (limits certain drug to a suitable professional level).
- Limiting the dispensed quantities at one time for some drugs.
- Revising guideline for antibiotics among hospital staff.
- Supervising and monitoring prescribing practices.
(4) Cost of drug expenditure participation:
Prescribers, medical practitioners may be valuable to participate in reconciling needs and funds procedure. Prescriber awareness of the prices encourages them to take cost into consideration. The price list may encourage them to make inexpensive choices.
(5) Structured drug order forms:
The most frequently used drugs, could be structured in a preprinted form, the form contains the standard dosage regimen, the prescriber would be provided by this order sheet and then he can select or tick on.
(6) Treatment Guidelines:
For specific more frequent diseases and the protocols of treatment.
(7) Course of therapy (CoT):
In blister packs, although it may increase the total cost but it seems to be convenient to the dispenser and the patient.
(8) Financial Aspects:
In cost recovery program:
- Vital drugs could be sold less than its real costs.
- Nonessential drugs could be sold at greater than its real prices.
This aspect can encourage the use of vital drugs and discourage the use of nonessential drugs.
Drug sales by the prescriber should be forbidden.
(9) Setting Regulations:
Drug registration: Even if registered in the country or registered in the hospital drug formulary, the hospital or the system regulations could be settled by the drug and therapeutic committee.
Limiting drug list: Managerial interventions and committee regulations. In some countries limitation is only for the public sector in others for both private & public sectors.
Prescribing limitations: Committee can regulate the prescribing authority of drugs limited to prescribers levels or facility level. Constant, specialist, general practitioner or paramedical each level prescribe a limited range. Prescription by junior staff for higher level should be countersigned by the specialist.
Dispensing limits:
- A course of therapy limitation/ out patient duration of therapy limitation.
- Pre-packed course of therapy.
- Maximum disposed quantities for abused drugs.
- Selective method, maximum for each drug individually because some limitation can have adverse effects on treatment of some disease e.g. chronic disease.

2.11.4.2 Conducting Information:
A- Training of Prescribers:
1. Pre-service training in rational prescribing.
2. In service training.
3. Supervisory visits.
4. Lectures, seminars and workshops.
B- Printed Materials:
- Clinical literature, News letters.
- Treatment guidelines and formulary.
- Circulating the regulations and the managerial aspects.
- Flyers and leaflets.

C- Face- to face contact:-
- Outreach by trained educator.
- Opinion leaders: habits will be transmitted to young doctors.
D- Patient education:
- In many cases irrational prescribing is due to the pressure of patient demand.
- Patient education via, radio, television, pamphlets and printed materials.
2.11.4.3 Modern Structured prescribing: most problems could be solved by a computer program. All selected formulary drugs are entered in the data base.
- Enter, click on the desired drugs.
- Click for prescription print out.
- Every prescriber is provided with a computer and trained to use it. Name of prescriber, professional level, diagnosis and date.
- Any non-formulary drug could not be prescribed on the typical formal prescription and it is not allowed.
- This method is suitable for insurance programs provided that an authorized drug committee approves the selected formally drugs.
- Without entering the insurance card number you cannot open the issue page.
- This method is useful in large hospitals as well as small facilities.
- The program can report on patient number, number of prescription issued, the differential analysis for the prescribed drugs.
- Each level code have the related drug list allowed for that level.

2.11.4.4 WHO Guidelines for typical prescription:
1- Heading. 2- The patient name. 3- Date of issue. 4- Drugs. 5- Diagnosis.
6- Signature & stamp of the prescriber. 7- Address & qualification of the prescriber. 8- Duration of treatment. 9- Repetition of drugs.

2.11.5 Drug Information
Unbiased drug information is essential for prescribers, dispensers and users to approach appropriate drug use. The need for information differ from level to another and from a health worker to the patient.

2.11.5.1 Information includes:
- Generic name and brand name.
- Indication and contra-indications.
- Level of use and regulatory aspects.
- Side effects and precautions.
- Overdose and its treatment.
- Dosage and route of administration.
- Drug of choice and alternatives.
- Availability and cost.

2.11.5.2 Role of drug information center (DIC):
Primary: To give clear definitive information on drugs and promote their rational use.
Secondary: To keep up-to-date with pharmacological and therapeutic literature and disseminate relevant information sources of drug information.

2.11.5.3 Sources of information:
Primary sources: These are the foundations on which other information is based. (Journal publications, Reports, clinical trials, case reports, pharmacological reports).
Secondary Sources: These are reviews of the primary literature (abstracts, articles, analysis..)
Tertiary or General Sources: These are documented information in a condensed format (Text books, Standard treatment manuals, formulary manual … etc).

2.11.5.4 Setting up a Drug Information Center
To successful drug information center requires a stable location and environment:

A) Philosophical Commitment:
(1) Active: reactive in providing information on request.
(2) Proactive: reaching out information for whom may need in an effective and convenient way.
(3) Cooperative: Involving all health disciplines and best utilizing the existing resources.
(4) Creative: Satisfying the needs and expectation of the users and create demands and raise the expectations.

B) Location and Housing:
(1) Should be centrally located within the hospital, to allow better access to the information and library.
(2) Secure space- 32 m² in one or two rooms or three adjacent rooms.
a- Office work. b- Storage of references c- Equipment d- Visitors.

C) Staff: Should have a high belief on their mission, fully dedicated and have no other business activities.
1-Clinical or a hospital pharmacist (chief).
2-Pharmacist
3-computer operator..
4-Three active employees.

**Equipment requirements and communications equipment:**
- 2 computers, scanner, Photocopying machine, 3 telephone lines, 2 mobile telephone, fax machine, internet line, printer. Appropriate software programs, answering machine. Shelves for books and references. Tables, chairs, refrigerators and television.

2.11.5.5 Services & Activities:
1- Activities including intelligent and relevant answers to quires either personal, written or by telephone from doctor’s, health workers & patients.
2- Proactivities include:-
   (1) Publishing newsletters or drug bulletins.
   (2) Participating in clinical activities.
   (3) Participating in formulary and treatment guidelines committee.
   (4) Hospital drug & therapeutics committee.
   (5) Training health professionals.
   (6) Preparing short, problem oriented bulletins.
   (7) Providing in-service training to health staff.
   (8) Making short presentation to out patient groups.
   (9) Making short presentation to community organization.
   (10) Good perception could be enhanced through :
       a- Building alliances with most clinicians and involving them as consultants and reviewer.
       b- Ensure that staff are readily accessible by telephone or personal.
       c-Making extra efforts for usual drug related questions.
       d- Participating in patient rounds with doctors.
   (11) Collaboration with other centers in developing countries through the Pharmacy Information Section of the International Pharmaceutical Federation (PISIPF) and the International Society of Drug Bulletins (ISDB).

2.11.5.6 Training: Training in managing drug information center is necessary for key personal. Training includes drug information retrieval, literature review, analysis and evaluating information, publication development and sustainable planning and funding. Staff should have relevant research activities, they should have a career structure similar to those of academic institutions. Trained staff should be well paid.

2.11.5.7 Evaluation: To achieve monitoring and evaluation all tasks should be reported and documented, write any question been asked, every person and the responses provided, references used and compliments received, time of service. Personal contacts, questionnaire and focus group. Periodicals being disseminated. Prepare an index of valuable addresses.

2.11.5.8 Problems and Suggested Solutions:
Lack of readily available information:
Lining with other centers by fax or Email
Lack of acceptance of DIC as a source of relevant information: Involving influential clinicians in developing the center and review out reaches. Promote, efficient and relevant responses to quires.
Lack of financial and human resources: Good planning from the beginning, professional involvement and generous payment.
Lack of political will of the decision makers to establish DIC:
Highlight the value of information and its failures. Allow policy-makers to win the success.
2.11.6 Dispensing:

Good dispensing ensures that an effective form of the correct drug is delivered to the right patient in the prescribed dosage form and quality, with clear instruction and in a package that maintains the potency of the drug.

It is thought that, dispensing is a simple routine process that cannot go wrong, just read a written drug, delivered to the patient, but its not that so simple, all the health care activities will be of no value if the patient does not receive the effective form of the drug, clear instructions for use and in an appropriate package.

2.11.6.1 Place:
The site of the pharmacy should be located in an appropriate place, clean and organized. The dispensary area and staff should be clean, free of dust and dirt. Shelves, surroundings, equipment, packaging material and staff should be maintained clean and organized. Food and drink must be kept out of the dispensing area, refrigerators are used only for medicine. Cross contamination of tablets dust is not allowed e.g. penicillin tablet may contaminate tablets being harmful to sensitive patient. Stock should be organized alphabetically or according to the code index. Drugs should be labeled with satisfied information.

2.11.6.2 Temperature:
The temperature of the environment must meet the requirement of the handled drug, bottles must be kept close except on use. Fast moving item are placed in the most accessible areas. Walls, shelves, door and windows should be neat, clean and polished.

2.11.6.3 Personnel:
The major difference between supplying medicines and supplying other goods is that the patient receiving drugs is not able to justify the quality and the use of the product he received. The responsibility for this, lies on the dispenser who must be legally practicing this task, that is a professional pharmacist.

Assistants, technicians, dispensers should be trained on:

Common knowledge about medicines they dealing with.
- Accounting, calculations and inventory recording.
- Cleanliness and accurate honest practices. Effective communication with patients. The activities of these training programs should be supervised by professional pharmacist. A registered pharmacist is a professional that holds the issue. The role of the pharmacist in the supply system had been significantly altered in the last 20 years from product oriented care to patient oriented care, moving from care of pharmaceuticals to be one of the clinical team involved in deciding and designing the patient treatment, the pharmacist is referred as an expert of drugs. Technicians should be trained to deal with drugs. Drugs consume a largest budget in the health service and so it is unfair to be left for untrained, irresponsible staff.

Assistant staff should follow a written protocols and closely supervised.

2.11.6.4 Dispensing Process
(Fig20) The dispensing cycle

- Drug name, strength, dosage form, quantity
- Dosage, route of administration, instructions
- Patient name, Doctors name, Pharmacist and pharmacy.
- Expiration, instruction for storage
1-Receive, validate the prescription and confirm the patient name, age and Sex.
2-Verfying and interpret the prescription, the abbreviation, the dose. Check the age and sex, calculate the dose and quality required, Identify any drug interaction.
3-No verbal prescription is accepted except on emergencies , and rewritten shortly. Any doubt about what is required , the prescriber should be checked because an error in dispensing may cost lives.
4-Prepare items : counterchecking to ensure accuracy, write the label and check it . Many containers should not be opened at one time. Dependence on the place of the item or the color may be fatal.
5-Instruct the patient, let the patient repeat the instruction and recheck the patient name, warning about possible side effects and deliver.
6-Cancel the prescription, sign and send to record.
The use of numbered receipt system combined with prescription-ready indicator that displays at remote location can overcome the problems created due to crowed drug outlet. ( Stones -2003 )

2.11.6.5 The recommended containers :(WHO)
-For tablets and capsules : Blisters , plastic Sackets, plastic or glass containers
-For liquids : Amber bottles with screw cap , glass or plastic with tight up caps are acceptable , but previously used containers are unacceptable .
- For drops: Amber dropper bottle , plastic dropper bottles.
- Creams: Wide mouth jar with well closed lid. Tubes for ointments

**Course of therapy packaging:**

**Prepacked course of therapy is suitable when:**

1. Heavy load of work, limited dispensing time.
2. Few drugs are prescribed currently.
3. The same quantities and dosage.
4. To protect medicine from atmospheric deterioration.

The prepacking course of therapy provides more accurate prescribing because it follows the standard treatment, less errors, and allows more time for the dispenser to communicate with the patient, earlier and more accurate records for inventory control could be provided and so more accurate consumption data could be obtained.

**Tools:**

a. Triangular tablets counter  
   b. Electronic tablet counter  
   c. Pan weighing scales

**2.11.6.6 Promoting efficient management:**

Patients care and even life, is on the hands of dispensers, so the accuracy is always more important than speed of dispensing. Double check of prescription, more than one of the staff handling each prescription allows good opportunity for life saving. Prepacking and labeling commonly used, reduces the time and improves safety.

Maintaining daily, weekly, monthly and yearly records. Daily list the drugs in stock.

Presenting an irreversible non-endorsable prescription system. Arranging more pharmacy staff for the most loaded hours.

Representation of the pharmacy staff in the hospital committee to reflect the problems and resolve the patient flow. Regular inspection is essential.


**2.11.6.7 Computer:**

Patient name, insurance number, age, sex, prescriber, level of prescriber.

Drugs & quantities.

Each prescription data is entered and called out to give the sum of the drugs issued by day, week, month and lastly the year consumption. The patient frequency of visits could be determined. The prescribing habits could easily evaluated.

**2.12 DRUG FINANCING:**

**2.12.1 General Resources:**

i) **Government budgets**.

ii) **User fees**.

iii) **Health Insurance**.

iv) **NGOs. (donation)**.

v) **Loans and protocols**.

**2.12.2 Financing relationship:**
Regulations

When the provider and the payer is closely related or are a single organization it a managed care service..
In this type of health service, in spite of the easy cost control, it creates a conflict
of interest between cost control and quality of care.

2.12.3 Government budgets:
Government expenditure for drugs varies according to the (National economic
output) of the country.

In developing countries when drugs were financed by the government budget
faces many problems of stock outs and inappropriate quality of care. Government financing for drugs, is a burden on the national development and it
is a cut from the funds of defense, education and other activities. Increasing
taxes and consequently increase prices. Higher demands with limited funds,
results in drug shortage, bad qualities, frustration of the working staff and lastly
wide spread of diseases and lost of ability of the nation. (Antezana & Velasquez
1996)

When resources are limited, expenditure on preventive services are more cost
effective than drug treatment, even at the primary health level.

Argument to get governmental financial support:-
The supply system need to advocate to access the governmental support. The
general subjects to clarify are the Health impact of drugs, quantification and
costing of drugs, Per capita analysis, Economical impact, Expenditure analysis -
Gap of the budget analysis, Political feasibility - Impact on utilization on the
health facilities. Comparative analysis with the regional countries. - Improving
management (Quick1997)

Even if the funds is high and the budget is sufficient there will be a great
challenge to gain access to the budget often after short falls, inability to
spend due to late procurement procedures or to any other reason.

2.12.4 Financial Equation:
* Higher demands; Requires increase in the financial resources.
* Decrease in resource; yield a lower quality of care.
* Increase in demands, higher costs, in the presence of good resources, the
required quality of care could be obtained by improved management.
(MSH-2002)

In developing countries and even in developed countries, governments faces
many constraints to satisfy the health demands for the population. As drugs
are costly and consume a large proportion of the budget, thoughts to find a
way to increase the resources is essential.
* It is the responsibility of the government to ensure that drugs finance is managed in such a way that makes drugs accessible and affordable.

2.12.5 Health insurance:

Insurance coverage increases with the income. It is more than 75% coverage in a well established economies, it is only 5% in Africa.

The basic philosophy of health insurance is the risk-sharing, if an individual is ill, the cost of treatment would be shared by the population. This is organized by paying a regular premiums. So the whole group protect themselves from paying a full cost of treatment, which they may not afford. (MDS –1997)

2.12.5.1 Types of health insurance:

There are four international types of health insurance.

1- Social health insurance:

Social security funds, governmentally organized, compulsory systems for the formal employees, premiums are often deducted from salaries. It may be according to the income. Service may be provided either in the government, insurer or private facilities.

It may cover preventive service, out patient, in patient and primary care.

Insurance coverage increases with the income.

2- Managed care:

Have the incentive to encourage cost control and drug rational use.

The insurer takes the role of supervising the activities, managing the service or contracts with specific provider.

3- Community prepaid schemes:

A group of cooperatives collect premium and state the service could be provided. It is informal, the service is only for those who previously paid and may receive the service and drug free of charge.

4- Private health insurance:

Private companies or organization insures for societies, companies and cooperative. The service provided does not cover the primary health care, preventive service and sometimes ignores the outpatients.

2.12.6 User charges:

The consumer directly pays for his drugs. Programs of RDF for the government, community or NGOs adopt schemes of drug purchase in bulk, provided in a reasonable cost. The revenue is used to replenish drug supply according to BAMAKO initiative. The drug – sales schemes include preventive service, immunization, health education, salaries

User charges can:

1. Increase the substantial revenue.
2. Enhance drug availability and increase quality of care.
3. Shift the public resources to other provisions.
4. Local control of resources (decentralization).
5. Reinforce the use of local services rather than referring. However; user charges should not replace the government funding. Measures are needed to ensure access for the poor. (Quick-1997) Attention should be given to management and restricted measures to ensure accountability, fees schedules (larger hospital —health center) here, the fees collected = drug dispensed.

The differences of RDF from private is that:-
1) Concern with essential drug.
2) Direct link between diagnosis and transferred
3) Affordability of drugs
4) Low cost due purchasing in bulk. The improvement in quality of care could compensate the user charges (World Bank). (Parker and Knippberge-1999)

2.12.7 Donation:
Generally donation accounting for the long term development, concentrating on the primary health care, essential drugs, RDF, supply of drugs only for emergency situation, training to implement a national drug policy, to improve management, to promote rational drug use, to support production and to improve quality assurance capacity.
Loons are generally for infrastructure, human resources and health care development.
Unless the country is poor enough, both private and public sectors can not provide all essential drugs needed, donation of drugs is not required.

2.12.8 WHO Recommendation for drug finance: (Dumolin -1998)
1- Objectives must be to improve and facilitate the access of the whole population to essential drugs.
2- Participation of the government in paying the national drug expenditure is essential.
3- Percentage of this participation must be of a priority.
4- Money saved by improved management must be additional resources for purchasing drugs.
- 10 US $ per capita for drugs per year.

2.12.9 Local financing sources: -
Cost of drugs may be supported by employer or other local sources, NGOs. The direct user charges provides a major share of drug financing.
Markup on drugs often used for salaries, immunization and other expenses.

2.12.10 Government responsibility: -
Population that has no financial resources as refugees, poor rural areas, prisoners and arrested people, fighters, civilians on the war operators, closed areas and casualties are the responsibility of the government to provide health service and free of charge drug supply.
2.12.11 RDF

When funds are limited, drug shortage becomes common even when selection, procurement, distribution and use are efficient and rational. Cost sharing through drugs fees is one of the alternatives for purchasing essential drugs.

The World Bank defines the RDF as the community financing for the availability of essential drugs at full cost prices. RDF is at first, one-time capital injected in the system, purchasing drugs (should be of affordable prices, mainly essential drugs.), sales (it may be with marginal interest), the revenue is used to replenish utilized stock and cover the operation cost (Parker D and Knippberge-1999).

2.12.11.1 Objectives :-

1. Availability of drugs as a real improvement of health care.
2. Reserve funds for suitable supply of drugs.
3. Essential drugs are critical for preventive care and curative care.
4. Patients always willingly pay for drugs.
5. Inadequate amount of drugs with high prices in the private sector. The RDF prices are more affordable.
6. Patients and prescribers make greater value of drugs when paid, enhancing rational prescribing and use.
7. Efficiency of drugs service and good revenue.
8. The main objective of RDF is to maximizes access to drugs.
9. RDF without source of low cost drugs, subsides quickly and ceases to revolve.

2.12.11.2 Common pitfalls :-

1. Money collected is insufficient to replenish the original stock and funds soon be depleted.
2. Careful economic and accounting analysis.
3. Increase in the procurement cost due to changes.
4. Underestimated capital.
5. Rapid program expansion.
6. High operation cost.
7. Losses, theft, deterioration and mismanagement.
8. Tie of funds in the bank.
9. Delayed collection from facilities and other payment agencies.

WHO (1996) – the higher income country the lower the share of drugs of the total health expenditure.

less than 5$ / capita = unlikely regular supply of drugs to population.
10.5-10 $ / capita = could supply larger part of population
11.10 – 50 $ / capita = the needs of entire population would be satisfied. (Kaddar, Dumoulin and Velasquez 1991).

2.12.12.1 Problems facing health insurance :-

1. Moral hazard :-
Member used health service more frequently than if they are not insured. Deductibles and co-payment are used to control this problem.

2. Adverse selection:
   People at greater health risk with chronic illness join the program while healthiest are not. Here, increased cost and reduce sharing.

3. Skimming:
   When insuring group and rejecting others with high risk. Results in avoiding those who need the service.

4. Cost escalation:
   Rising costs maybe resulting from greater use of technology or increase in demand and utilization.

Ideally, insurance schemes should be designed on the concept of the overall health policy and health financing strategy.

2.12.12.2 Issues that need to be included in designing schemes:

14. Benefits to be included (outpatient, inpatient, drugs).
15. Organization of health services.
16. Premiums calculations and payment mechanisms.
17. Utilization and cost control measures.
18. Administrative arrangement.

(WHO, Norman and Weber 1994, design of social insurance schemes)

A successful insurance program must organize the registration of members and dependents, the definition of services coverage, accurate projection of payment to set premiums, collection of premiums, handling of claims, payment providers, utilization, quality monitoring, and cost control.

2.12.12.3 Reasons for including drugs in the health insurance:

1. Drugs are essential components of modern health care.

2. Early treatment of diseases reduces the cost of health care. (malaria, diabetes if not treated early the cost of treatment will be more later. (complications and hospitalization)

3. Drugs spend high share of the household health cost, inclusion of drugs makes the program more acceptable.

2.12.13 Supply of drugs in health insurance programs may be from:

   - Private pharmacies – reimburse the bill for the patient.
   - Private pharmacies.

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- Insurance – affiliated pharmacies.
- In house pharmacies.
- Pharmaceutical benefits management schemes.

Reimbursement of the bill to the patient, provides flexibility but yields a high administrate cost and abuse is not easy to control.

Managed care insurance program, have their in house pharmacies. Staff may be on salary basis or the entire pharmacy service may be contracted out. Here, the insure exert greater control over drugs availability, cost and regulations.

* Pharmaceutical benefits management (PBM) schemes contracted with the insurer to manage pharmacy service.

* the PBM provider negotiates drug prices with suppliers sets the formulary of drugs to be used, reviews and adjudicates claims, reviews pattern of utilization by patients and provider, audit the program to prevent abuse and fraud, and implement programs for the rational use of drugs.

PBM appears to add another modern model and successfully reduce cost to insurers.

2.12.14 Payment:-

Controlling the cost of drugs by co-payment.

1) In order to enhance generic prescribing:
   - 1 $ for generic drugs.
   - 2 $ for brand name drugs.

2) To rationalize drug expenditure:
   100 % free for the lifesaving drugs – to 0%(zero) for non – essential drugs according to VEN system.

3) Annual funds of drugs value for each member may defined.

4) Percentage of reimbursements scheme:
   - 25% to be paid for drugs used in chronic illness.
   - 50% to be paid for other drugs.
   - 75% to be paid for symptomatic treatment drugs and in minor diseases. (Quick-1997)

5) Maximum allowable cost for maximum reimbursement for each item in order to enhance generic prescribing.

6) Saving from the member’s payment is 25 – 30% of the total retail cost. In the military corps – Sudan it is 5 – 7%.

40% saving if used generic drugs over brand-named drugs.

The average prescription cost at USA pharmacies for Medicare insurers is 49.84 Dollars. The commonly purchased drugs were the anti-depressants. (Medicare 2002)

2.12.15 Prescribing control:-

1- Selective reimbursement of drugs on the formulary list (white list) encourages compliance. Other non-formulary (black list) drugs including non prescription drugs discouraged by lack of imbursement.

2- Generic equivalents are of lower cost.
3-Treatment guiding is recommended especially in managed care particularly for common diseases and for higher – price drugs.

4-Specific items or groups of drugs or therapeutic categories could be indorsed firstly before dispensing.

5-Quantities dispensed ,number of items per prescription, frequency of refills and total expenditure , all could be controlled by regulations.

6-Review of over prescribing and follow up of prescription , dispensing regulations.

Cost control measures must not reduce the accessibility of essentials drugs. Medicare does not pay anything for the out patient drug expenses and gain 10% discount from the contracted pharmacies.  
( Medicare-2002)

Although each financing mechanism has benefits and limitations ,the net effect of pluralistic approach is to distribute the burden of financing across several recovers. The challenge is to make optimal use of the available funds.

2.12.16 Guidelines For Managing finance :

A)Cash basis:

recording transaction only when cash is received or spent.

B)Accrual basis :record all transaction at the line they are make . every transaction is evaluated in cost wise.

the use of the accrual basis system is the most suitable for sustained program of drug supply .

the financial manager is responsible for ensuring that the resources are used in the best way possible to achieve the program objectives.

2.12.16.1 Objectives :-

1. Preparing a long-term plan, proposing the most cost-effective way to provide the planned services. Outline the resources needed.

2. Setting a competitive and affordable prices.

3. Preparing a budget to plan containing the expenses.

4. Preparing a cash-flow forecasts to ensure the availability of cash to cover obligations.

5. Analyzing the costs to assess cost effective and monitor efficiency.

6. Controlling and manage collection, safekeeping and spending of funds.


8. Systems should be designed to control expenses, operation cost and depreciation.

2.12.16.2 Principles for financial control :

➢ Dividing duties among different individual.
- Regulating transactions through the use of written procedures.
- Recording and monitoring all transactions.
- Providing a constant period accounting reports.

2.12.16.3 Books to be kept:
1. Cash received book.
4. Accounts received ledger owing to the program.
5. Accounts payable ledger owed by the program.
6. Sheets for purchases and sale.
7. General ledger for income.
11. Inventory records showing quantities and costs.
12. Fixed assets register.

2.12.16.4 Reports Required:
1. Budget preference report: annually and monthly, shows the come from grants, drug account, expenses and comparing the budgeted and the actual revenue for the last year.
2. Income and expense report: Monthly and annually. shows the income and expenses to date and accumulative surplus or deficit in a percentage to the drug cost.
3. Balance sheet: Monthly and annually balance of the end of the period at one times shows assets, liabilities, reserves and funds balances. Liabilities is measured by comparing the cash balance to the accounts payable. It is import to balance, that drug stocks and accounts receivable will result in cash income that can meet the liabilities.
4. Drug stock accounts: Summary of the total account of drugs and detailed account by drug, attached to the income and expenses.
5. Accounts payable and receivable: Shows the balance of each debtor and creditor, breaking the balance into months. The situation of each supplier, regions and facilities.
6. Report in drugs distribution free of change and waivers for sales to the poor or special group. should be recorded in special receipts.
7. Value of drugs expired or lost.
9. Value of orders not received.
10. Situation of each supplier.

2.12.16.5 Good financing control:
A) receipts:
1. Prenumbered receipts for all cash received.
2. Keep the original of conceited receipts.
4-Cash and cheques received should be kept separately from other funds and should not be used as a source of payment. Bank them promptly. 
5-Revise bank balance every month. 
6-Use a register to record all cheques received. 
7-Do not cash personal cheques from petty cash. 
8-Register all donations or fixed assets and showing the value. 
B) Assets:
- Protect against loss or theft with appropriate security and insurance. 
- Keep books for equipment and vehicles. 
- Identify all related equipment by marking. 
- Maintain a fixed assets register and keep an up-to-date maintenance and inspection records. 
- Keep cash reserves in a low-risk investment. 
- Monitor advances and accounts receivable to be cleared within its period. 
- Maintain up-to-date inventory records and reconcile balances each month with the accounting record. 
- Use physical checking up a sample of inventory balances each month. 
C) Controlling Expenditure:
- Establish detailed procurement procedures. 
- Obtain written bids or quotes for all purchase above specified limits and attach the purchase order. 
- Use a local purchase order for all local purchases. 
- Check the entry of received goods in the inventory records. 
- Check the quantities, quality and prices of received goods according to the purchase order specifications. 
- Make all payments in cheques. 
- Documentation of all purchases. 
- Check the proposed expenditure against the budget. 
- Check that funds are available. 
D – Liabilities
- Keep accounts payable at a minimum level. 
- Maintain control over suppliers invoices, what have been paid, the delivery and date of receipt.

2.13 Managing Security
2.13.1 Objectives:
1) Ensure that safe and effective drugs are available in authorized outlets at all levels.
2) Minimize Shortage, abuse and misuse of drugs.
3) Depends on accurate reasonable records on drug consumption and morbidity data.

4) **Minimize leakage of the systems**

2.13.2 *Types of security breaches*:

1- Theft
2- Fraud
3- Abuse
4- Commissions “ bribery “.

Shortage caused by these breaches leads to deaths and patient suffering.

2.13.2.1 Theft:

**A- Forms of theft**

a- Small, chronic, sustained and small scale leakage; staff at the storage area are usually responsible.
b- Large scale, may involve persons inside and outside the system.
c- Diversion of goods before reaching its destination involves person in responsible positions.

**B- Factor promoting theft:**

1) Poor physical security in stores.
2) Weak inventory records.
3) Unlimited access to stores by unauthorized people.
4) Insufficient staff salaries, with products of high value.
5) High demand for drug in the private sector.
6) Weak punishment decisions.
7) The same product in the market “ No identifiers “

**C- Probable outlets of stolen drugs:**

a. Exported to neighboring countries
b. Sold to or stole by physician and other health workers.
c. Sold directly to the public through families, friends and pharmacies.

**D- Sites and probable forms of theft & control:**

1) At the port:

Form of theft:

1- Diversion of shipment to other country.
2- Off-loading to dispatching vessels to others country.
3- Petty theft by port workers.
4- Major theft at the customs warehouses.

**Control:**

1- Containerization of goods.

2-Rapid port clearance.

2) At the medical stores:

a. Forms of theft:

1- Major theft, breaking and entering.
2- Major systematic theft by employees.
b. Control:
   1- limited access to storage areas for unauthorized employees.
   2- Secure lock and doors.
   3- Unannounced search of theft and physical inventory taking.
   4- Periodical stock counts and auditing the receipt and issue records.

3) Transportation:
   a. Forms of theft:
      1- Sellig drugs by the driver along the route.
      2- Systematic diversion of all shipment to the market.
      3- Large quantities, by facility representative.
   b. Control:
      1- Keen document verification.
      2- Packing seals.
      3- Strong boxes.

4) At the hospital:
   a. Forms of theft:
      1- Petty theft by the staff for personal and family use.
      2- Drinking spirits and refill with water.
      3- Big quantities for the market.
      4- Big quantities for the use in the private clinics and nurse unofficial practice.
   b. Control:
      1- Drug accounting and periodical checking the outpatient and wards.
      2- Consumption report for frequently stolen drugs.
      3- Locked transport boxes for the ward and emergency.
      4- Presentation of prescribing form for ward issue for expense and frequently abused drugs.
      5- Hospital pharmacy should not be accessible when pharmacist or dispenser is not there (evening, weekends). Emergency supplies for the emergency room and ward will be supervised by nurses.
      6- Word can keep a limited number of drugs in full containers for each drug as stock, refilled emptied (replenishment) with a dispensary records for each drug (rotating stock container).
      7- Up grading pharmacy staff: Trained pharmacist and dispensers has been credited to reduce theft. Screening of individuals, professional socialization and higher pay may explain the issue.

5) At the Out patient and health centers:
   Control:
   (1) Maximum dispensing quantities.
   (2) Recording the individual prescription.
   (3) At the health center dispensing of valuable drugs can be done by the physician.
   Forms of theft:
- Patient multivisits to different clinics.
- Writing multiple prescriptions by the physician.
- False names or false patient.
- Patients facing illness.
- The use of government drugs in the private practice.
- Diversion of some item to the market by the labors, dispensers, nurses and even physicians.

E- General security measures for theft:
1- Use of unique identifiers:
   a- Unique monogram or logo: imprinted in all containers strips and foils.
   b- Register batch number: and forbidding the supplier to sell the same batch.
   c- Emboss tablets and imprinted capsules.
2- Perfect inventory records:
   a- It provides good tracing on security breaches.
   b- " " consumption comparison.
3- Unannounced physical inventory count.
4- Survey of suspected sale outlet.
5- Collecting informal information.
6- Close the outlets of the stolen drug and enforce legal punishment.

F- Good Security Management:
- Secure storage areas with limited access at all points of the system.
- Active used of inventory records.
- Storage area physically well designed.
- Systematic and orderly shelving.
- Maintain unique identifier.
- Unannounced inventory counts and discrepancy reporting.
- Concentrate measures on fast moving expensive items.
- Responsibility of security to one person.
- Prescription filling is forbidden at the warehouses.
- Improve staff salaries and working conditions.
- Use of supportive measures as:
  - External and internal lightening.
  - Alarm system.
  - Private security agent.
  - Double locks.
  - Closed delivery vans (closed vehicle).

2.13.2.2 Fraud:
1) Manufacturer:
   - Forms of fraud:
     a- In proper quality.
     b- Reduced quantities and packaging.

   - Control:
     - Direct visits to manufacturer to assess compliance to the offer specifications.
     - Good quality assurance practice.
Receiving committee, rigid inspection

2.13.2.3 Commissioning:

Illegal payment from supplier to the system staff to deviate choices of drugs, increase order quality, accept higher prices, and biases supplier selection

1-Choice of drug:
- A bribe is difficult to be given to a committee. Selection of drugs should be a responsibility of a committee.

2-Influencing quantities:
- The use of accurate consumption data closes the way for bribery to the purchasing office to alter quantities.
- Effective forecasting on the basis of dependable inventory record.

3-Acceptance of higher prices:
- Purchasing should be only through committee.
- Tender basis.

4-Supplier selection:
- the tender board use transparent procedures.

2.13.2.3 Cost – effectiveness:

1) Nothing is cost-effective than improving selection of drugs, procurement, accurate inventory control records, effective distribution, quality assurance, good forecasting, checking of receipts, unannounced physical stock counts and continuous reporting. No additional cost will be paid.

2) Measures for identifiers, construction of secure warehouses and appropriate staff payment can be measured against the outcome and the cost of:

- Use of inappropriate qualities.
- Cost of drugs shortage.

More purchases caused by theft

- Higher prices caused by bribes which are added to the real price.

3) Concentrated rigid punishment is not costly.
Chapter 3

Objectives
A- Main objectives:

1- To identify and clarify the major functions and components of an effective drug supply system through comprehensive study of drug supply dimensions.
2- To tackle the problems of the drug supply systems in the Sudanese Medical Corps.
3- To design a suitable implemental proposal for improvement.

B- Specific Objectives:

1- To define a disciplinary organizational structure for the pharmaceutical service in the Peoples Armed Forces.
2- To predict a suitable method for selection of pharmaceuticals.
3- To clarify the good pharmaceutical procurement practice.
4- To assess the warehouses, the distribution system and propose the effective pipeline to ease the flow of drugs.
5- To investigate the prescribing problems and define the impact of setting regulations on rational prescribing.

6- To explain the importance of inventory records in the dispensing process.
7- To highlight the financial obstacles and find a way to overcome the problems.
8- To identify the probable security breaches.
9- To explain the role of computer and the importance of information in the supply systems.
10- To present a proposal for implementing a drug information center.
Chapter 4

Methodology
4. The Methodology:

4.1 The Subject:

The research had been carried out in the Sudanese Medical Corps (The Military Medical Services Directorate) health facilities, at the center and the regional hospitals in the period from 8/2000 to 2/2004. The subject Drug Supply Management is a wider issue and need to be segmented, but for the great need of the military medical services, the research covered all the dimensions hopefully to be applied. So, the research was focused on the systems. Further studies could be carried out on the topics being tackled.

4.1.1 Importance of the subject:

The drug supply of the SMC faces many problems necessitating the study of the drug supply dimensions. They are:

1. Scarcity of financial resources.
2. The general trend of the army usually contains a complaint on the supply performance.
3. The organization is unstable. The hesitation in location of the supply sector was clear and in aggregation and segregation of activities.
4. The shortage of drugs at the war areas may cost the fighters lives.
5. Inequity in the existence of two systems, the war areas supply depending on the government budget with the known difficulty in its accessibility in spite of the share of the fighters in the health insurance program deductibles.
7. The rumors of inefficiency of the tender methods in drug purchases.
8. The potentials in providing non-essential drugs. All these make the comprehensive study of the drug supply systems a must.

4.1.2 Guiding tools:

The tools used for investigations are:

1. WHO indicators.
2. Drug supply systems assessment (managing drug supply).
4. Assessment of organizations.
5. Interviews to expertise.

4.1.3 Preparatory phase:

To prepare of the study managerial background is essential. This was obtained by:

1. Visit to Management Improving Center (Khartoum). For planning, management and organization studies.
2. Sudan Academy for Management Sciences, for organizational studies.

4.2 Data collection:

4.2.1 Surveys:

Visits to the different military areas and regional hospitals.

Data required:

1. Prevalence of diseases.
2. Drug consumption.
3. Transportation routes.
4. Efficiency of distribution.
5. Number of forces to be covered.
6. Drugs suitable for the region.
7. Times of deliveries.

Sources of data:

1. Direct contact to the health providers.
2. Review of records.
3. Officers group discussions.
4. The leaders interviews.

4.2.2 Retrospective studies:

Records at:

1. Central Warehouses.
2. Takaful Warehouses.
4. Reports at the hospitals and pharmacies.
5. Documents.
6. Takaful statistical unit.
7. Computer Programs.
8. WHO, Health insurance, RDF Khartoum and CMSPO.

4.2.3 Interviews:

1. Medical Corps Leader (2 cycles).
2- NFDMS General Secretary.
3- Financial Affairs Directorate General Manager.
4- CMSPO Manager General.
5- Sudan List of Essential Drugs Program Manager and Deputy.
6- MOH Pharmacy Directorate Head Departments.
7- Health Insurance –Consultation Department.
8- General Audit.
9- Military Medical Supply Managers (retirees)

4.2.4 Group Discussions:
1- Officers at the military Areas Headquarters.
2- Regional Hospitals personnel.
3- Continuous discussions with pharmacists in uniform.
4- Financial Affairs of Takaful.
5- RDF of Khartoum State Pharmacists.
6- Random discussions with users.

4.2.5 Prospective studies:
1) A form to fill 50 prescriptions at the center.
2) A form to fill 30 prescriptions at the capital peripheries.
3) A form to fill 50 prescriptions at the regional hospitals.
4) Coverage of prescriptions of one month at one regional contracted pharmacy.
5) 1013 prescriptions covering a full week at the public pharmacy.
6) Daily temperature records, 8 in the morning, 1p.m and 3 p.m. from February 2002 to July 2002.

4.3 literature Review:
4.3.1 Libraries:
i- Sudan National Records.
ii- Sudan Academy for Administration Sciences.
iii- WHO Khartoum Office.
iv- U of K library.
v- Management Development Center.
vi- ITC Library.
vii- MOH Library.
viii- CMS Library.
ix- Army Research Library.
x- MSH Electronic Library.

4.3.2 INTERNET:
 ➢ WHO web site,
 ➢ British Royal Medical Corps web site,
 ➢ British Hospitals web sites,
 ➢ USA Army web site,
 ➢ American Pharmaceutical Association web site.
 ➢ MSH web site.

The main valuable reference that guided the emphasis of the research is the Manual of the MSH, Managing Drug Supply, the first edition 1987 and the last edition 1997 (Quick-1997).

4.4 Comparative study:
In a visit to Jordanian Royal Medical Services for two months a comprehensive study for all the logistics systems had been carried out.
The data had been obtained by direct contact, direct questions, observations, reviewing papers and reports, computer program, lectures on all activities and one group discussion.

4.5. Analysis:
4.5.1 Methods:
1. Focusing on the systems, compiling the results with the literature.
2. Assessment guided by the literature topics.
3. Comparing the results to that of the JRMS.
4. Simple calculations by Microsoft Excel program.
5. Frequencies by SPSS.
6. ABC analysis tool.
7. Therapeutic categories analysis tool.
8. Detailed Therapeutic category analysis tool.

4.5.2 Computing:
1/ Program of the drug supply by a programmer from Almadar computer center using access data base.
2/ Excel.
3/ SPSS at the Board of Weather Expectation Informational Unit.
Chapter 5

Results And Discussion

5.1 Drug policy and planning:
There is no legalized, endorsed and documental statement concerning drug policy or adopting the National one.

The directives of the NCS and objectives of the SNDP were not known in the field of SMC.

There are no sound procedures to formulate the drug policy within the military service or to design a plan for the supply of drugs.

The pharmaceutical performance of the supply systems of the SMC could not be evaluated due to the absence of a clear mission statement. Selection of drugs is through the MHI list which lacks consensus and stability. Storage, distribution and rational use of drugs are without guided objectives. The list of the free drugs is not constant. The successful implementation of the MHI program was due to the wise involvement of all sectors and to the wise presentation for the covered groups.

The formulation of drug policy requires the constitution of technical and involvement committees. The involvement of the health and military sectors provides consensus and highlighting the goals. The endorsement by the Chief of Staff provides the commitment of the Headquarter. The initiator for the task may be the Board of Directors of Takaful or the recommended Pharmacy and therapeutic committee. Then program and working plans could be designed according to the stated goals and objectives.

The mission statement should not contradict the National Directives and the military discipline. The WHO general plan for pharmaceutical supply provides appreciated precursor to design a comprehensive strategy.

The political, financial and military support is essential. The executive level should design a budget and time-tied plans.

5.1.2 NFDMS : The stated policy of the NFDMS divided the activities into three dimensions, the building, the equipment and personnel. The performance was not stated.

5.1.3 The SNDP : Referring to the SNDP which states the purchasing of drugs through tenders, supporting the domestic drugs, advising for establishment of statistical units and giving attention to the substantive distribution of drugs to the regions. These subjects are not in action and even the SNDP was unknown in the field of the MC.

5.1.4 The Jordan RMS : There is a written, endorsed policy document.

**JRMS supply system objectives :**

1-Improving performance and upgrading quality of service.

2-Rapid achievement.

3-Control and follow up.
Strategies: Planning and organizing the work and stating the objectives in a frame of plan considering the evaluation and studying the results of the evaluation.

A- Improving performance and upgrading quality of service.
1- Maintaining substantive supply of the medical requirements.
2- Maintaining the lowest possible inventory levels and keeping the losses to minimum.
3- Previous statement of the specifications, standards and purchasing method and the criteria for evaluation.
4- Implementing the legal relations systems in contracting.
5- Improving the concept of planning and policy statement.
6- Making available higher quality drugs in the lowest possible prices.
7- Keeping good reproductive relations with suppliers.
8- Activating the principle of competition.
9- Evaluation of suppliers and their performance.
10- Activation of personnel by incentives.
11- Ensuring the principle of wise and modern management.
12- Maintaining quality and technology.
13- Security of information.
14- Training the personnel through workshops, residency, lectures, multipurpose short and long-term training.

B- Rapid achievement.
1- Adopt the principle that divides the work according to specialties.
2- Computerization to achieve rapid flow of information.
3- Upgrading and developing the communication media.

C- Control and follow up.
1- Working through committees to provide transparency and for follow up the performance. The programs and responsibilities of these committees should be previously stated.
2- Subdividing the duties according to the staff abilities.
3- Follow up the performance through the connected computers network and by keeping close.

Responsibilities of performance improving committee:
1- Evaluation of the procedures of requisition from the warehouses.
2- Procedures of handling drugs from the warehouses till recorded on the inventory control at the hospital warehouses and the outlets.
3- Numbering and arrangement of the stock and storage conditions.
4- Procedures of filling the prescriptions and departments requisitions.
5- Procedures of dispensing drugs to the inpatients.
6- The inventory records at the pharmacies and departments.
7- Procedures of selling to other health facilities.
8- Procedures of handling the dangerous drugs and narcotics.
9- The personal responsibilities for equipment.

5.2 The Organizational structure of the pharmaceutical services in PAF:
5.2.1 Medical Corps: According to the Ordinance 1994 all the pharmaceutical services are in one unit managed by the Leader Deputy. On establishing Wafra Drug Manufacturing Plant, two pharmacists and the manager were in charge. It was affiliated to the Military Cooperative Corporation and then transferred to the General Board for the Military Manufacturing. The NFDMS established the Medical Supply Corporation and then Niessar Drug Company. Two pharmacists were involved. In 1999 Wafra Drug Plant had been affiliated to the NFDMS and the Takaful (risk-sharing) had been merged in the field of the Medical Corps.

In the year 2001, when the Medical Corps Leader announced for duality in the system and the Medical Corps Leader post have no authority on the staff, facilities and the civilian personnel working in the military health facilities, a new arrangement was settled as follows: (Army Headquarter-2002) (Fig.21)
5.2.1.1 Pharmaceutical activities of the NFDMS:-

A-Wafrapharma Laboratories Drug Company:-

(1) Raw materials importer.
(2) Drug manufacturer and whole seller for 28 items of different dosage forms. B-Neissar Drug Company:
1. Drugs and equipment importer and whole seller.
C-Medical Supply Corporation: ( Cleared out)
1. Drugs and equipment importer and whole seller.
2. Retail Public Pharmacies. (8 pharmacies).
D-Moving Troops Supply Unit:
Supplying the fighting troops, on their movement only. Working through direct purchasing from the local market.

All these drug companies are subordination of the Investment Department of the NFDMS except the supply unit. 7 pharmacists out of 13 officers pharmacist of the PAF are working in the NFDMS companies on trade basis. The revenue of which is used to finance the NFDMS activities.

5.2.2.2 (Fig. 22) Takaful organization structure(2001-2003):

Takaful General Directorate (Obstetrician)

Drug Supply → Capital (central region) → Regions (states) → Medical Service → Security and control → Legal affairs → cards → Finance

Warehouse II

Executive office → P.U → War operation

Warehouse I

Supply

Supply → Executive office → Statistic

Equipment → Drugs → Sanitary → Fluids and dressings

Central hospitals pharmacies

Regional hospitals pharmacies

Public pharmacies on contract

Public pharmacies on contract
Drug supply department is one of eight departments subordinated to Takaful manager. It is responsible for all drug logistics activities in the PAF.

5.2.2.3 Reorganization for the year 2004:

1-The Medical Supply Corporation of the NFDMS had been cleared out, the importation section had been affiliated to Niessar Drug Company and the 8 Public Pharmacies are affiliated to Wafrapharma plant.

2-The post of the leader deputy for the medical supply had been filled by the plant manager (Brigadier, pharmacist) being responsible for the supply of the war areas with a colonel pharmacist as assistant.

1-The post of the supply manager of the Takaful had been filled by a colonel pharmacist and nominated as a second leader deputy for the medical supply.

( Fig. 23 ) The New Organization Structure (2004):

\[\text{Chief Staff Deputy for Administration}\]

\[\text{MHI}\]

\[\text{Investment} \quad \text{Niessar Co.} \quad \text{Actions} \quad \text{Wafrapharma} \quad \text{Plant}\]

\[\text{Hospitals and Supply} \quad \text{Adminstration & Actions} \quad \text{Training} \quad \text{Preventive medicine} \quad \text{Planning}\]
5.2.2.4 (Table 6) Military pharmacists distribution (2004):

<table>
<thead>
<tr>
<th>Position</th>
<th>Brigade</th>
<th>Colonel</th>
<th>Leutenant major</th>
<th>Major</th>
<th>Captain</th>
<th>Leutenant</th>
<th>Total</th>
</tr>
</thead>
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<td>1</td>
<td>-</td>
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<td>2</td>
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<td>-</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Takaful</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

Comment:

1- It was clear that there was no distinguished pharmaceutical sector in the armed forces. Actually there are pharmaceutical units scattering among three bodies working in the same field of the armed forces.

2- From 1998 to 2004, the supply activities had been aggregated and segregated six times, suffering from a situation of instability of organization.

3- Seven out of thirteen military pharmacist are working in the NFDMS.

4- The pharmaceutical activities are not directly supervised by SMC Leader.

5- The Supply Department of Takaful supervises two supply units within other departments.

The following organizational structures are for comparison:

5.2.3.1 The RDF, Khartoum State Organization Structure:

Fig (24) The RDF organizational structural chart
The RDF Council was chaired by the Minister of Health.
The Procurement Committee was chaired by the Manager of the RDF.
Now on the year 2003 it became an autonomous organization.

5.2.3.2 The Sudanese Medical Supplies:
Which had been one section in the Ministry of Health known as the Medical Stores, was developed to the Medical Supplies subordinate to the Ministry of Health, then a General Board subordinated to the Ministry of Finance and MOH. It had been an autonomous organization after Dutch expertise study in 1991 became an autonomous public organization and organized as in figure (25). (CMSPO-1991)

(Fig 25) CMSPO Organization Structural Chart 1991 (Martinot-1991)
Then it had been later organized to five directorates:

<table>
<thead>
<tr>
<th></th>
<th>Drug affairs</th>
<th>Storage directorate</th>
<th>Administration and finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>Quality control.</td>
<td>b. Inspection and receipt.</td>
<td>b. Purchases.</td>
</tr>
<tr>
<td>c</td>
<td>Sales.</td>
<td>c. Inventory control.</td>
<td>c. Administrative affairs</td>
</tr>
<tr>
<td>e</td>
<td>Requisitions.</td>
<td>e. Shipping and deliveries.</td>
<td>e. Training.</td>
</tr>
</tbody>
</table>

4- Medical workshop.

5- Internal auditing.
In 2003, new directorates had been implemented:

1- General Directorate for Planning, Researches, Statistics and Training.
2- General Directorate for Total Quality.
3- States.
4- Purchases.
5- Marketing and Sales.
6- Financial and Administrative Affairs.
7- Storage and Transportation.
8- Medical Technology.

But, both the CMSPO and the RDF do not give attention to the drug use, prescribing and dispensing. Their role stopped on deliveries. They are not responsible for drug expiration at the health facilities, pricing, storage and inventory records.

The organization of the SMC may be compared with the following:

5.2.3.3 USA Army: The pharmacy corps was established in 1942. The medical service had been consolidated with the pharmacy corps in 1947. The medical service corps is divided into four sections:

1- Pharmacy and supply. 3- Optometry.
2- Sanitary and engineering. 4- the medical allied sciences.

The last apothecary achieving the pharmaceutical service of the States Army has passed the job for pharmacists at 1934. (Skalqut-1985)

5.2.3.4 The British Army: In the Royal Army Medical Corps, there are the Royal Army Pharmaceutical Agency, Hospital Pharmacy and the Fighting Operation Stock Maintenance. Pharmacists work in short service commissions that renewed every three years, the pharmacists transfer from one division to another under the command of the Royal Army Medical Corps Headquarter. (Adcock-2000).

5.2.3.5 Malaysia organization of pharmaceutical supply: A mixed model: a central coordinate division of logistics. Maintaining the functions of the selection and procurement centrally and distribution and control of use individually. This achieves economic saving and staff specialization in procurement. (MDS-1997)

Malaysia organization of pharmaceutical supply: State Pharmaceutical Laboratories and Stores. (SPLS) – have major 4 divisions:

(1) Production units.
(2) Medical stores.
(3) School of dispatching.
(4) Quality control laboratory.

Medical stores handle purchasing, port clearance, warehousing, inventory control and dispatching headed by a pharmacist and 3 pharmacists for supervisory functions.

5.2.3.6 The Arabian Army- Jordan:
The pharmaceutical service was divided into four departments. All of them are directly subordinated to the manager of the RMS in the same managerial level with Hossain Medical City which constitutes four hospitals. Fig (26)

The health insurance is a unit in the Financial Affairs Department.
2.3.7 The basis of Organizing of the Pharmaceutical Services in the Sudanese Army. The followings are the general basis:

1) The life span required was long-life lasting service.
2) Activities performed in the Sudanese Medical Corps, all the military areas covered by the Sudanese Army. Extended national and international duties.
3) Specialty: Pharmaceutical service.
4) Uniformed pharmacists are appointed for the task.
5) All available technologies are required to be incorporated.
6) Considering the geographical, military environment, the different climates in the Sudan and different transportation routes.
7) The available resources, the Takaful premiums, governmental support and finally the NFDMS resources.

5.2.4 Assessment:

The pharmaceutical service organization could be assessed as follows:

1. The pharmaceutical activities was scattered among the services of the MHI and the investment companies of the NFDMS.
2. The pharmaceutical activities are not joined together in any way. The pharmacists in different position are not organized in one unit, their responsibilities, authorities are completely different from their military ranks and professional experience.
3. There is no pharmacy department and no senior pharmacist, which is against the military discipline and the professional ethics and management principles.
4. Pharmacists in different positions have different salaries, different facilities regardless of the military ranking or the professional experience.
5. The organization of the pharmaceutical services in PAF did not recognize the Specialization principle. The manager of the supply had been once a radiologist, dentist and surgeon.
6. Civilian pharmacists are working in the field of military service in Takaful and war operations supply in NFDMS while military pharmacists are working in the market managing two drug companies.
7. There was no transfer of experience among the military pharmacists.
8. Coordination between these different sectors is in a narrow range always there is a need for the headquarter interventions.
9. The supply pharmacists were convinced that lower prices than those of NFDMS companies could be obtained.
10. In spite of the same clients who are the military patients, the same health provide, the same deductibles but there are two systems for supply for those in the war areas and those at the peaceful cities, the former depend upon the army budget.
11. Unity of command for the whole pharmaceutical sector is not existing.
12. The chain of flow of command, the chain of authority, all the pharmaceutical activities are not positioned as a subordinate to the leader either in the NFDMS or the medical corps headquarter.
13. The organizational structure is available for both the Takaful and NFDMS, but arranging their pharmaceutical activities in one line of authority is not existing.
14. Written procedures between these sectors are essential for all decisions.
15. Due to different status of pharmacists, in that irregular and disordered system lead to a feeling of discontent due to inequitable situations. The military discipline and line of authority had been broken down in spite of the fact that all armies strongly adopt line of authority type of organization.
16. To do team work, the feeling equity should always be kept in mind.

5.2.4.1 The supply unit:

Being a central unit, central stores on the basis of health insurance program that providing the service and drugs, get the following disadvantages:

1) Managed Care Health Insurance, lowers the quality of care for the service, (Quick-1997, Simerat-2000), however efforts were divided in managing the finance, providing the health services, issuing the subscribers cards, collecting deductibles and premiums, contracting for the service and drugs in different regions and pharmacies, personnel and security, control and follow up, and managing the drug supply, spontaneously this will lower the quality and decrease the specialty.( Quick-1997),(Simerat 2001).
2) Among these responsibilities, efforts can not be concentrated or focused to the supply interventions and problems.
3) Being away from the center of command, the image, attitude and interventions of the pharmaceutical sector will be faint and non-active profession ship.
4) The hospital pharmacies were out of the supervision of the Central Supply Unit. (no technical supervision).

5.2.4.2 Constraints:

1- One of the great constraints for the supply unit, is the monthly allocation to cover the monthly needs.
2- Central Warehouses supplying the whole country realize the difficulty in transport and exposing drugs to the climatic conditions for many days.
3- Bulk procurement could not be achieved to obtain lower prices.
4- Rigidity of procedures; lack of chance to sell excess stock or unneeded items or nearly expired drugs. This is due to the formal procedures of such cases.
5- Contracting for service on one hand and contracting for drugs from the retail pharmacies yields a considerable loss of resources.

In all cases an autonomous or semiautonomous drug supply can work efficiently and effectively. A proposal was constructed by the Deputy of the Medical Supply. He formulated it as a medical supply and manufacturing corporations, a military organization excluding the two NFDMS companies; shifting the manufacturing plant of the NFDMS to this corporation. Financing is supposed to be shared among different organizations and it is supposed to be commanded by the Council of Ministers according to the act 1976. This needs difficult procedures. Financial difficulties will persist and the long chain procedures will
not be lasted. Employees will suffer the same conditions. The proposal was built on the recommendation of the annual conference of commands.
5.3 Selection of Drugs:

There were no written stated policies governing drug selection except a verbal command from the Chief of Staff Deputy for Administration, not to buy any unregistered drugs.

No drug and therapeutic committee.

No specific procedures or post responsible for the issue.

Selection depends mainly on the high voices of users and prescribers and lastly the opinion of the supply manager.

5.3.1 Mechanisms of selection:

Till the year 1998, drugs had been purchased according to the doctors demands and direct contact of drug companies with the manager. Trade names are popular except drugs from the CMSPO. There was no specific drug list, no tender was held.

5.3.1.1 First tender list:

In the year 1998, for the tender purposes, a committee was appointed by the Leader Deputy for Medical Supply from the pharmacists of the Medical Corps, to prepare a list of drugs and to estimate the required quantities.

Requirements had been divided into the following groups:

Drugs and I.V. fluids, X-ray requirements, dental requirement, devices, tools and equipment, sutures, dressings and laboratory reagents.

Detergents, insecticides, sanitaria.

Categorizations was based on the National List of Essential Drugs 1995.

A Circular had been sent to all departments to define their demands.

5.3.1.2 The tender list Feb. 1999:

1- Drugs: Table (7) The Therapeutic Categories of the Tender 1999

<table>
<thead>
<tr>
<th>No</th>
<th>Therapeutic group</th>
<th>No. of items</th>
<th>Group no.</th>
<th>Therapeutic group</th>
<th>No. items</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Anaesthesia</td>
<td>10</td>
<td>13</td>
<td>Diuretics</td>
<td>4</td>
</tr>
<tr>
<td>02</td>
<td>Analgesic,anti-inflammatory/gout</td>
<td>12</td>
<td>14</td>
<td>GIT</td>
<td>36</td>
</tr>
<tr>
<td>03</td>
<td>Anti-bacterial drugs</td>
<td>49</td>
<td>15</td>
<td>Hormones and related</td>
<td>21</td>
</tr>
<tr>
<td>04</td>
<td>Antiparkinsonism and psychiatric drugs</td>
<td>22</td>
<td>16</td>
<td>Immunoglobulins</td>
<td>9</td>
</tr>
<tr>
<td>05</td>
<td>Antifungal</td>
<td>6</td>
<td>17</td>
<td>Muscle relaxants &amp;</td>
<td>6</td>
</tr>
<tr>
<td>06</td>
<td>Antihistamine</td>
<td>4</td>
<td>18</td>
<td>Narcotics</td>
<td>4</td>
</tr>
<tr>
<td>07</td>
<td>Antimalarial drugs</td>
<td>9</td>
<td>19</td>
<td>Ophthalmologic</td>
<td>16</td>
</tr>
<tr>
<td>08</td>
<td>Antiprotozoal,</td>
<td>8</td>
<td>20</td>
<td>Respiratory tract</td>
<td>15</td>
</tr>
<tr>
<td>09</td>
<td>Antisera</td>
<td>10</td>
<td>21</td>
<td>Vaccines</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>Blood components</td>
<td>11</td>
<td>22</td>
<td>Vitamins minerals</td>
<td>14</td>
</tr>
<tr>
<td>11</td>
<td>Cardiovascular drugs</td>
<td>30</td>
<td>23</td>
<td>x-ray film and fluids</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Dermatological drugs</td>
<td>23</td>
<td>24</td>
<td>ENT</td>
<td>5</td>
</tr>
</tbody>
</table>

2- Lab. Reagents and kits = group 50: 109 item

3-Dental requirement:

They are eight groups containing 141 items.

4-27 items for environment sanitation.

5-Surgical and medical equipment into 9 groups.

They are nine groups containing 97 items.

Items were numbered for the therapeutic group for the first two positions, 4 positions for the number of the item within the pharmacological group, and the last two positions for the dosage form and the concentration.

All item names were in generics. No brand names were used, or mentioned.

5.3.1.3 Selection of drugs for the year 2003:

Preparatory phase:

The Supply Department, announces all departments to define their demands for the year. Most of them did not respond positively. However, within the level
and activities of the pharmacists of the drug supply the new list had been settled for the purposes of the proposed tender.

The 2003 tender ledger

1. Drugs : 344 items.
2. X-ray : 22 items.
3. I.V fluids : 15 items.
4. Disinfectant : 4 items.
5. Dressings : 9 items.
6. Sutures : 40 items.
7. Dental : 78 items.
8. Surgical equipment : 152 items.

Table (8 ) 2003 Drug list according to the Tender of the Takaful :

<table>
<thead>
<tr>
<th>Group</th>
<th>Therapeutic groups</th>
<th>Number of items1999</th>
<th>Number of items2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Anaesthesia</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>2-</td>
<td>Analgesic, antipyretic, antinflamma and gout</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>3-</td>
<td>Antibiotics</td>
<td>53</td>
<td>63</td>
</tr>
<tr>
<td>4-</td>
<td>Antiepileptics, antiparkinsonism &amp; Psychiatric</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>5-</td>
<td>Antifungal drugs</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>6-</td>
<td>Antiallergy drugs</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7-</td>
<td>Antimalarial drugs</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>8-</td>
<td>Antiportozaol drugs</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>9-</td>
<td>Blood component</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>10-</td>
<td>Cardiovascular drugs</td>
<td>24</td>
<td>38</td>
</tr>
<tr>
<td>11-</td>
<td>Dermatological preparations</td>
<td>30</td>
<td>39</td>
</tr>
<tr>
<td>12-</td>
<td>Diuretics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13-</td>
<td>ENT preparations</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>14-</td>
<td>GIT drugs</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>15-</td>
<td>Hormones, endocrine and related drugs</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>16-</td>
<td>Immunoglobulins</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>17-</td>
<td>Muscle relaxant and cholinesterase inhibitors</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>18-</td>
<td>Narcotics</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>19-</td>
<td>Ophthalmologic preparations</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>20-</td>
<td>Respiratory tract drugs</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>21-</td>
<td>Vaccines</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>22-</td>
<td>Vitamins and minerals</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>23-</td>
<td>Potassium Salts</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>24-</td>
<td>Contrast media and lubricants</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>26-</td>
<td>X-ray</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>27-</td>
<td>Empty Bags</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

360 items

5.3.2.1 Logic of selection :
It is a fact that no supply system can afford all drugs circulating in the world wide market, selection was a must. Every country selects drugs to be used by the population, then reselects the essential drugs. Then the health facilities select their own list to be available within the facility or adopt the national one. The supply system may select a certain range of drugs to work on it.

5.3.2.2 Selection in practice :
WHO used to fill the International List of Essential Drugs and renew it periodically. The Sudanese CMSPO issued a ledger book on the early eighties. The Committee of Therapeutics Affairs revises it annually. The Sudanese List of Essential Drugs had been issued since 1995. The new list will be presented sooner. The JRMS filled the RMS Drug Formulary since 1993. Additions and deletions in formal procedures were a continuous activities of the Therapeutics Higher Committee.( RMS-1993 )

5.3.2.3 Legal aspects :
The National Act of the Health Insurance, 2001, Chapter 4, Drugs Services, Matter 19, Paragraph 1, 2, 3 - gave the States Councils of the Health Insurance the authority to decide the therapeutic groups or items to be dispensed to the patient, according to the general policy issued by the National Insurance Council.

5.3.2.4 The Medical Corps:
Drugs are expensive, they constitute 50% - 60% of Takaful health insurance budget. The monthly purchases of drugs amount to 70-80 million SD to meet the demands of all departments and all military health facilities. A special attention should be given.

Open prescribing system provides good opportunity for irrational use of drugs as over prescribing of non-essential, expensive, new and unsafe drugs can find the way to the system. Expensive vitamins, cosmetics and cosmetic-like preparations can deplete the available funds.

Huge amount of prescriptions referred to retail pharmacies, constituting about 50-45% of the system affiliated pharmacies expenses.

Selection exhibited by supply pharmacists may be more professional than that done by medical departments. Without a highly authorized council, physicians will not stop irrational prescribing. They could not be committed to prescribing the chosen drugs. Without a highly authorized body to set regulations for selection of drugs and encouraging physicians to prescribe the only selected drugs, the flow of prescription to retail pharmacies might not stop. The list of drugs covered by the contracted pharmacies on 29/1/04 indicates 275 items are out of stock, all of them are brand named drugs. In March 2004, 225 items had been referred to the Public Pharmacy, 68% of them are not on the stores list. The covered items are unknown to the prescribers, dispensers and patients.

The Takaful Statement of Purchasing Regulations- 2003- stated that the committee that selects the drugs determines the quantities and carry on tendering. The members are the supply pharmacists plus an accountant, but a highly authorized committee is required for selection and another two committees to carry on the process. The committee can regulate the activities of companies representatives. Addition of drugs to the list should not be influenced by the individual opinion, pressure of the medical staff or the producing companies.

Drug of choice for different diseases treatment regimen had not been stated.

Inpatient and outpatient drug schemes are not available and there are no regulations and training programs.

Military Drug Formulary like that of JRMS, could not be achieved and consequently treatment guidelines could not be issued without establishing a higher therapeutic committee. Defining prescribing levels, health facilities levels and setting regulations could be achieved through the activities of an authorized council. This situation may be compared with the JRMS.

5.3.2.5 Drug selection at the JRMS:
General policy: Any item should not be available at any military health facility if it is not registered by the Therapeutics Military Higher Committee.

The Therapeutics Military Higher Committee:
The TMHC was launched by the RMS manager, structured from all departments, chaired by the Internal Medicine Head Department. The duties, responsibilities and authorities are defined in the same command. The senior pharmacist is the chief in duty and the Pharmacy Directorate Manager of the JRMS is the secretariat of the committee. The decisions of the TMHC are unnegotiable and the staff willingly obey. It regulates the pharmacy activities.

5.3.2.6 International Recommendation:
The recommendation stated by the American Society of Health System Pharmacist and that issued by the workshop of the Sudanese Hospital Pharmacists states that: The multiplicity of drug availability and the complexities surrounding their safe and effective use, make it necessary for hospitals to have organized sound program for maximizing rational use of drugs, the Pharmacy and Therapeutics Committee is the organizational keystone for this program (Quick-1997).

5.4 Procurement of Drugs

5.4.1 Procurement of drugs in the Sudanese Medical Corps:
All procurement procedures took place at the Supply Unit. The same committee that decides the selection of drugs, prepares the procurement list and determines the quantities of drugs also carries on the procurement activities.

5.4.1.1 Policy and Objectives of Procurement:
There was no written policy statement, but generally, the purchasing regulatory statement- 2003 directing to obtain a good quality drugs in the best possible prices. Only registered drugs were allowed. It had been stated
as a directive for the committee. Quantities should cover the whole year. There were no directives to
purchase domestic drugs separately.

- There was no document statement, but inclusively, the objectives are to acquire quantities to cover the
annual consumption of drugs for all regions.
- Expend the available funds.

5.4.1.2 Model of the supply system:-

It is a governmental, Military Central Medical Stores CMS old style.

5.4.1.3 Quantifying drugs: Quantities are determined at the central warehouse level based on the annual
consumption, only adjusted for the available stocked quantities. Morbidity data was not available and of no
value at any site of Medical Corps. Consumption patterns for the regions was not accurate, undependable and
the records were poor. The only way to determine quantities was that obtained on calculating the quantities
issued in the bin card for the whole year QY – (minus) the quantities in stock Qs. = quantity required Qs
QT = (QY- Qs)

Safety stocks:

Named as the critical stock, it is the reorder level. The minim reorder level, critical stock and safety stock are
the same.

\[
\text{stock} \quad \text{months}
\]

\[
\text{One month Safety Stock reorder level}
\]

\[
\text{No reserve stock for the lead time.}
\]

The safety stock is the consumption of one month. When the stock falls to the quantity required to cover
one month, the storekeeper announces for purchasing.

5.4.1.4 Procurement Methods:
1- Direct purchase except for the years 1998 and 1999.
2- Restrictive competition to cover the monthly needs, only in march2004.
3- The Army Regulatory Statement issued by the Financial Affairs stated that all purchases should be in a
competition. Direct purchase was not allowed.
Takaful “the MHI” which carried out the task issues a regulatory statement 2003 which restrict direct purchases
except in case of a single source of supply of an item or little quantities is required for emergency situations.

5.4.1.5 The tender process
1- The year 1998:
The first tender in the Sudanese Medical Corps was achieved in the year 1998.
Consumption was estimated in a consumption book based on the experience of the staff. The budget was six
hundred millions Dinars. Then another tender book was prepared, quantities were based on the available funds.
The funds could not be paid in one batch so, again the quantities were cut into quarters.
Then announce for quotation mentioning the conditions which are:

- Legal suppliers and companies are the only accepted bidders.
- Unregistered drugs were allowed but should be registered at the country of origin and GMP certification is essential.
- Quantities could be increased, decreased or even deleted.
- Payment was 25% firstly, 25% after delivery, 25% after a month and 25% after another month.
- The process aimed to be repeated quarterly.

On the fixed date at 12 o’clock bids were opened, signed and numbered.

The leader charged a committee from the pharmacists plus an accountant from the Central Financial Affairs as there was no accounting unit in the supply department. Another member was a judge from the Legal Affairs.

As no prices were available, after adjudicating the tender, the cost of the whole tender was calculated, reconciled to the funds and adjusted. Adjustment was based on the known prevalence of diseases and the requirements of the fighting troops, war areas and pressing the quantities required for the centre.

Then the orders had been approved by the Deputy Chief of Staff - Supply. Contracts were prepared and signed by him. 150 millions SD is the total tender value for the first quarter plus 30 millions SD debt for the CMSPO.”

These amount of money was fulfilled with difficulties during the whole year and the process could not be repeated due to lack of accessibility of the previously allowed army budget.

2- Tender process for the year 1999:
The same as 1998 except that the health insurance program took place.
The tender was assumed to be 1.2 billions SD, 2/3 to be financed by the health insurance and 1/3 to be financed by the army budget. The process succeeded except in that the lead times were not accurately calculated. Overlapping of accounts in some cases is due to the shortage of the army budget.

In this tender audit procedures took place at the Army Headquarter level mainly State Minister of Defence. The technical committee which did all the activities is from the pharmacists of the supply, higher committee from the Medical Corps Leader and the Head Departments. In this tender for the first time a price indicator was edited and widely distributed.

3-The Tender process for the year 2000:
In December 1999, all papers were ready. The domestic drugs were isolated from the imported items. A tender for domestic drugs was settled. Announcing all the drug manufactures directly, promptly getting the offers and a committee of both Military Medical Supply and the MHI supply actively adjudicate the offers and orders were ready except the army drug plant which was asked to adjust the prices. Meanwhile, all the activities had been ceased by a command from Deputy Chief of Staff - Administration to separate the Takaful supply from the war areas supply system.

During the years 2000, 2001 and 2002, purchases were directly done according to the levels of the stock and the prices obtained are high.

4- The tender process for the year 2003:
On the year 2003, a tender was prepared on the same mentioned procedures.

Tendering activities:
On adjudication of every group of drugs a consultant physician was invited. Two winners for each item were mentioned, the second as a reserve standby. Unregistered drugs were not allowed. Upon the direction of the SMC Leader; the companies of “NFDMS”, Wafrapharma, Niesar and Imdad Corporation should have the priorities provided that they should comply with the quality and accept the lower prices obtained. Price indicator was edited, orders were positioned. The time table and prequalification of suppliers are advanced techniques. Delivery dates were left to the supplier. Specification or packaging were not mentioned. The tender is in the local currency and receipt at the Central Military Warehouses. Payments were promised to be on deliveries.

Reports:
1- Report on the winning supplies and reserve for drugs, consumable.
2- Report on the winning supplies and reserve for equipment.
3- Orders in a form of report for every supplies.
A total of: 173,702,725 SD for surgical tools and equipment materials
A total of 150,000,000 SD was to be allocated for drugs to be purchased directly and from the CMSPO.

Deliveries and payment:
Agreed to be settled on contracting. However, no contracts for direct purchases were settled. All papers and procedures, and orders were sent to the Deputy Chief of Staff for approval and budgeting. Till the end of the year there was no reply. Purchasing was drawn again to direct purchase or negotiated purchase due to monthly batches of budget.

70,000,000 SD was the monthly budget for drug procurement.

5.4.2 Procurement Assessment
At the SMC the Procurement Committee members are from the supply staff who select the list, adjudicate the bids and lastly receive the goods. This leads to repetition of procedures, any mistake could not be discovered, opportunities for self interest and domination of personal opinions was present unlike at JRMS, where, not more than one member of the committee was allowed to be a member in another committee.

5.4.2.1 Procurement Policy and objectives:
The statement highlights the long and short term aims. It represents the overall guide for the activities. The objectives stated by WHO for procurement are suitable to be applied within the SMC field.

5.4.2.2 The model Procurement system:
In spite of the great advantages of the autonomous and semiautonomous procurement systems, the procurement system in SMC is still the old one. Health insurance of the managed care type providing services and drugs. This type is widely opposed even in providing the health service.(Quick- 1997, Simerat - 2001). The procurement system in JRMS is a CMS type with a semiautonomous character, but the health insurance is a unit in the Financial Directorate of the RMS.

5.4.2.3 Quantification:
The quantification of drugs depends on the consumption records of the bin card at the Central Warehouse.

1. This did not calculate the items that were not listed.
2. This did not calculate the shortage at the peripheries, the shortage at the outlets and theft, spoilage and waste.
3. The high percentage of contracted pharmacies contribution.
4. It did not consider the lead-time, outbreaks, theft, spoilage and waste.
5. On practicing this method, calculating the total cost of the estimated quantities is essential, because the actual demands in money-wise could be used to advocate for enough budget.
6. One month safety stock is not enough, WHO stated three months for the CMS and a total of 25 months to fill the pipeline.( Quick-1997).
7. The reordering level is different from the SS because, it calculates the lead time plus The SS.( Fig.16)
Quantification of drugs at the JRMS is through direct surveying of the utilization of drugs at the outlets taking the experience of the health provider and the pharmacist there, being responsible for the quantities he had determined. However many factors can affect this method.

1. Changing the staff of prescribers.
2. Changing the treatment pattern by the same prescriber.
3. Introduction of new drugs.

Morbidity method: - It could not be used because:
Data is not available.
There is no effective statistical unit.
Data obtained by Takaful Statistical Units did not consider disease and ages. The forms of the statistical data collection did not include diseases and age range.
It considers only patient attendance which indicates the work load. It did not include patient expenditure or prescription expenditure.
Physicians rarely write the diagnosis.
The road map for acceptable quantification is to estimate the quantities at the outlets and proper continuous monitoring. Then establishing a reliable inventory and morbidity records for the future quantification.

5.4.2.4 Procurement methods:
The government regulations that state the methods of procurement. The Financial and Accounting Procedures Regulatory Act 1995, chapter 8-56 to 65, regulate the methods of purchasing and contracting. It states the followings:

1-The open tender is an obligation.
2-Restricted tender in:
   a) Emergencies.
   b) Only known source items, where open tender can not bring out competition, but a prequalification report should be kept for bidders.
3-Direct purchases only in the following cases:
   a- Single supplier.
   b- Technical reasons.
   c- Protocols.
Any direct purchase should be reported and the reasons should be stated and approved by higher authority to avoid corruption and self-interest.
The procurement method in SMC is a mixture of:
   a. Direct purchases for the last two years.
   b. Open tender and direct purchases for the year 2003.
The open tender failed due to financial obstacles, and then drugs were directly purchased, again like the last two years.
The total value of five deliveries to five war areas for one month in the year 2001 calculated by direct purchase price = 235% of its cost calculated by the last tender price.
Prices obtained after the failure of the tender 2003 equal 150% of those obtained by the tender.
The Military Financial Affairs used to issue directives for the purchasing methods, which adopt the purchases through tenders and wise competitions.
The JRMS used to open a biannual international tender. Restricted tenders are in a narrow range and direct purchases are forbidden. In Malaysia additions and deletions to meet the basis of demands for government hospitals and health services depend upon drugs offered by CMS. When they wish to direct purchase, pharmacist involved must request a clearance certificate to allow him to buy directly. 7000 items in kardexes, daily issuing and receiving, scheduled indenting system, annual consumption is requested from the states. Availability of skilled and expert pharmacist and personnel leadership, good communication system, reliable supply information, adequate financial and material resources are factors of success in Malaysia.

5.4.2.5 The tender process:

The practice of adjudication is formal, however the National Regulatory Act 1995 describes the official steps to practice tendering. The commitment of the Army Chief of Staff must be written. They should be involved in all the procedures- and sign all the papers regarding the process to gain the army headquarter commitment. The lack of political commitment and military support of tender lead to unavailability of finance resulting in the tender failure. Continuous direct purchasing will lead to the system collapse.

5.4.2.5.1 Reviewing the selection list:

At the SMC the list is prepared in informal, non-obligatory character. The opinions and demands of physicians are not stable. Additions depend on the individual physician pressure on the procurement unit. The Supply Directorate can add or delete any drug. This results in prescribing unavailable drugs leading to prescription referring to the contracted pharmacies, which constitutes 45%-50% of the total drug expenditure.

In studying 1013 prescriptions at the center, the Public Pharmacy contribute to about 82% of the total cost of these prescriptions for one working week.

5.4.2.5.2 Reconciling needs and funds:

There may be no available budget to finance the tender, and this usually leads to failure. The total expenditure should firstly be calculated, the financial resources secured, reconciled and adjusted then asking for bids. This what usually takes place in JRMS as in their procurement cycle.

5.4.2.5.3 Choosing the procurement method:

All demands are mentioned in one ledger.

Drugs assumed to be purchased from the CMSPO like narcotics, anesthetics, muscle relaxants, immunoglobulins, vaccines and antisera should be in a separate book and no need to loose time because no company can participate in these categories.

Drugs locally manufactured by the Army Plant were included in order to determine the lowest prices, where one company can trick by lowering the prices of these item as they can suggest the army factory should provide them, so the
prices of these items could be negotiated with the plant and a contract defining the quantities, prices and dates of delivery may be acceptable.

Domestic drugs were not separated in a separate tender according to World Bank, WHO recommendations, the native principles and the general directives of the government in supporting the domestic industries.

5.4.2.5.4 Prequalification of suppliers:

Although prequalification of suppliers is internationally recommended but there are no records for suppliers. The supplier performance monitoring card is useful if applied perfectly.

5.4.2.4.4 The tender process, Time table:

Delivery dates should not be stated by the bidder but should be previously stated. The lead times should be calculated and payments should be specified.

(Table 9) Proposed time table

<table>
<thead>
<tr>
<th>Month</th>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>Select supplier and approve result</td>
<td>Receive supplier and make payment</td>
</tr>
<tr>
<td>Feb</td>
<td>Winner notify contract</td>
<td>Receive supplier and make payment</td>
</tr>
<tr>
<td>Mar</td>
<td>Receive check payment</td>
<td>Receive supplier and make payment</td>
</tr>
<tr>
<td>Apr</td>
<td>Review select list</td>
<td>Document preparation</td>
</tr>
<tr>
<td>May</td>
<td>Quantification</td>
<td>Open period for offers</td>
</tr>
<tr>
<td>Jun</td>
<td>Document close tender</td>
<td>Evaluation collect samples offers</td>
</tr>
<tr>
<td>Jul</td>
<td>Receiving and check supplier make payment</td>
<td>Receive supplier make payment</td>
</tr>
<tr>
<td>Aug</td>
<td>Receiving and check supplier make payment</td>
<td>Close up tender</td>
</tr>
<tr>
<td>Sep</td>
<td>Review tender</td>
<td>Receive and check supplier make payment</td>
</tr>
<tr>
<td>Oct</td>
<td>Review tender</td>
<td>Receive and check supplier make payment</td>
</tr>
<tr>
<td>Nov</td>
<td>Review tender</td>
<td>Receive and check supplier make payment</td>
</tr>
<tr>
<td>Dec</td>
<td>Review tender</td>
<td>Receive and check supplier make payment</td>
</tr>
</tbody>
</table>

5.4.2.5 Contracts and orders:

There were no contracts for direct purchases. The contract should specify the followings:

1. The products full specifications.
2. The delivery dates.
3. The remaining shelf life.
4. The inner and outer packaging.
5. The quantities.
6. The inner labels specifications.
7. The receipt station.
8. Quality standards.
9. Payment schedules.
12. Validity of the contract.
5.4.2.6 Drug Expenditure Analysis:

(1) **VEN system:**
Classification of drugs into vital, essential and non-essential require committee efforts.

(2) **ABC analysis:**
This analysis is not known within the system. For practice, ABC analysis for the tender 2003 in (chart1).

1- All items were entered Excel sheet, the unit prices and quantities. Every drug was numbered.
2- The total value for every drug is obtained.
3- The percentage of every value to the total value is calculated.
4- The percentage is sorted in descending manner.
5- In another column of the work sheet the accumulated percentages for all drugs were obtained.
6- On plotting the items against the accumulated percentage a curve was obtained.

This provides the following results:

1. Only 45 items consume 70% of the total expenditure- A.
2. The next 35 drugs represent 15%of the total expenditure.- B.
3. The remaining items represent only 15% -C.

Actions should be made to category A:

a- Setting regulations.
b- Controlling consumption and inventory records.
c- Increasing security measures.
d- Looking for alternative procurement methods to obtain lower prices.
e- Introducing therapeutic constituents of lower prices.
Therapeutic Category Analysis.

Expenditure of therapeutic categories for the tender 2003(charts2,3,4,5 and 6).

1/ Drugs were sorted according to the therapeutic indications.
2/ The expenditure of every group is obtained.
3/ On plotting the expenditure against the therapeutic categories, X-ray requirement appears as a higher expenditure and represents 76% of the total expenditure( charts 2 and 3 ). On revision, it had been noted that the quantity is expressed in one film while the price given is for one box of 100 films, then multiplication of quantity by the price gave a high value, without such analysis it is difficult to discover such mistake.
4/ After correction, the expenditure of every category is obtained, the percentage from the total and the accumulated percentage are calculated on the excel sheet ( Table 10).
5/ Plotting the expenditure against categories(charts 4 and 5) to clarify the difference between the charts already obtained.
6/ Plotting the accumulated percentage against the categories yields the required curve (chart 6) which indicates the followings:
   a- The higher expenditure of antibiotics.
   b- The expenditure of the multivitamin and minerals is 4.75% plus the haematinics group which is mainly Ferrous gluconate and Ferrous+Folic acid (1.22%) equal 5.97% which is greater than the expenditure on antimalarials (4.88%) plus cardiovascular drugs (0.94%).
   c- The expenditure on multivitamin group and the haematinics group (5.97%) is greater than the expenditure on drugs of the GIT group plus the Ophthalmologic preparations plus the cardiovascular drugs.
   d- Attention should be given to the expenditure of these groups and more regulations are needed.
Again hormones appear in an inferior position. By group analysis for the hormones and related substance it had been found that hydrocortisone represents the peak in expenditure, (chart 7) the observation is that such price is very high, another method for procuring this item should be practiced.

(Chart 2) Therapeutic Category Analysis-Tender 2003 X-Ray Included

Therapeutic Category analysis-tender2003

X-ray
Therapeutic Category Analysis

- Antibiotics
- I.V Fluids
- Hormones
- X-ray
- Analgesics
- Antimalarials
- Vitamines
- Psychiatric
- Dressings
- GIT
- R T drugs
- Ophth. Prepar
- Dermatologic
- Anaesthesia
- Haematinics
- Cardiovascula
- Antiprotozal
- Antihistamine
- ENT
- Dental materi
- Misalleneous

Therapeutic category analysis X-ray corrected
Chart 4: Therapeutic Category Analysis after Correction

Therapeutic category analysis-2003

Dental materials
surgical sutures
X-Ray &
Vitamins &
Ophthalmological
Muscle
Endocrine &
ENT
Dermatological
Blood
Antimalaria
Antifungal
Antibiotics
Anaesthesia

therapeutic category

Millions
SD
### Therapeutic Category Analysis, Tender 2003.

<table>
<thead>
<tr>
<th>No.</th>
<th>Therapeutic Category</th>
<th>SD millions</th>
<th>Percentage</th>
<th>Accumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antibiotics</td>
<td>274.99</td>
<td>31.48</td>
<td>31.4894749</td>
</tr>
<tr>
<td>2</td>
<td>I.V. Fluids</td>
<td>124.97</td>
<td>14.31</td>
<td>45.7994749</td>
</tr>
<tr>
<td>3</td>
<td>Endocrine and related drugs</td>
<td>77.86</td>
<td>8.91</td>
<td>54.7094749</td>
</tr>
<tr>
<td>4</td>
<td>X-ray and contrast media</td>
<td>59.5</td>
<td>6.81</td>
<td>61.5194749</td>
</tr>
<tr>
<td>5</td>
<td>Analgesic, antinflammatory and gout</td>
<td>52.86</td>
<td>6.05</td>
<td>67.5694749</td>
</tr>
<tr>
<td>6</td>
<td>Malarial drugs</td>
<td>42.67</td>
<td>4.88</td>
<td>72.4494749</td>
</tr>
<tr>
<td>7</td>
<td>Vitamines and Minerals</td>
<td>41.52</td>
<td>4.75</td>
<td>77.1994749</td>
</tr>
<tr>
<td>8</td>
<td>Psychiatric drugs</td>
<td>29.01</td>
<td>3.32</td>
<td>80.5194749</td>
</tr>
<tr>
<td>9</td>
<td>Dressings and disinfectants</td>
<td>25.28</td>
<td>2.89</td>
<td>83.4094749</td>
</tr>
<tr>
<td>10</td>
<td>GIT</td>
<td>22.6</td>
<td>2.59</td>
<td>342.4094749</td>
</tr>
<tr>
<td>11</td>
<td>Respiratory tract drugs</td>
<td>22.35</td>
<td>2.56</td>
<td>344.9694749</td>
</tr>
<tr>
<td>12</td>
<td>Ophthalmologic preparations</td>
<td>21.29</td>
<td>2.43</td>
<td>347.3994749</td>
</tr>
<tr>
<td>13</td>
<td>Dermatological preparations</td>
<td>14.62</td>
<td>1.67</td>
<td>349.0694749</td>
</tr>
<tr>
<td>14</td>
<td>Anaesthesia</td>
<td>11.42</td>
<td>1.22</td>
<td>350.3694749</td>
</tr>
<tr>
<td>15</td>
<td>Blood components</td>
<td>10.67</td>
<td>1.222</td>
<td>351.5914749</td>
</tr>
<tr>
<td>16</td>
<td>Cardiovascular drugs</td>
<td>8.23</td>
<td>0.94</td>
<td>352.5314749</td>
</tr>
<tr>
<td>17</td>
<td>Antiprotozoal drugs</td>
<td>7.94</td>
<td>0.9</td>
<td>353.4314749</td>
</tr>
<tr>
<td>18</td>
<td>Antihistaminic drugs</td>
<td>5.61</td>
<td>0.64</td>
<td>354.0714749</td>
</tr>
<tr>
<td>19</td>
<td>ENT</td>
<td>4.9</td>
<td>0.56</td>
<td>354.6314749</td>
</tr>
<tr>
<td>20</td>
<td>Dental materials</td>
<td>4.4</td>
<td>0.5</td>
<td>355.1314749</td>
</tr>
<tr>
<td>21</td>
<td>Misalleneous drugs</td>
<td>4.11</td>
<td>0.47</td>
<td>355.6014749</td>
</tr>
<tr>
<td>22</td>
<td>Antifungal drugs</td>
<td>3.8</td>
<td>0.43</td>
<td>356.0314749</td>
</tr>
<tr>
<td>23</td>
<td>Diuretics</td>
<td>1.25</td>
<td>0.14</td>
<td>356.1714749</td>
</tr>
<tr>
<td>24</td>
<td>Surgical sutures</td>
<td>0.68</td>
<td>0.07</td>
<td>356.2414749</td>
</tr>
<tr>
<td>25</td>
<td>Dental sutures</td>
<td>0.63</td>
<td>0.07</td>
<td>356.3114749</td>
</tr>
<tr>
<td>26</td>
<td>Muscular relaxants</td>
<td>0</td>
<td>0</td>
<td>356.3114749</td>
</tr>
<tr>
<td>27</td>
<td>Immunoglobulins</td>
<td>0</td>
<td>0</td>
<td>356.3114749</td>
</tr>
<tr>
<td>28</td>
<td>Narcotics</td>
<td>0</td>
<td>0</td>
<td>356.3114749</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>873.272452</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(Chart 5) Accumulated Percentage of Therapeutic Categories

(Chart 6) Hormones and Related Drugs Expenditure Analysis
6.5.5.1 Price Analysis:

A study of 30 items chosen by cluster method across the therapeutic groups, and stratification method based on the rate of movement to calculate the IMAT and price indicator, yields the following results:

1. 13.3% of the sample was from the Army Drug Plant where the prices are the same as the tender.
2. 10% of the sample, the tender price and direct purchase price are almost equal, it had been found they were domestic drugs.
3. Four items of prices lower than that of the tender, it had been found they are from the CMSPO.
   - One item price increased by 66.6%
   - One item price increased by 281.9%
   - One item price increased by 800%
   - One item price increased by 1,187.8%

That the total value based on the quantity in the tender, the cost of the tender is 65,700,000 SD and the cost calculated by the CMSPO prices is 8,352,000 SD. That the cost according to CMSPO prices is 13.7% that of the tender.

4. One item newly introduced to the system, after scientific lecture of the drug company, price increased from the first direct purchase by 5% (single source).
5. One item was not listed in the tender ledger.
6. One item basic unit was not definite.
7. 53.3% the sample the prices were higher than those of the tender.

Table (11): The tender prices and direct purchases prices.
<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Direct purchase</th>
<th>Total value</th>
<th>Tender price</th>
<th>Total value</th>
<th>Unit tender price to the direct price %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400.000</td>
<td>25</td>
<td>10.000.000</td>
<td>4</td>
<td>1600.000</td>
<td>16%</td>
</tr>
<tr>
<td>2</td>
<td>2.000</td>
<td>917</td>
<td>1.834.000</td>
<td>270</td>
<td>540.000</td>
<td>29.4%</td>
</tr>
<tr>
<td>3</td>
<td>400.000</td>
<td>6.5</td>
<td>2.600.000</td>
<td>3.2</td>
<td>1.280.000</td>
<td>49.23%</td>
</tr>
<tr>
<td>4</td>
<td>100.000</td>
<td>11</td>
<td>1100.000</td>
<td>8.6</td>
<td>860.000</td>
<td>78.18%</td>
</tr>
<tr>
<td>5</td>
<td>1600</td>
<td>1043</td>
<td>1.668.800</td>
<td>396</td>
<td>633600</td>
<td>37.96%</td>
</tr>
<tr>
<td>6</td>
<td>3000</td>
<td>275</td>
<td>825.000</td>
<td>91.5</td>
<td>274500</td>
<td>33.3%</td>
</tr>
<tr>
<td>7</td>
<td>80.000</td>
<td>17.4</td>
<td>1.392.000</td>
<td>7.4</td>
<td>592.000</td>
<td>42.5%</td>
</tr>
<tr>
<td>8</td>
<td>50.000</td>
<td>26</td>
<td>1.300.000</td>
<td>6.4</td>
<td>320.000</td>
<td>24.6%</td>
</tr>
<tr>
<td>9</td>
<td>1000.000</td>
<td>8.03</td>
<td>8.030.000</td>
<td>6.42</td>
<td>6420000</td>
<td>80%</td>
</tr>
<tr>
<td>10</td>
<td>2000.000</td>
<td>3.7</td>
<td>7.400.000</td>
<td>1.8</td>
<td>3600.000</td>
<td>48.6%</td>
</tr>
<tr>
<td>11</td>
<td>30.000</td>
<td>75</td>
<td>2.250.000</td>
<td>6.1</td>
<td>183000</td>
<td>8.13%</td>
</tr>
<tr>
<td>12</td>
<td>900.000</td>
<td>37</td>
<td>33.300.000</td>
<td>30</td>
<td>2700000</td>
<td>81%</td>
</tr>
<tr>
<td>13</td>
<td>50.000</td>
<td>1000</td>
<td>50.000.000</td>
<td>507</td>
<td>25.350.000</td>
<td>50.7%</td>
</tr>
<tr>
<td>14</td>
<td>2.500.000</td>
<td>8.5</td>
<td>21.250.000</td>
<td>7</td>
<td>17.500.000</td>
<td>82.3%</td>
</tr>
<tr>
<td>15</td>
<td>60.000</td>
<td>100</td>
<td>6.000.000</td>
<td>35</td>
<td>2100.000</td>
<td>35%</td>
</tr>
<tr>
<td>16</td>
<td>700.000</td>
<td>6</td>
<td>4.200.000</td>
<td>2.5</td>
<td>1.750.000</td>
<td>41.66%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>153.149.800</td>
<td></td>
<td>90.003.100</td>
<td>Mean = 46.16%</td>
</tr>
</tbody>
</table>

(1) The tender item price equal to 46.16% of its direct purchase price.
(2) Direct purchase expenditure = 170.16% of the tender.
5.5.1. Wafrapharma Drug Plant:

Chart 7) Direct Purchase and Tender Prices 2003

Direct

Tender price
It is one of the main NFDMS supporters. It provides a considerable revenue for the NFDMS. It works in profit basis and sells drugs for the open market.

a- The Production Department:
   1- Two lines for capsules.
   2- Compressed tablets line.
   3- Wet granulation
   4- Coating line.
   5- Dry suspension line.
   6- Syrups line.

b- Quality Control Laboratory: A well equipped laboratory that can perform most of the pharmacopoeial tests.

c- Commercial Department:
   1- Marketing twenty eight registered items.
   2- Eight public pharmacies.

5.5.2. The relation between Wafrapharma and Drug Supply:

1- The policy stated that the main objective is to cover the PAF needs of drugs.
2- The NCS stated in the paragraph of the health services, it is required to support this drug production plant as it is the only governmental drug plant.
3- The Armed Forces restricts the use of unregistered drugs.
4- All essential lines are available, and any generic product could be manufactured.
5- The supply unit staff believes that this plant is out of the system as it is affiliated to the NFDMS and works on profit basis and can find more appreciative prices.
6- Many items were not in stock when requested by Takaful, because the plan of production and import of raw materials is not designed to satisfy the Takaful needs which were not planned.
7- The presence of special personnel regulatory statement with different facilities to staff exaggerates the gap between the plant and the supply personnel.

All these problems could be solved by reorganizing the military pharmaceutical sector, and directing the plant to produce those preparations recommended by the WHO as small scale local production within the health facility.

5.5.3 Takaful production unit:

A small laboratory affiliated to the main warehouse producing the simple preparations for the local application, antiseptics, detergents and spirits. The diagnostic reagents were also prepared and the simple skin preparations. Centralization of the unit and delivering preparations on request gives the unit the characters of the store. If the hospital pharmacies are ready and equipped for the purposes of compounding pharmaceutical preparations in efficient laboratories, the results will be more valuable.

The JRMS was not concerned in drug production because of the existence of national industrial competition.

In Malaysia, the production is one of the four sections of SPSL.

5.6 Quality assurance:

- Only registered drugs were allowed.
- Certificate of registration.
Laboratory testing for the batches or certification of analysis were not requested.
No laboratory testing for the samples to the laboratory
Drug registration is not enough in assuring the quality. Batch certificates which assure the quality of the batch should be requested. Sample analysis was not in practice even in the presence of the well equipped Wafrapharma quality control laboratory and the presence of a trained staff.

5.7 Drug Donation:

Donation from friendly organizations could not be forbidden, but for the last few years, all donation from other armies and domestic organizations provides drugs beyond the expiration date of unrequired varieties and sanitary of no actual need or value. Donations are always accepted, 93% of the last accepted donation on 1999 from two different Arab countries were actually obsolete and scrap and stationeries which could not be sold according to the army regulations.

However, a preprinted scheme will cease the probable errors. The Sudan-china protocol had added a great burden to the supply unit, that is because all items quality and quantities were not accepted and it had been discarded last year. This is due to the absence of a specialist in such provisions. The problem of the language that is not widely understood let to stagnation of products and expiration. This problem took place in the SPLA where 80% of French drug donation had been expired because the labels were written in French.(Quick-1997).

5.8 Distribution
5.8.1 Distribution hierarchy:

There are two distribution systems existing:
- War areas supply system.
- Health insurance supply system.

Each have medical stores different from each other and sometimes overlaps in at the central level or at the utilization level. Both are within the same area. Having one administrative unit sometimes and two different units in others. Each of them distributes drugs in sunlight rays model. The Centre is supplying all the points except in rare cases in the war areas.

The Central Medical Stores are supplying different levels of health services.
No other medical supplies stores at the regions.
5.8.2 Stores:

Type of stores:
Manual warehouses using shelves and to a lesser extent pallets. There are no machine or mechanical devices in receipt, handling, issuing and delivering procedures.

5.8.2.1 Physical Structure:

Location & site:
At Omdurman City within the Medical Corps compound. Being the central medical stores, they are dealing with the army requirements for the whole country. Fig (27).

Design:
Old hunger type buildings, the roof is metal, walls in bricks in concrete parcels and the columns appeared in a good condition. Except the store of Takaful which is metallic and covered by fibrous wooden material.

Size:
All height are 4 meters.
2) Building B2 Equipments: 952 m$^3$.
3) Building B3 Dressing and fluids: 952 m$^3$.
4) Building B4 Sanitary stores: 650 m$^3$.
5) Building B5 Takaful medical stores:
   - a- Drugs 17 x 6 x 3.5 meters = 357 m$^3$.
   - b- Office and delivery 7 x 8 x 3.5 = 196 m$^3$.
   - c- Dressings and fluids: 8 x 8 x 3.5 = 224 m$^3$.
   - d- Equipment = 8 x 10 x 3.5 = 280 m$^3$. Total = 1057 m$^3$.
6) Building B6 Takaful new warehouse: B6 18 x 45 x the whole building but it was divided into sections. The storage area is 25 x 18 x 4 m$^3$ = 1800 m$^3$.

Fig. 27 location of warehouses
5.8.2.2 Storage Conditions :
A- Takaful warehouses
1- Cold chain : Crowded refrigerators of the household type,
2- Temperature ; All air conditioners are in good condition, but there are no temperature records and
no thermometer.
3- Facilities : No mechanical tools nor semi mechanical devices.
All activities took place manually.
4- Shelves : Arranged in a small area and it is crowded.
5- Pallets : None
6- Arrangement of drugs :
Drugs were arranged according to the stock code on shelves.
7- Aeration : There are no windows and exhaust fans.
8- Security measures: No fire preventions alarms and no fire fighting measures.

B- Actions medical Warehouses
1- B1, B2, B3, B4, The concrete is good. The roofs are in need of rehabilitation. The air coolers are not in
work.. The temperature exceeds 35°C
They are completely empty.

Communications: -
There are no telephones, the internal lines had been removed.

Inspection :
Annual audit by the Army General Inspector, they always revise the financial and managerial procedures,
taking physical stocks.
They audit the cards and cut the stock .

5.8.2.3 Staff: -
Takaful :
Only one civilian pharmacist at the stores level. The rest of the staff are storekeepers and labors. Clerks
on the inventory records.

Actions section:
The manager is an apothecary (a brigadiers 36 working years ). The staff was frustrated because they were underpaid and hoping to transfer to Takaful or the Plant. No facility devices were there.

B7 Medical gases store: Located within the clerk office. It needs to be transferred to another building. It serves both sections.

5.8.2.4 Receiving Procedures: - The store keeper receives the orders, compares the quantities with the invoice, and fills the form 12C (Annex.1) and deliver to the inventory record and the manager to sign it. Then send to supply manager to be entered in the computer item page. This is due to the direct purchase where the only regulations and specifications are quantities and payment.
Prices were recorded only at Takaful supply in the unit price by the accountant.

During the tender 1999, all order files were sent to the different stores to check the quantities against order and checking the specification. A committee was in charge, but files had not been opened. The committee did not continue its work.

Committees were called on rare cases when there was indistinct receipt. The receipt and delivery areas are within or next to the shelves and the refrigerators.

As all purchases were from the local market no discrepancies were reported. Invoices are in trade and brand names. Expiry dates were checked and reported. The invoices are according to the company packing for the market, while the T.O.C or (12C) or the receipt document the items were written in trade name and quantities in the basic unit. The expiry dates sometimes were not recorded in the T.O.C (12C) because there was no position previously printed for this issue.

Some labels of containers did not state the quantity inside. The invoices do not explain directly the unit price but the packet price. The batch number was not stated in the invoices. The T.O.C of 3 copies; One for the computer, another for the inventory control and the third copy for the general file.

5.8.2.5 The Warehousing Procedures: Each item was placed in its location. Bulk stocks were kept near its cell with a sample in the cell.

1-Stock numbering:

The first two positions for the pharmacological groups. The second for the number of the item within the therapeutic category. The last two numbers for the concentration and dosage form. The numbers were written in cards and placed in the cell. Cell cards, were not used for recording the transactions.

2- The bin card: (Annex.2) Shows the quantity, the item name and number, additions and subtractions using FEFO system.

Dressing and fluids possess code numbers while equipment were not. Equipment were categorized into groups, according to the utilizing department.

Drugs that need a controlled temp. were placed in the refrigerator but there were no thermometers. Narcotics were kept in a locked cupboard. To be opened only by the storekeeper who was not a pharmacist.

3- Issuing:

Pull system, for each health facility a request (Form 47) (Annex.3) was filled in three copies prepared and approved by the pharmacist in Takaful Warehouses, sent to the storekeeper who filled the quantity issued, subtract the quantity and record in the bin card and send it to the accountant to calculate the cost. The accountant returns it back to the storekeeper to prepare the quantities and delivery. Then he sends a copy to the inventory clerk within the store and the other copy to the computer program unit.
Fig (28): Issuing cycle

4- Delivery was done in three ways:

1- To the facility representation or messenger.
2- Regions Liaison Office.
3- An employee from the supply on mission.

In Cases of moving troops or war areas additional command from the Deputy Chief of Staff-Actions is required. The request would be prepared by the store keeper, approved by the pharmacist and then issued and priced.

The prices of drugs were recorded in the accounting book. Requisitions are of three copies, one in the store at the inventory control and the other in the file at the computer unit.

Form (12C) was prepared for delivery of supplies. It is signed by the receiver in the stores and it was filed and delivered to the computer. A copy was sent with supplies to the facility.

The Pass voucher (Annex.4) was in the system where the control and security department and the facility manager signs the voucher. This voucher should be returned back to the stores otherwise no supplies will be sent to the mentioned facility. Delivery occur within the storage area.

Packaging at Takeful warehouses is in cartons and stacked with sticker, while the other section in loose and easily spoiled cartons. Usually received by the troop representative or the liaison office.

5- Physical stock taking:
Stock is physically taken annually by the Army General Inspector Office, who use to issue a report regarding the procedures and the financial status.

5.8.2.6 Computer:
A unit associated to the supply executive manager 3 computers, and server, one of the computers for the office work. No other computers in the stores.

The operators have no pharmaceutical knowledge. Their duty is to enter stock transactions, after receiving papers from the store. The computers status of the stock is usually 15-30 days later.

The Program Screens:
The main screen is the preface of the following screens:

1- Main files screen (Annex.11)
This represents the dictionary and index of the drugs within the program
a- Input
b- Doctor type (meaning the pharmacist in duty"
c- Item generic name]
d- Suppliers.

The Program Screens:
The main screen is the preface of the following screens:

1- Main files screen (Annex.11)
This represents the dictionary and index of the drugs within the program
a- Input
b- Doctor type (meaning the pharmacist in duty"
c- Item generic name]
d- Suppliers.
Customer number:-----------------------------
Qty :------------------------------------- approval:------------------

4-Alarming screen:-
   a-Using quantities .
   b- Using expiry date.

5- System Reports:-
1) Item Name list
2) Stock status
3) Alarming using critical point
4) Alarming using expiration date
5) General deposit using specific criteria
6) General deposit with numbers of delivery dates
7) Withdrawal using specific criteria
8) Withdrawal with number of delivery dates
9- Other reports………………

Reconciling the stock recorded at the store and the computer program had not been held. The stock status on the computer is 15-20 days latter. The reports were not in use, the last tender was based on the stock records. By the end of the year, annual reports may be provided. Manager and the two pharmacists in the administration unit were not on practice of the computer program but the two operators can provide them the information they need.
5.8.3 Distribution

Network :

All health facilities at all levels were supplied directly from the Central Stores.

1-Central Region:-
   a-Centre.
   b- Peripheries

5.8.3.1 Capital region : Central outlets supplied weekly . Table ( 12 )

<table>
<thead>
<tr>
<th>General pharmacies</th>
<th>Surgical Theatres</th>
<th>Departments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referred Clinics Pharmacy</td>
<td>Ahmed Gasim preparation .</td>
<td>hospital senior nurse</td>
</tr>
<tr>
<td>Paediatric Hosp. Pharmacy</td>
<td>&quot; &quot; anaesthesia.</td>
<td>causalities &quot;</td>
</tr>
<tr>
<td>In patient Pharmacy</td>
<td>Arif general surgery preparation.</td>
<td>Referred clinics &quot;</td>
</tr>
<tr>
<td>Dental Pharmacy</td>
<td>&quot; &quot; anaesthesia .</td>
<td>Families hospital &quot;</td>
</tr>
<tr>
<td>Psychiatric Pharmacy</td>
<td>Shalali &quot; &quot; preparation .</td>
<td>Paediatric &quot; &quot;</td>
</tr>
<tr>
<td>Families Hos. Pharmacy</td>
<td>&quot; &quot; anaesthesia.</td>
<td>I.C.U. hospital</td>
</tr>
<tr>
<td>T.B. Pharmacy.</td>
<td>Orthopaedic surgery preparation.</td>
<td>peritoneal dialysis</td>
</tr>
<tr>
<td>Mohandiseen Health Center Pharmacy</td>
<td>Families hospital preparation.</td>
<td>Dental laboratory</td>
</tr>
<tr>
<td>Central Pharmacy</td>
<td>&quot; &quot; anaesthesia.</td>
<td>Blood Bank</td>
</tr>
<tr>
<td></td>
<td>Dental surgery preparation.</td>
<td>Laboratory headquarter</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; anaesthesia.</td>
<td>X. ray new unit</td>
</tr>
<tr>
<td></td>
<td>ENT theatre preparation.</td>
<td>Word X. Ray</td>
</tr>
<tr>
<td></td>
<td>Ophthalmic surgery preparation.</td>
<td>MRI</td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; anaesthesia.</td>
<td>Orthopaedic hospital.</td>
</tr>
<tr>
<td></td>
<td>Nur Eleyoun theatre.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orthopaedics (II) preparation .</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot; &quot; anaesthesia.</td>
<td></td>
</tr>
</tbody>
</table>

B/ Peripheral Hospitals and Health Centres : (monthly internal):Table ( 13 )

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Elgyada Hospital</td>
<td>11 Migrous Workshop Health Centre</td>
</tr>
<tr>
<td>2 General Warehouses Hospital.</td>
<td>12 Kalakla Health Centre .</td>
</tr>
<tr>
<td>3 Elshagra–armed forces Hospital</td>
<td>13 Public Defence Health Centre</td>
</tr>
<tr>
<td>4 Jabal awlia Hospital .</td>
<td>14 Paratroopers Health Centre .</td>
</tr>
<tr>
<td>5 wadiSaidna Military Centre</td>
<td>15 Mohandiseen Health Centre.</td>
</tr>
<tr>
<td>6 Karari Health Centre .</td>
<td>16 Military Prison</td>
</tr>
<tr>
<td>7 Bahri Health Centre .</td>
<td>17 Darussalam Health Centre</td>
</tr>
<tr>
<td>8 Jaylli Health Centre .</td>
<td>18 Fatasha Health Centre .</td>
</tr>
<tr>
<td>9 Kadro Health Centre .</td>
<td>19 Khur Omer 9th Band Health Centre .</td>
</tr>
<tr>
<td>10 Mahlaj Health Centre.</td>
<td></td>
</tr>
</tbody>
</table>

5.8.3.2 The States (regions ) : Monthly intervals .Table ( 14 )

<table>
<thead>
<tr>
<th>Takaful : a total of</th>
<th>63 outstation .</th>
<th>War areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wau Hospital .</td>
<td>Fawo Centre.</td>
<td>Juba &amp;EquatorialRegion</td>
</tr>
<tr>
<td>Hospital/Center</td>
<td>Region/Contract Details</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Malakal Hospital</td>
<td>New halfa (contract)</td>
<td></td>
</tr>
<tr>
<td>Aweel Hospital</td>
<td>Halfa (contract)</td>
<td></td>
</tr>
<tr>
<td>Kosti</td>
<td>Shawak (contract)</td>
<td></td>
</tr>
<tr>
<td>Runuk</td>
<td>Gala.nakhal(contract)</td>
<td></td>
</tr>
<tr>
<td>Ghitaina (contract)</td>
<td>Obeid Hospital</td>
<td></td>
</tr>
<tr>
<td>Maloot (contract)</td>
<td>Bara (contract)</td>
<td></td>
</tr>
<tr>
<td>Demazin Hospital</td>
<td>Nhood (contract)</td>
<td></td>
</tr>
<tr>
<td>Singa Health Centre</td>
<td>Talodi Health Centre</td>
<td></td>
</tr>
<tr>
<td>Sinar (contract)</td>
<td>Dalang Health Centre</td>
<td></td>
</tr>
<tr>
<td>Medani Hospital</td>
<td>Kador Health Centre</td>
<td></td>
</tr>
<tr>
<td>Hantoop Centre</td>
<td>Lir Health Centre</td>
<td></td>
</tr>
<tr>
<td>Shendi Hospital</td>
<td>Banabos Centre</td>
<td></td>
</tr>
<tr>
<td>Atbara</td>
<td>Majulad Centre</td>
<td></td>
</tr>
<tr>
<td>Wadihalfa Centre</td>
<td>Higlig (civil hospital)</td>
<td></td>
</tr>
<tr>
<td>Dongla (contract)</td>
<td>Ribkoona Hospital</td>
<td></td>
</tr>
<tr>
<td>Duhba (contract)</td>
<td>Lagawa Health Centre</td>
<td></td>
</tr>
<tr>
<td>Marai (contract)</td>
<td>Abugeba Centre</td>
<td></td>
</tr>
<tr>
<td>Bawarith Hospital</td>
<td>Abugabra Centre</td>
<td></td>
</tr>
<tr>
<td>Salalab Centre</td>
<td>Alledhya Centre</td>
<td></td>
</tr>
<tr>
<td>Tokar Health Centre</td>
<td>Almairam Centre</td>
<td></td>
</tr>
<tr>
<td>Sinkat Hospital</td>
<td>Abyay Health Centre</td>
<td></td>
</tr>
<tr>
<td>Jabit north Centre</td>
<td>Nyala Hospital</td>
<td></td>
</tr>
<tr>
<td>Jabit south Centre</td>
<td>Fisher Hospital</td>
<td></td>
</tr>
<tr>
<td>Dordiab Centre</td>
<td>Genana Hospital</td>
<td></td>
</tr>
<tr>
<td>Hlieb (planned)</td>
<td>Zalinga (contract)</td>
<td></td>
</tr>
<tr>
<td>Kasala Hospital</td>
<td>Dtain (contract)</td>
<td></td>
</tr>
<tr>
<td>Gadarif Hospital</td>
<td>Kotom (contract)</td>
<td></td>
</tr>
<tr>
<td>Gerba Hospital</td>
<td>Kass (contract)</td>
<td></td>
</tr>
<tr>
<td>Aroma Centre</td>
<td>Kubkabia (contract)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5.8.4 Transportation

All methods of transportation are in use.

#### 5.8.4.1 Continuous transportation land lines:

<table>
<thead>
<tr>
<th>1- Portsudan</th>
<th>7-Medani</th>
<th>10-Shendi</th>
<th>12-Obeid</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Kasala</td>
<td>8-Singa</td>
<td>11-Atbra</td>
<td>13-Dalang</td>
</tr>
<tr>
<td>3-Girba</td>
<td>9-Damazin</td>
<td></td>
<td>14-Abugeboiha</td>
</tr>
<tr>
<td>4-Godarif</td>
<td></td>
<td></td>
<td>15-Kosti</td>
</tr>
<tr>
<td>5-New Halfa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Foa</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shipping on buses; Passenger buses, lorries and trucks. Requisitions were received from Casi express (private mail company) or by the facility representative.

5-7 days to prepare the drugs and supplies. Received by the representative or by the packing and shipping office, packed in cartons being bought from the market, and sealed with plaster strip. Numbering the cartons, labeled by writing on the carton and signing the pass voucher by the control and security department, then in a metal box of 1.5 tons supplies were carried to the shipping office at the Public Market. A private office was contracted for transportation.

#### 5.8.4.2 Railways:

Wadihalfa line and Bobanosa line in a journey of three days, supplies were there.

#### 5.8.4.3 Large Trucks and Airfreights:

Neyala, Genaina and Fashir.
5 days by land. 4 hours by air.

5.8.4.4 Regions Liaison Offices:-
1- Juba  2-Wau  3-Malakal  4-Ribkona  5-Aweil .
Supplies were transported by the salaries aircraft monthly accompanied by the regional representative, transportation here was free.

ElDamazin Region, use to send a car to take the drugs issued by the war section and was not allowed to take the Takaful supplies .
All are supplied in monthly intervals . When there are small quantities or laboratory reagents, they are delivered by Casi express.

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All are supplied in monthly intervals . When there are small quantities or laboratory reagents, they are delivered by Casi express.

The expenses of the transportation annually consume about 5-7 million pounds paid by the centre to the contracted office. The representatives were given 10,000 SD for each trip. When there is no representative the papers were signed by the packing and shipping office. If there are any discrepancies, the facility manager reports on the back of passing voucher and write a letter explaining the case. The office usually transport and deliver the actions supplies by the same routes.

The supplies may wait at the warehouse after receipt for many days .

5.8.4.5 Transportation to Talodi , Liri and Lagawa:-
Tolodi and Lirie requirements were delivered to Abugebeha and then by lorry to Taiodi and Lirie . Lagawa requirements may be delivered to Obeid where it is reshipped on a lorry to Lagawa .

5.8.5 Distribution Assessment :

5.8.5.1 Warehouses :

1-Location and site: It is suitable to be centered in the Medical Corps Headquarter because:

1) Accessibility to all regions.
2) The load of work is at the centre.
3) Better communications.
4) Point of import.
5) Center of supplies.
6) Center of transportation routes to different regions.
7) More secured.
8) Better facilities.
9) Center of ministries and the army higher commands.

2-Design:

The medical warehouses are scattered on the area of the medical corps. In an area of 6400m$^2$. (Fig27 ) shows the buildings within the area. No boundary walls. No entrance and gate- the whole area is open which may complicate the control. The loss of image of the supply together with the uncontrolled roads among the stores results in difficulty in control and management. It allows the pass of walkers and small vehicles within the area.

B$_3$ building being so far from the center of the stores near the combustibles and the grade and car maintenance workshop, and floor workshop and construction stores, an open area, a football field being a center of aggregations.

B$_6$ building within the area of the drug production plant which is the only extension for the plant, that faces problems with the MOH to gain addition store
for the finished products and packaging materials to comply with GMP. The plant had been blocked by this building on the other hand it is isolated from the other buildings. An engineer can take the task, but a boundary wall according to (Fig.27) surrounding buildings B1, B2, B3, B4 and B7 will result in an over of 6400m², with a considerable storage area that will solve the problem.

In December 2003, the new Takaful Warehouse had been put in work, blocking the production plant expansion and area required for a warehouse.

The plant could not be developed in its area and a threaten to be closed by the Federal Pharmacy Directorate.

However, store B1, B2, B3 and B4 remaining without maintenance and rehabilitation and nearly empty.

Most of the rubber consumables became rigid and completely spoiled

(1) the area of the need warehouse is = 18x25 = 450 m² are a storage area.
(2) The area of B1, B2, B3 and B4
   B1 = 13.5x38 = 513 m²
   B2 = 8.5x28 = 23.8 m²
   B3 = 8.5x28 = 23.8 m²
   B4 = 6.5x25 = 162

   1151 m²

5.8.5.2 Storage Conditions:

(Table 14 ) Temperature inside B₁:

<table>
<thead>
<tr>
<th>Month</th>
<th>Morning</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max.</td>
</tr>
<tr>
<td>Feb</td>
<td>25 ºC</td>
<td>30 ºC</td>
</tr>
<tr>
<td>March</td>
<td>28 ºC</td>
<td>31 ºC</td>
</tr>
<tr>
<td>April</td>
<td>34 ºC</td>
<td>42 ºC</td>
</tr>
<tr>
<td>May</td>
<td>37 ºC</td>
<td>41 ºC</td>
</tr>
<tr>
<td>June</td>
<td>32 ºC</td>
<td>36 ºC</td>
</tr>
<tr>
<td>July</td>
<td>33 ºC</td>
<td>35 ºC</td>
</tr>
</tbody>
</table>

It is clear that drugs inside this store are subjected to drastic storage conditions which may affect the stability and therefore the validity of the stored items. The warehouses contain no kind of operational facilities even the thermometer.

The cold chain needs deep freezers and non-freezer refrigerator not the household model.

5.8.5.3 Warehouses Procedures:
1- Receipt:
- The absence of a receipt committee make errors in receipt, discrepancies and corruption more probable.
- Receipt by trade names, without presenting the stock number led to miss understanding of workers and inventory control clerks.
- Invoices from the companies also don’t point to the order of purchase, generic name and the stock number, actually the suppliers do not receive a written order.
- No receipt area or store like that of the Jordan RMS, the import store, because no testing for quality took place in SMC. In JRMS there is a receiving area and a committee with a check list.

Receipt Report:- in spite of being essential; the habits of direct purchase, cash on delivery; receipt on invoice gave no chance for reporting. Discrepancies usually corrected verbally. The form used for receipt is the same form used for issuing and having the same color.

In all reviewed invoices, drugs are in trade names, no obligation or instruction had been issued to use generic name, a matter leads to confusion of trade names in the papers with the stock numbers of drug which had been set in generic names. The receipt form is filled in basic units while the invoices were filled in packet units. Expiration, batch number, unit price and package size all were not included in the receipt voucher leading to inaccurate transactions, weak monitoring of expired drugs and security breaches.

In JRMS, only generic names are allowed. A form of discrepancies with receipt check list (Annex 14).

Receipt should be done by a committee on the basis of preprinted check list.

2-Issuing:

When client requisition arrived, it would be approved by the Warehouse Manager who decides the quantities that could be delivered. On the basis of his experience and then sends the approved request to the storekeeper who fills the column of the issued quantity according to the stock level. Then he delivers the papers to the accountant who calculates the cost and sends one copy to the computer and two copies to the storekeeper.

In this cycle (1) The computer program works as an audit control.

It is 15-30 days later. It should be up-to-date.

(2) The Pharmacist; Warehouse Manager, decides the quantities without knowing the actual stock; this result in the difference in the two columns, quantity approved and quantity issued.

(3) Storekeeper issues different quantities from that approved contradicting all regulatory rules of storekeeping specifically the Regulatory Act of the Republic, as bias may happen and a good opportunity for theft.
(4) No studies for the facilities consumption took place. In JRMS all the process is computerized. Quantities is determined on an allocations basis which opens the door for troubles in changing the orders.

3- Delivery:

No separate delivery area. The deliveries take place within the stock area resulting in many theft cases. Confusion and overlapping of consignments to different hospital usually take place.

4- Stock taking:- Stock is physically taken annually. Announced physical stock taking will never report discrepancies, but unannounced stock taking or periodical stock taking was not practiced.

5- Warehouses facilities:

No thermometers or scale balances, forklift or any sort of vehicles.

6- Inventory control: A clerk of the warehouse did not record the unit price and expiration date in the card.

In JRMS where was a safety stock of two months and where the stock falls to consumption of 6 month the recorder starts, calculate the lead time.

The reorder system should be installed in the computer program. The SS and the LT should be calculated for each drug, at this point the order should start. All the processes should be computerized.

7- Work load:

The annual filled requisitions at the warehouse were 2100-2400 requisitions. All facilities in the country request directly from the Central Stores against all the organization regulation and hierarchy of organization disregarding the army organizational structure..

For the center, weekly requisitions for all theaters and clinics, pharmacies and patients wards, x-ray units and laboratories, at the same time hospitals and moving troops. Large facilities and dispensaries, make a high load of work upon the warehouse activities and staff. While in Jordan each facility takes their allocations every 2 months. Regional stores are at the health facilities, in the SMC there was 7-8 deliveries daily in other word one delivery every hour, actually this could never be imagined else where.

5.8.5.4 Distribution Network

A total of 157 Stations were supplied from one central warehouse without calculating the moving troops, emergencies and unscheduled requisitions and unscheduled activities.

42 Stations weekly supply.

19 Stations at the central region monthly supply.

64 Stations scattered among the whole country supplied monthly.
32 Stations at the war areas supplied occasionally.

157 Stations constituting the network beside the moving troops and emergencies.

1-Central Military Region:-

The center: 1/ Pharmacies 9 Stations.

   Departments 14 Stations.

   Theaters 19 Stations.

42 Stations Supplied weekly.

2/ Peripheries 19 monthly

2- States: Table (15) The States Distribution Network

<table>
<thead>
<tr>
<th>Military area</th>
<th>Center</th>
<th>Supply stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Equatorial M. Area.</td>
<td>Juba</td>
<td>1</td>
</tr>
<tr>
<td>2- Bahar el Gazal M. Area</td>
<td>Wau</td>
<td>1</td>
</tr>
<tr>
<td>3- High Nile M. Area</td>
<td>Malakal</td>
<td>1</td>
</tr>
<tr>
<td>4- White Nile M. Area</td>
<td>Rabak</td>
<td>4</td>
</tr>
<tr>
<td>5- Middle M. Area</td>
<td>Obied</td>
<td>8</td>
</tr>
<tr>
<td>6- Western M. Area</td>
<td>Fashier</td>
<td>11</td>
</tr>
<tr>
<td>7- Northern M. Area</td>
<td>Shendi</td>
<td>6</td>
</tr>
<tr>
<td>8- Eastern M. Area</td>
<td>Faou</td>
<td>9</td>
</tr>
<tr>
<td>9- Blue Nile M. Area</td>
<td>Damazin</td>
<td>3</td>
</tr>
<tr>
<td>10- Jazera M. Area</td>
<td>Medani</td>
<td>2</td>
</tr>
<tr>
<td>11- Red Sea M. Area</td>
<td>Port Sudan</td>
<td>8</td>
</tr>
<tr>
<td>12- Mojlad and west Newwair M. Area</td>
<td>Ribkona</td>
<td>9</td>
</tr>
<tr>
<td>13- Aweel independent M. Area</td>
<td>Aweel</td>
<td>1</td>
</tr>
</tbody>
</table>

Every station is independent from its neighbor or Military Area, it was supplied directly from the central stores which results in a high load of work, delay in supply and spoilage of drugs during transportation.

The stations should be gathered and correlated to the centre of their military areas. The regional stores will be valuable.

Unlike JRMS where the last station is 300km from the centre. The Sea Port AGABA is 110 km from the centre. In spite of this fact they deliver consignments to the regional hospitals store in two months intervals. The transportation to Neyala and Fashier expend a week by lorries where drugs are subjected to high temperature and sunlight which may alter the quality.
Regional warehouses to be supplied every three months, directly managing the supply operations and the logistic process at the region, maybe preferable changing the hierarchy of distributions from sunrays model to pyramidal model.

3- Actions:
The Equatorial Region consists of 35 supply Stations
The Buhar El Gazal Region consists of 33 supply Stations
The middle Military Area consists of 8 supply Stations
White Nile Region consists of 35 supply Stations
Red Sea Region consists of 8 supply Stations
Higher Nile Region consists of 22 supply Stations.

For all these factors regional stores and regional logistic unit is strongly recommended.

5.8.5 Computer:
The program used is highly effective on reporting and audit process but does not provide the stock for determining the quantities, making it of no value to be used by the pharmacist who approve the quantities. The program was not designed to calculate the cost of the transactions and the prices of drugs (Annex.10). At the JRMS the inventory control, the distribution and the tender process all are computerized.(Annex 11)

Computerizing the system will reduce the amount of papers. Only a request form, then a computer invoice could be issued, cards may continue the same procedures.

5.8.6 Distribution in Malaysia: delivery depends on the consumption quality, monthly or even weekly, from every state (2-4 distinct hospital, 4-5 maternal and child clinics, 20 health centers) each of which supplied directly by its own transportation. The good telephone communications facilitate the issue. Drugs were dispensed freely, but each state has its budget and being supplied against that budget which transferred to CMS fund on delivery. Each State Pharmacist was under professional supervision of the National Director and also is administratively responsible to the State Health Service Director.

5.8.7 Kit system:
A kit for every 100 person, moving forces could be approved by the selection committee depending on the regional demands analysis.

Frequencies of drugs on the regional demands:
On studying the monthly needs of eight regions by direct survey method, 82 drugs had been determined for each region on the basis of quantity and
expenditure. The frequency of these drugs among the regional needs had been obtained by the aid of SPSS program.

The results is that, (Table 16). (Chart 9) Two drugs are common for all regions, another eight drugs are common for seven regions. Twenty seven drugs are required by two regions only.

On calculating the percentage of the frequency of each drug from the total requirements, sorted in descending manner, then the accumulative percentage is obtained. The result is that, 37 drugs constitutes 70% of the total needs, (Table 16). The next 17 drugs covers the next 15% and lastly 27 drugs represents only 15%. (Chart 10) These results almost complying the national standards. The 37 drugs are classified as follows:

1- Antibiotics ......................... 14 drugs.
2- Antimalrials ......................... 5 drugs.
3- Vitamines and Haematinics ........ 5 drugs.
4- Analgesics ........................... 4 drugs
5- GIT ................................. 6 drugs
6- Antiallergy ........................... 2 drugs
7- Sedative .............................. 1 drug.

The use of antibiotics requires further studies.

This practice may be useful in the selection of drugs, quantification, setting the priorities and adjusting the budget.
Drugs Frequencies on the regional demands ( Table 16)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name Drug</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chloroquine phosphate amp.</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Ampicillin+ Cloxacillin 500mg cap.</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Chloroquine phosphate tab.</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Quinine sulphate tab.</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>Tetracycline cap.</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>Amoxycillin 250mg cap.</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Co-trimoxazole tab.</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Bezyl Penicillin 1 mega vials.</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>Metronidazole tab.</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>Doxycycline cap.</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Procaine Penicillin 1 mega vials.</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>Gentamycine 80 mg amp.</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>Hyoscine tab.</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>Ampicillin+ Cloxacillin 500mg vials.</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Quinine 600 mg amp.</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>Antacid tab.</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>Acetyl Salicylic Acid tab.</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>Ibuprofen 400 mg tab.</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
<td>Chlorpheniramine maleate tab.</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>Diazepam tab.</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>Multivitamins cap.</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Promethazine 25 mg tab.</td>
<td>4</td>
</tr>
<tr>
<td>23</td>
<td>Paracetamol 500mg tab.</td>
<td>4</td>
</tr>
<tr>
<td>24</td>
<td>Hyoscine amp.</td>
<td>4</td>
</tr>
<tr>
<td>25</td>
<td>Ciprofloxacin 500mg tab.</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td>Erythromycin tab.</td>
<td>4</td>
</tr>
<tr>
<td>27</td>
<td>Sulfadoxine+ Pyrimethamine tab.</td>
<td>3</td>
</tr>
<tr>
<td>28</td>
<td>Cephalexin 250 mg cap.</td>
<td>3</td>
</tr>
<tr>
<td>29</td>
<td>Norfloxacin 400 mg tab.</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>Chloramphenicol cap.</td>
<td>3</td>
</tr>
<tr>
<td>31</td>
<td>Diclofenac25 mg tab.</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>Loperamide tab.</td>
<td>3</td>
</tr>
<tr>
<td>33</td>
<td>Ferrous gluconate tab.</td>
<td>3</td>
</tr>
<tr>
<td>34</td>
<td>Folic acid tab.</td>
<td>3</td>
</tr>
<tr>
<td>35</td>
<td>Vitamin B-complex tab.</td>
<td>3</td>
</tr>
<tr>
<td>36</td>
<td>Vitamin A</td>
<td>3</td>
</tr>
<tr>
<td>37</td>
<td>Salbutamol 4mg tab.</td>
<td>3</td>
</tr>
</tbody>
</table>
(Chart 8) Frequencies of Drugs in the Regional Demands
5.9 Prescribing:
5.9.1 Prescribers:-
The physicians at the Central Region are from all medical professional levels. They are subordinated to different employment categories, some are militaries, others are on the National Service and civilians on contract. Many are on the Houseman ship and few are registrar. Table (17) illustrates the situation.

(Table 17) Prescribers at the Central Region on October 2003

<table>
<thead>
<tr>
<th>Professional Level</th>
<th>Militants</th>
<th>Civilians</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Specialist</td>
<td>70</td>
<td>14</td>
<td>41 of them at Referred clinics</td>
</tr>
<tr>
<td>2) General Practitioner</td>
<td>20</td>
<td>23</td>
<td>Civilians are on contract.</td>
</tr>
<tr>
<td>3) Registrar</td>
<td>-</td>
<td>31</td>
<td>At the centre only</td>
</tr>
<tr>
<td>4) National Service</td>
<td>230</td>
<td></td>
<td>At the Centre only</td>
</tr>
<tr>
<td>5) Houseman ship</td>
<td>138</td>
<td></td>
<td>At the Centre only</td>
</tr>
</tbody>
</table>

- The military G.Ps are at the out stations.
- Of the 23 G.Ps civilians, 15 are at the centre and 8 at the peripheral health centres at the capital area.
- All numbers are not constant. Numbers of categories 4) & 5) are changeable.

5.9.2 Clinics at the Centre:-

1) Casualties Ward Medicine, surgery, ENT, Ophth, Dermatology.
2) Referred clinics.
3) Families Obs and gyny clinics, patient ward and theatre.
4) Paediatric Paed. casualties, clinics and inpatient rooms.
5) Dental; All clinics.
6) Psychiatric Clinics and rooms.
7) Chest Clinic outpatient and rooms.
8) U.T Medicine and surgery.

(Chart 9) Regional Demands of Drugs

- The chart illustrates the accumulated percentage of regional demands of drugs.
- The x-axis represents the number of items, ranging from 1 to 81.
- The y-axis shows the accumulated percentage, ranging from 0 to 120.
- The graph demonstrates a steady increase in demands as the number of items increases.
5.9.3 Inpatient Prevalence in nursing days:
Prevalence on 2000 is 133,802 Nursing days.
Prevalence on 2001 is 292,680 Nursing days.

5.9.4 Outpatients prevalence at different clinics:
Data obtained from Takaful Statistical Unit on the patients attendance at different clinics at the Centre (Table 18) is then sorted and analyzed to get the mean prevalence per year (chart 11). The mean prevalence per month is obtained from 10 months for the year 2003. The records for Surgery and Orthopedic are not available at that time.

(Table 18) The Mean Prevalence of Patients Attendance

<table>
<thead>
<tr>
<th>Clinic</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 W. Medicine</td>
<td>69538</td>
<td>84567</td>
<td>102606</td>
<td>256711</td>
<td>85570.33</td>
</tr>
<tr>
<td>2 W.Surgery</td>
<td>5406</td>
<td>8789</td>
<td>10701</td>
<td>24896</td>
<td>8298.67</td>
</tr>
<tr>
<td>3 W.Orthopedics</td>
<td>4632</td>
<td>7715</td>
<td>9394</td>
<td>21741</td>
<td>7247</td>
</tr>
<tr>
<td>Referred</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Medicine</td>
<td>8660</td>
<td>11053</td>
<td>17750</td>
<td>37463</td>
<td>12487.67</td>
</tr>
<tr>
<td>5 Referred Surgery</td>
<td>4202</td>
<td>6522</td>
<td>8992</td>
<td>19716</td>
<td>6572</td>
</tr>
<tr>
<td>Referred</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Orthopedic</td>
<td>2981</td>
<td>3982</td>
<td>4723</td>
<td>11690</td>
<td>3896.67</td>
</tr>
<tr>
<td>7 Ophthalmology</td>
<td>10435</td>
<td>14251</td>
<td>17831</td>
<td>42517</td>
<td>14172.33</td>
</tr>
<tr>
<td>8 Dermatology</td>
<td>5191</td>
<td>6309</td>
<td>8603</td>
<td>20103</td>
<td>6701</td>
</tr>
<tr>
<td>9 ENT</td>
<td>4905</td>
<td>6199</td>
<td>4947</td>
<td>16051</td>
<td>8338.33</td>
</tr>
<tr>
<td>10 Urinary Tract</td>
<td>1453</td>
<td>2749</td>
<td>4323</td>
<td>8525</td>
<td>2841.67</td>
</tr>
<tr>
<td>11 Officers Clinic</td>
<td>6173</td>
<td>7415</td>
<td>11427</td>
<td>25015</td>
<td>8338.33</td>
</tr>
<tr>
<td>12 Paediatrics</td>
<td>32888</td>
<td>41923</td>
<td>52619</td>
<td>127430</td>
<td>42476.67</td>
</tr>
<tr>
<td>13 Chest</td>
<td>1933</td>
<td>3648</td>
<td>4723</td>
<td>10304</td>
<td>3434.67</td>
</tr>
<tr>
<td>14 Dental</td>
<td>7989</td>
<td>18479</td>
<td>24204</td>
<td>50672</td>
<td>3434.67</td>
</tr>
<tr>
<td>15 Families</td>
<td>21060</td>
<td>26575</td>
<td>35301</td>
<td>82936</td>
<td>27645.33</td>
</tr>
<tr>
<td>16 Psychiatrics</td>
<td>0</td>
<td>0</td>
<td>10234</td>
<td>10234</td>
<td>3411.33</td>
</tr>
</tbody>
</table>

(Chart 10) Annual Mean Prevalence of Patients at the Central Clinics

Clinic mean/month
1 W. Medicine 14009
2 W.Surgery 0
3 W.Orthopedics 0
Referred
4 Medicine 1562
5 Referred Surgery 766
Referred
6 Orthopedic 409
7 Ophthalmology 1548
8 Dermatology 676
9 ENT 725

(Chart 11) Monthly mean prevalence of patients at different clinics for the year 2003
5.9.5 Number of items per prescription:
Although no regulation had been put in place but the average of items per prescription was as follows:
1) Inpatient at the center: 5.2 items/prescription.
2) Outpatient at the center: 4.1 “   “
3) Regional hospital: 3.3 “   “

5.9.6 Prescribing habits:
In a study of 1013 prescriptions in one outlet covering the whole week the public pharmacy (out of the system) from 20-26/4/2002.
1) No of prescription studied: 1031.
2) Prescriber stamp: 312, 135 of them are dermatologists.
3) Unstamped prescriptions: 710.
4) Written diagnosis: 410.
5) No diagnosis: 603.
6) Spelling mistakes: Uncountable.
7) Overprescribing: 90% counting vitamins, sweetening agent, cosmetics.
8) Errors in pharmaceutical dosage form: (susp/syrup), (tab/cap), (cream/ointment).
9) Duplication : recorded .
10) Trade names : 95% in anther study 85.9% .
11) Dosages: recorded in antibiotics. 

Ten prescriptions were written in green ink, one prescription 90000 SD , without diagnosis and physician stamp . It was 30 Humegon amp.
One prescription containing 20 item of a total cost, 8040 SD.
One prescription value was 56250 SD . 
One prescription converting isorbid trinitrite10mg sublingually as needed and 5mg b.d orallly.
Amikacin inj dosage as one injection every other day . 
One prescription, the duration of use for 6 months, issued in a cost of 20100SD
10 vials cefuroxime 750 mg in one trade name were dispensed in one issue to one out patient .Cardiovascular drugs as digoxine , antihypertensive drugs were referred to the Public Pharmacy because they were not available at the hospital pharmacy . 
Peripheries of the capital can refer prescriptions to the Public Pharmacy in spite of being prescribed by medical assistant .

5.9.7 Drug information resources :
The general resources of information on drugs are: 
= Medical representatives. 
= Consultant .
= Colleagues.
= Indexes (mimes).
= Textbooks .
= Bulletins and papers.
= Patient.
= Pharmacies.

5.9.8 Prescriptions forms:
Out patient .annex (5). In patient annex (6) . Casualties form annex (7) Chronic diseases follow up card , annex (8) .
- No need for the patient to revisit his physician .The patient can send the card with his relatives when the drugs he used were finished .A new allocation was prescribed according to the doses of drugs written in the card.

5.9.9 Inpatient doses :
A green form of prescription was filled ,waiting for the co-patient to buy the drugs in 25% bases from the pharmacy .All prescribed doses was dispensed in one shoot .New drugs when added on the physician round should be in a new green form , this form again was issued from the outpatient clinics from Takeful officer.

5.9.10 Regulations of prescribing :
There was a talk about a Regulatory Guidance Booklet , but it is out of stock and it is not available in practice . 
-Except that it is known that more than 4 items is not allowed .
-Over 5000SD drug value should be approved by the pharmacist in the centre supply unit in the Takeful of the capital area.

5.9.11 Assessment :

(1) The expenditure of the multivitamin and minerals group and Haematinic preparations in the tender 2003 is 5.977%.
The expenditure of surgical sutures + diurects + ENT + antihistamine + antihypertensive and cardiovascular drugs + ophthalmologic preparations + antiprotozoal including metronidazole 5.713%.

This indicates the depletion of funds in unnecessary drugs. While the antimalarials is 4.8%, the vitamins + the ferrous = 6%.

(2) Issuing a prescription form on patient registration before meeting the physician, automatically there is a prescription. A prescription for every form spontaneously there is a bill.

(3) The frontal position of the hormones and related drugs group in tender analysis, the therapeutic category analysis indicates the use of high risk drugs.
The problems in prescribing lie on five main points:

1) Dependence on civil employment, young doctors resident for housemanship or recruited under the native act whom are untrained enough to carry on the task.
2) System mismanagement.
3) Regulation settings.
4) Information induction.
5) Load of work.

None-stamped prescriptions is irrational prescribing and many civilian doctors have no stamps. In 60% of the prescriptions, the diagnosis is not stated indicating carelessness. Together with the spelling and dosage mistakes, concentration errors indicate the lack of training.

Exchange of prescribed drugs at the public pharmacy to cosmetics indicate the irresponsibility of the prescriber, the dispenser and the patient.

Over prescribing of vitamins, sweetening agents, cosmetics like preparations, glucose diagnostic sticks, hair and skin care preparation, these need a rigid regulations.

Work load:

About 50,000 outpatient per month, and 300,000 nursing days for the inpatient is great burden on doctors and different pharmacies.

There are 70 military specialists, 14 are civilians. Every specialist care about 650 outpatient and 4000 nursing days for the inpatient per month. 162 patients per week, 81 patient every clinic provided that the specialist has two days per week. If one day weekly, 162 patient results in 3 minutes for every patient and 1½ min. if working once weekly + 1000 nursing days weekly. The Native Strategic plan point to 50 patients for every specialist.

This high load of work gave the image of irrational prescribing and writing the prescription properly. (Chart 11-12)

Prescribing Regulations:

(1) The regulations usually issued, were easy to be forgotten or being unknown to the most prescribers because of the frequent mobilization of 75% of the prescribers who were house officer or native recruitment or registrars.
(2) The regulation issues seems to be a managerial commands of the supply department, as it should be of higher authority and circulating continuously and supported by the activities of the Drug Information Center.
(3) The list of drugs was not always available and difficult to be obtained even on request.
(4) No treatment guidelines which is essential in training junior medical staff.
(5) Leveling of prescribers and drugs to be prescribed by the different health practitioners levels seems to be managerial commands not restrictive and was
not in work. As these interventions should be part of the selection list issued by a highly authorized committee.

(6) There was no limits for drugs to be dispensed, one month therapy was used for chronic illness, but one can find prescriptions for 6 months treatment.

(7) For chronic diseases, where the patient was in certain drug treatment and specific dose, and given a card (Annex 8) when declaring this, the patient had no need to revisit the doctor, when the relative brings the card new cota will be prescribed and dispensed. In this situation the patient dead or a life, improved or need other drugs or other dose or any circumstances changed, all these had not been regarded leading to irrational prescribing.

(8) All doctors write any drug under the name of their boss, the prescriber signs for the unit of specialist supervising him. The specialist always endorse that prescription because any patient seen by any doctor in his unit will increase the specialist incentive, because incentives are based on the number of filled prescriptions at the pharmacy. This in turn motivate the prescriber to write a prescription on every form.

**Forms:**

(a) The red form of the specialist:

1. It is designed on the basis of political states but not for the military areas. Which are not always the same.
2. Stated that for external treatment (specialist) for the in patient treatment.
3. There is no serial number.
4. Insurance number was used unlike JRMS where using the military number which could never be repeated.
5. Stating the hour of visit which not in use.
6. The primary diagnosis rarely filled.
7. The prescription form contains also the request for investigation, results of investigations and values of drugs making it crowd.
8. The value of drugs was usually collected by a voucher or receipt.
9. At the tail of the long paper states the total of visit fees + investigation fees + drug cost. It is designed for buying the service, investigations, drugs and not for service and drug providing.
10. Number of prescriptions required, issued but actually meaning number of items.
11. Lastly; payment by Takaful, patient, accountant signature and health insurance officer approval. However, this sequence was not in use, but if it is activated it may provide the expenditure per patient.
12. The form is in 3 copies using carbon paper, one of which for the patient, one for the pharmacy and the other for Takaful. High load of papers for the prescriber.

(b) White form for the casualties, the same points were applied.

(c) Green form: for the inpatient but working like the outpatient form. Forms are for drugs; not daily dose but the whole course of therapy.
i. If the doctor need to add or change the treatment report, he had to ask the co patient for new form.
ii. If the co patient is absent, the doctor round finished the patient will receive the new treatment at once, till the co patient came, bringing a form and searching for the doctor to fill it. Then to the pharmacy to bring the whole drugs. While the inpatient is getting worse.
iii. The image of the service was not so compact and smooth. While the patient at the Heart Center having a treatment sheet designed area drug to the English Hospitals style where there is a special place to prescribe the drug, to issue it from the pharmacy and the nurse who gave the dose at its proper time, all should sign at a restrictive place. A dose of 24 hours was issued (Annex 12)

(13) In JRMS house officers and paramedical were not allowed to write a prescription.
(14) Drugs sellers activities should be organized and under the control of the Drug Information Center.
(15) In JRMS winners pay for each item, but the insurers do not. Equal payment for each item equalizes all drugs in price which is not true.

5.10 Dispensing :
Dispensing of drugs within the pharmacies of the Medical Corps could be discussed from many sides of view, pharmacy practice, place, personnel, procedures, financial aspects and medical services crop. Pharmacies were the last stations of service before the patient go home.

5.10.1 Pharmacies at the Center of SMC :
Personnel:-
Military pharmacists within the central hospitals:
a. Lieutenant pharmacist ➔ part time supply manager for Capital Region.
b. Captain pharmacist ➔ causality ward pharmacy
c. Major pharmacist ➔ referred clinics pharmacy.

The Major pharmacists were graduated as a pharmacist, 5 years after the Captain and the lieutenant. The military rank is contradicting to the professional experience. The remaining pharmacist are either under housemanship who were graduated last year or on National Service. They work 2-3 days a week.

Native Service pharmacists are resident for 4-8 months while those on horsemanship residency is 12 months.

No military pharmacist were in the regional hospital, fighting troops nor war areas.

The Native Service Central Administration Office use to send pharmacists for 4 months to Juba, Wau and in casualties to Kasala and Port Sudan. This took place out of the supply system. The pharmacy assistants, who were trained on the dispensing practices were the only support for the pharmacy service within the medical corps.

Pharmacy laboratory:-
There are no laboratories, depending on Takaful production units.

Distribution of pharmacies :
Location, working hours, personnel, average number of prescriptions and the framework (Table 19).

**Load of work:**
Every pharmacy has one window for dispensing. Many workers are inside and the prescription moves on the dispensing cycle till the patient collects the prescribed drugs. The pharmacy receives many prescriptions daily in a certain working hours. The ratio between the working time and number of prescriptions been dispensed may express the load of work.

(Table 20) indicates that there is a problem at the Central Pharmacy, Referred Clinics Pharmacy, Paediatric Pharmacy and Certain days at the Families Pharmacy.
## B. Locations, working hours, personnel and service areas

<table>
<thead>
<tr>
<th></th>
<th>Pharmacy</th>
<th>Site &amp; location</th>
<th>Building’s shaded area</th>
<th>Working hours</th>
<th>Average daily prescription</th>
<th>Personnel</th>
<th>Service framework</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Central pharmacy</td>
<td>Casualties and evacuation compound</td>
<td>4 x 2½ 10m²</td>
<td>First shift 24 hours 2nd shift</td>
<td>320 50</td>
<td>1. captain ph.</td>
<td>- Casualties clinics</td>
<td>No weekend</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. Native act ph.</td>
<td>- evacuation ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. 3 assistants labours</td>
<td>- inpatients after daytime</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- surgical theaters</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- casualties rooms 24hr.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Referred clinics</td>
<td>Referred clinics compound</td>
<td>7 x 4 28 m²</td>
<td>(8-2) 6 hours</td>
<td>357</td>
<td>1. major pharmacist</td>
<td>- referred clinics within the compound except urology</td>
<td>5 days work Thursday: off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. National Service pharmacist</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3. 2 assistants labor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Officer families ward pharmacy</td>
<td>Officer’s families in patient ward</td>
<td>3 x 2½ 4 x 4 23½ m²</td>
<td>24 hours</td>
<td>45 day time 40 evening</td>
<td>1. National Service pharmacist</td>
<td>- All inpatient after daytime</td>
<td>No weekend</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2. 2 assistants labor</td>
<td>Orthopedic ward</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Officer families ward</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pediatrics pharmacy</td>
<td>Pediatric hospital</td>
<td>4 x 3 + 4 x 3 = 24 m²</td>
<td>24 hours</td>
<td>120 daytime 50 evening</td>
<td>2 assistants morning 1 assistant pharmacist evening</td>
<td>Out patient and inpatient during daytime obs.</td>
<td>Continuos service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Urology only Monday</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Families hospital pharmacy</td>
<td>Referred clinics compound</td>
<td>3 x 4 12 m² no space</td>
<td>(8-1) 5 hours</td>
<td>Sun:50 Mon: 250 Tu:200 We:70 Tr: off Sat: 150</td>
<td>National Service pharmacist 1 assistant pharmacist</td>
<td>ENT dent/ medicine Surgery/ outpatient Ophth. Inpatient</td>
<td>5 days work Thursday: off</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hospital Internal pharmacy</td>
<td>ENT/ophth. And medicine in patient compound</td>
<td>3 x 2 ½ 7½ m²</td>
<td>(8-1) 5 hours</td>
<td>17</td>
<td>1 assistant pharmacist</td>
<td>Psychiatric hospital</td>
<td>Patient receive drugs on admission from the central pharmacy</td>
</tr>
<tr>
<td>7</td>
<td>Psychiatric pharmacy</td>
<td>Psychiatric</td>
<td>4 x 4 + 4 x 4</td>
<td>(8-1) 5 hours</td>
<td>Sunday: 60</td>
<td>1 assistant pharmacist</td>
<td>Dental hospital</td>
<td>Inpatient and</td>
</tr>
<tr>
<td></td>
<td>hospital</td>
<td>size</td>
<td>hours</td>
<td>personnel</td>
<td>outpatient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>----------</td>
<td>-----------</td>
<td>--------------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Dental pharmacy</td>
<td>Dental hospital</td>
<td>3.5x4 + 3.5 x4 28 m²</td>
<td>(8-2) 6 hours</td>
<td>60</td>
<td>1 assistant pharmacist</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Load of work:
Table (20) Dispensing time at different outlets:

<table>
<thead>
<tr>
<th>Pharmacy</th>
<th>Time per one prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Pharmacy: day hours</td>
<td>1 minute</td>
</tr>
<tr>
<td>After day hours</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Referred Clinics Pharmacy: day hours</td>
<td>1 minute</td>
</tr>
<tr>
<td>Officer Families Pharmacy: day hours</td>
<td>2 minutes</td>
</tr>
<tr>
<td>After day hours</td>
<td>7 minutes</td>
</tr>
<tr>
<td>Pediatric Pharmacy: day hours</td>
<td>½ minute</td>
</tr>
<tr>
<td>After day hours</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Families Pharmacy : Sat. Tu. Mon.</td>
<td>1 minute</td>
</tr>
<tr>
<td>Rest of the week</td>
<td>2 minutes</td>
</tr>
<tr>
<td>Internal Pharmacy</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Psychiatric Pharmacy</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Dental Pharmacy</td>
<td>6 minutes</td>
</tr>
</tbody>
</table>

5.10.2 Dispensing procedures:
Fig. (29) Dispensing cycle:

- Patients pay 25% of the drugs price.
- War operations injured: The white form is stamped not to pay.
The National Service recruited patients have different forms and do not pay.
- Inpatients: pay also 25% of the prescription cost.
- Non-insured cored patients: not allowed.
- Emergency drugs: free

The psychiatric pharmacy:
- Militant in service: free for 3 months.

Retirees and services winners: pay 25%.

Doses for the outpatient for a month and inpatient for 72 hours/ then a week and one month on discharged.
The inpatients procedures were the same as the outpatient.

**Pricing:**
According to the price list issued by the central warehouses or to Form 47.
The assistant pharmacist review the prescription, costing the drugs in no time and calculate, free drugs, 25% of the cost and record them in the same prescription and then deliver it to the patient who move to the accountant table.

**Account:**
Receive the money and issue a voucher from 2 copies one copy in the voucher book and the other attached to the prescription. The patient then return the dispensing window. The accountant collect the daily crop and deliver to the central unit.

**Preparing the prescribed drugs:**
The patient delivers the prescription and the voucher to the assistant pharmacist and wait.
A group of prescriptions then delivered to the pharmacist inside who prepare the different prescription and instruct the assistant on doses and patient use, cancel the prescription.
Not available drugs was referred to the contracted pharmacy. Numerous prescription was referred to the contracted pharmacy.

**Registration:**
No prescription registration.
There are no drugs registration books and no inventory records. Only the prescriptions were tied up.

**Training:**
No any training course neither for the dispensers nor pharmacist.

**Audit activities:** Nil

**Dispensing window:**
The assistant call the patients by name to receive their drugs and instructions, overlapping of prescriptions occurs due to the existence of many patients at the same time.

**Chronic diseases:**
They have cards for follow up. However, they attend to take their drugs every month. (Annex. 8)

**Narcotics:** Pethidine HCl and morphine sulphate were dispensed by the pharmacist. The prescriber fills the form (annex. 9). The pharmacist retains the
empty ampoules and dispense the drug in a dispensable syringes to the nurse who sign the receipt.

**Labels:** no bags, Sackets or envelopes, instruction either verbally or by writing in a marker pen.

**Surgical operations:**
Sutures and consumables were dispensed at the pharmacy.

5.10.3 Dispensing during battles.

Accompanied medical team was responsible for the issue. If the team contains an assistant pharmacist, he will be taking the task, if not the medical assistant will curry on the issue. Civilians within the war areas are the responsibility of the army from the health and security aspects. Drugs shortage was common; fighters tend to buy their reserve drugs from the nearest local market.

5.10.4 Selected Therapeutic categories and item price investigations:
Table (21), Chart (13) and Chart (14) illustrate the results.

5.10.5 Inpatient housing according the pharmacy frame work:

1-Internal hospital pharmacy:
For in patient serving 452 beds.

2-Psychiatric Pharmacy:
For inpatient and outpatients. Inpatient it serves about 60 beds.

3-Officer Families pharmacy:
officer families ward 54 bed . orthopaedic ward 159 beds.

4-Pediatric hospital pharmacy:
For out patient and inpatients-54 beds

5-Casualities wards pharmacy
1-Out patients of the casualties . Inpatient admission for 24 hours-35 beds.
2-Evacuation ward: 80 bed
All surgical theatres were supplied directly from the central warehouses.

6- Families hospital pharmacy:
for the out patients and inpatients total of (73) beds

| Table (21)Dispensing investigations |
|------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Mohandes Pharmacy | 72 | 22 | 66 | 44 | 2.7 | 307.5SD |
| Pharmacy | Antibiotics | Antimalarials | Analgesics | Vitamins | No.of items | Average Price |
| Casualties | %42 | %0 | %32 | %22 | 2.1 | 3 | 52.9SD |
| Paesiatric | 78 | 22 | 46 | 16 | 3 | 3 | 52.9SD |
There are no records or registration books. The Takaful non-covered patients are not allowed to buy drugs from the pharmacy, because of the workload and the burden on the central stores, which

<table>
<thead>
<tr>
<th>Referee</th>
<th>48</th>
<th>0</th>
<th>22</th>
<th>26</th>
<th>2.2</th>
<th>436.0SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gyada</td>
<td>86</td>
<td>16</td>
<td>66</td>
<td>18</td>
<td>2.64</td>
<td>227.2SD</td>
</tr>
<tr>
<td>Families</td>
<td>38</td>
<td>0</td>
<td>23.8</td>
<td>52.9</td>
<td>1.73</td>
<td>384.2SD</td>
</tr>
<tr>
<td>Shagara</td>
<td>64</td>
<td>24</td>
<td>42</td>
<td>14</td>
<td>2.12</td>
<td>279.5SD</td>
</tr>
<tr>
<td>Obeid M.</td>
<td>67.5</td>
<td>32.5</td>
<td>40</td>
<td>25</td>
<td>1.8</td>
<td>225.0SD</td>
</tr>
<tr>
<td>Obeid Con</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1098.3SD</td>
</tr>
<tr>
<td>Khartoum Contract</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>577.2SD</td>
</tr>
<tr>
<td>Bahri Contract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>972.7SD</td>
</tr>
</tbody>
</table>

**Chart (12) Utilization of Therapeutic groups at different Outlets**

**Chart (13) Average Item Price at Different Outlets**
is not acceptable. Emergent cases, crying child on fever, dying from dehydration, women on delivery all could not have drugs even later in the night. In spite of paying the operation cost, investigation cost, hospitalization cost but could not have drugs from the pharmacy. Only 11.8% were generic name and they were:

(- Erythromycin, Ciprofloxacin, Multivitamin and Cough syrup) all others are in trade and brand names.

At one peripheral health centre for one day there were 20 prescriptions containing creams and shampoos in pairs and trade names.

Drugs dispensed at one contracted public pharmacies in Khartoum period from 1/12 – 31/1/2002, two months, on 95 prescriptions, 34% of them were multivitamin. The price was arranging from 600 -700 consisting the 75% . the price being 660 ÷ 3 x 4 = 880 SD, which equal 200% the price at the pharmacies inside the system. Expensive multivitamin of price 2800 SD was dispensed. On studying the prescriptions at one contracted regional pharmacy, 47 items were the total items being referred. 28 prescriptions of them could be available in the hospital in abundant quantities. They are produced by the army plant. Chloroquine phosphate syrup : 6 prescriptions.

Paracetamol syrup: 7 prescriptions.

Amoxycillin 125mg suspension. : 5 prescription of price equal to 300% of its price at central stores.

Contracted pharmacy correlated to Gyada hospital: The monthly consumption (100% ) of drugs referred from hospital to Takaful = 1,180,000 SD for the year 2002 Daily: 49,139.9 SD.

Average prescription cost : 1,060.5 SD

For a study of 101 prescription from 1-7/4/2002 results in:
1. Average prescription cost : 960.1 SD.
2. Average item price: 577.2 SD
3. Participation of hospital affiliated pharmacy: 30.35%.

**Pharmacies working under contract with Takaful**
The base is that, the patient pays 25% of the prescription
The pharmacy will be reimbursed by the remaining 75% from Takaful treasury.

A. **Center** :
1. Medical corps public pharmacy : center.
4. Bahri : Bahri area.

**5.10.6 Distribution of the Pharmacies within the Central Hospitals:**

It is clear that, there is great load of work on the referred clinic pharmacy which receives about 350 prescriptions daily with a time for each prescription one minute. Also the central pharmacy which receives about
320 prescriptions on the daytime needs a solution. There should be a way to minimize this burden, this may be through separation of the monthly cota using the cards of continues treatment from the daily prescriptions.

The overlap of free drugs and reimbursed drugs in the Central Pharmacy may lead to confliction; at the same time the high rate of flow of prescriptions ensures the high need to divide both activities.

The Casualties Pharmacy is better to use the unit dose system in a different form to ensure that the patient did not receive more than the allowed drugs and to make perfect records even in the presence of the dual system.

In JRMS, there is the Monthly Pharmacy and the causality cupboard for the free drugs mainly after daytime.

**Pharmacy areas:**

All areas are not official. The official specified area for the retail pharmacy is 50 m²

**The Operation Theaters Pharmacy:**

Specialized pharmacy and pharmacist in the surgical operations requirement is essential to make records to control the consumption and to provide reports on the theaters demands.

**The Internal pharmacy:**

The inpatient pharmacy usually acting on the patient file in daily doses, daily monitoring of treatment, daily patient assessment, all the purposes for patients admissions make the dispensing of a full course of therapy not recommended. The nurse should bring drugs independently from the co-patient.

The internal pharmacy is assumed to serve 452 beds, but it only receives 17 prescriptions daily. This is due to the prescribing in CoT and unit dose system. This CoT is taken at once from the outpatient pharmacy. This pharmacy could be activated by introducing the 24 hour dosage system to one section and supplying the theatres which are adjacent to it from the other section.

**The personnel:**

More militant pharmacists are needed. There should be a pharmacist in every pharmacy according to the Pharmacy and Poisons Act 2001. National Service pharmacists who work two days a week will not be responsible of the pharmacy activities. They rely completely on the assistants.

The distribution of the Native Service pharmacists from the MOH directly to the war areas is not justifiable.
5.10.7 The Dispensing Cycle:

The cycle was inverted. The pharmacist should be the first and the last station for the prescription. In the present cycle the pharmacist does not meet the patient

Instead of pricing drugs in the prescription form it better to issue a payable voucher.

To avoid overlapping of prescriptions and the crowdies near the window, a calling number system will of great value.

The pharmacy and the supply manager do not know the daily revenues of drugs to compare the drugs issued against the revenue. However, this would be of no value without inventory records.

There should be a labeled plastic bags and Sackets to pack the dispensed drugs. Structured stickers for writing the instructions are inexpensive.

5.10.8 Inventory records:

All of Central and Regional Pharmacies do not use to record the issued quantities and those being received. The daily and monthly record books are not available in all pharmacies. How did the stock been taken annually? The existing situation only and not against records will not be a true auditing. The consumption and drug utilization could not be calculated, because of lack of data.

5.10.9 Average item price during the year 2002:

- The price of drugs at the contracted pharmacies is three to four folds of its price at the affiliated pharmacies in spite of the direct purchases of the supply unit.
- Items of the Army Drug Plant should be available at the outlets in abundant quantities.

5.10.10 Therapeutic categories:

Prescriptions containing antibiotics: - 38% -86%

Outlets of high utilization of antibiotics need more efforts, training and direct contact to prescribers for rationalizing drugs use by minimizing utilization of antibiotics. The active and efficient HTC can set effective regulations and treatment Guidelines.

Antimalarial drugs are ranging from -16%- 24%of the prescription.

Vitamins : -16% -53%of the prescription. This indicates the irrational prescribing and over prescribing habits. However, more studies are recommended for irrational use of drugs.
### Distribution of the Contracted Pharmacies According to the Military Areas

<table>
<thead>
<tr>
<th>Military area</th>
<th>No of contracted pharmacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Juba</td>
<td>Nil</td>
</tr>
<tr>
<td>2  Malakal</td>
<td>Nil</td>
</tr>
<tr>
<td>3  Wau</td>
<td>2</td>
</tr>
<tr>
<td>4  Gizera</td>
<td>2</td>
</tr>
<tr>
<td>5  Red Sea</td>
<td>2</td>
</tr>
<tr>
<td>6  White Nile</td>
<td>3</td>
</tr>
<tr>
<td>7  Northern</td>
<td>4</td>
</tr>
<tr>
<td>8  Mujlad and w. Neuir</td>
<td>4</td>
</tr>
<tr>
<td>9  Blue Nile</td>
<td>5</td>
</tr>
<tr>
<td>10 Medeliternean</td>
<td>6</td>
</tr>
<tr>
<td>11 Western m.a</td>
<td>8</td>
</tr>
<tr>
<td>12 Eastern</td>
<td>10</td>
</tr>
</tbody>
</table>

In spite of the aggregations of forces in Juba and more crises were there, but Takaful did not extended its activities to Juba.

Payment of the 25% being a suspended problem, but a higher command can solve the problem.
5.11 Finance

**5.11.1 Resources:**

Before 1999, the only financial resources was the government budget, which did not satisfy the supply demands.

The budget considers all the medical corps activities, drugs, dressing, disinfectants, vaccines, preventive medicine requirement, hospital sanitary, machine and equipment on different classes.

**Table (22) Governmental budget:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Approved Budget SD</th>
<th>Actually accessed</th>
<th>Percentage of actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>400 millions</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>1998</td>
<td>400 millions</td>
<td>220 million</td>
<td>55%</td>
</tr>
<tr>
<td>1999</td>
<td>600 millions</td>
<td>180 millions</td>
<td>30%</td>
</tr>
<tr>
<td>2000</td>
<td>600 millions</td>
<td>100 millions</td>
<td>16.6%</td>
</tr>
<tr>
<td>2001</td>
<td>710 millions</td>
<td>95 millions</td>
<td>13.3%</td>
</tr>
<tr>
<td>2002</td>
<td>660 millions</td>
<td>6.757 millions</td>
<td>1.02%</td>
</tr>
<tr>
<td>2003</td>
<td>660 millions</td>
<td></td>
<td>6.05%</td>
</tr>
</tbody>
</table>

On 1997, no data available, this is due to unavailability of records. Invoice were delivered directly to the Central Financial Affairs to issue a cheque against each invoice.

During the year 1998, the first bank account was opened. A tender had been executed in quarterly bases. Only the first quarter had been executed due to the inaccessibility of the approved budget.

On the 5th of May 1998, a command 614 the Minister of Defense charged the Board of Directors for the Military Health Insurance, achieved by the Deputy Chief of Staff for Administration and the Medical Corps Leader is the Chief on duty.

The premiums were defined as 800 SD monthly for the officer and 400 SD for lower ranks.

This constitute 40%, according to Health Insurance Act. The MOF covers the remaining 60%.

**Recent Resources:**

Takaful (health insurance) treasury is the main support for drug supply all over the country for militaries, retires and families:

1) Government share directly from the MOF in monthly intervals is 80 millions SD
2) Member premiums deducted from salaries at the army financial affairs monthly: 70 millions SD
3) Retired militaries: 5 millions SD
4) Civilians in the army employment: 2 millions SD

**A total of 157** millions SD

The revenue of drugs paid by the patient (25% of the prescription cost was retained in a separate account to cover emergencies).
From the above budget the supply unit fund was not defined but a total of 70 millions SD monthly was allowed with argument, this constitutes 45.2% of Takaful budget. The supply unit held a tender for the year 2003. The total of 805,506,317 SD for drugs and dressings 173,702,725 SD for surgical equipment 200,000,000 SD for CMS public org. for untendered items 1179,209,042 SD

A total of 1.2 billions SD was required to fulfill the tender another budget of 0.6 billion SD was needed for the war areas. They are the monthly Takaful budget and the Financial Affairs budget being mentioned.

The remaining 87 millions SD of the budget was funded for:
1) Operation cost.
2) Salaries and incentives.
3) Contracted hospitals and doctors for services.
4) Contracted pharmacies.
5) Others.
No clear funds were defined.

5.11.2 Organization:-

The Army Central Financial Affairs were the only official outlet of the governmental finance to the army.

The governmental budget of the Medical Corps was one of the components of the general budget. Till the year 2001 there was no accounting unit within the Medical Supply Department. The finance was managed directly at the central level.

By implementing the ‘Takaful’ an accounting unit was established.

Now, as the main financial resources for the medical supply is through Takaful, the supply became one of the section of Takful organization. The Financial Unit managing the supply operations had been located as a subordinate of Takaful Manager.

The Financial Manager supervises an integrated team exhibiting the different accounting transactions and operations.

5.11.3 Procedures: Procedures for payment.

For deposit: Cash collectors at all pharmacies collect the 25% of drugs cost. They Issue a voucher for cash prescription, and then directly deposit cash to the financial unit daily, some weekly or even monthly for regions. The financial unit aggregates all deposit in a cash account nominated for this purpose.
5.11.4 Drug expenditure:
(1) 70-80 millions SD per months, for the drugs within the system.
(2) Contracted pharmacies, monthly announcement for payment, paid from
another fund.
(3) The total value of the inventory is 368,315,400 SD. at the Central
Warehouses.
(4) Revenue of the cost coverage service for uninsured patient.
5.11.5 Pricing of drugs:
No standard criteria, a price list was set in a non-formulary way, new
invoices follow the latest invoices. Prices were set in order to be below the
market price and above the invoice price. However, invoices were currently
entered without changing the prices. Many trade names follow one price
independent of the invoice price.
Prices are settled within the warehouses level and approved by the supply
managers.
5.11.6 Audit:
Audit procedures are carried out annually by the Armed Forces General
Inspector managerial and financial inspection, a report was annually raised to the
Army Chief of Staff.
5.11.7 Contracted pharmacies payments:
- pharmacies within the center announce weekly for payment.
- States pharmacies announce monthly for payment.
The Center:-
- The Annual Payment for the year 2003 is 107,200,000 SD

<table>
<thead>
<tr>
<th>Pharmacy</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Medical Corps Public</td>
<td>88.54%</td>
</tr>
<tr>
<td>2. M.A. faki Public</td>
<td>8.32%</td>
</tr>
<tr>
<td>3. Bahri: Pharmacy</td>
<td>2.48%</td>
</tr>
<tr>
<td>4. Jabal Awlia Pharmacy</td>
<td>.66%</td>
</tr>
</tbody>
</table>

Average month 9 millions SD

This value for the 75% reimbursement. The other 25% paid by the patient is 3
millions SD.
Center total annual shortage 144 millions SD

The States:
Table (23) The average payment per month for 75% reimbursement 2003:

<table>
<thead>
<tr>
<th>Area</th>
<th>No of pharmacies</th>
<th>Average month LS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. South of Blue Nile M.A.</td>
<td>5</td>
<td>29,166,783.45</td>
</tr>
<tr>
<td>2. Eastern M.A.</td>
<td>10</td>
<td>26,878,304.29</td>
</tr>
</tbody>
</table>
3. Western M.A.  |  9  |  23,178,566,78  
4. North Newair M.A.  |  4  |  24,375,813,80  
5. Northern M.A.  |  4  |  12,548,544,40  
6. Middle M.A.  |  6  |  12,049,424,62  
7. Buhr elGhazal M.A.  |  2  |  9,457,681,33  
8. White Nile m.a  |  3  |  6,108,285,89  
9. Gizera M.A.  |  2  |  5,476,135,82  
10. Red Sea M.A.  |  2  |  4,618,700,30  

|  |  | **153,858,240,68**  

The total cost of drugs for one month: **20,514,432 SD**  
The total cost of drugs for the year: **246,173,185 SD**  
In study 1/1/2001 – 13/3/2001(3 months) a total of 21,732,044,00 SD for contracted pharmacies. The payment to the contracted pharmacies increased by 100% from 2001 to 2003.

5.11.8 Deposits:

A. The Center

The 25% of drugs cost:

The total amount collected at the different pharmacies for the year 2003 till December is 90,538,620SD.

Table (24) Average per month for different pharmacies
<table>
<thead>
<tr>
<th>Pharmacy</th>
<th>Average/month in SD</th>
<th>Pharmacy</th>
<th>Average/month in SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Central Pharmacy</td>
<td>1724988</td>
<td>16. Bahri Pharmacy</td>
<td>215945</td>
</tr>
<tr>
<td>2. Pediatric Pharmacy</td>
<td>1237285</td>
<td>17. Kadroo Pharmacy</td>
<td>6629</td>
</tr>
<tr>
<td>3. Referred Clinical Pharmacy</td>
<td>1140823</td>
<td>18. Kalakla Pharmacy</td>
<td>75990</td>
</tr>
<tr>
<td>4. Dental Pharmacy</td>
<td>162493</td>
<td>19. Dar els lam Pharmacy</td>
<td>80798</td>
</tr>
<tr>
<td>5. Officer Families Ward Pharmacy</td>
<td>381504</td>
<td>20. Magrous Pharmacy</td>
<td>68372</td>
</tr>
<tr>
<td>7. Mohandesin Pharmacy</td>
<td>193399</td>
<td>22. Jayli Pharmacy</td>
<td>24363</td>
</tr>
<tr>
<td>10. Shagara Pharmacy</td>
<td>275334</td>
<td>25. Kur Omar Pharmacy</td>
<td>24949</td>
</tr>
<tr>
<td>12. General warehouse Pharmacy</td>
<td>107462</td>
<td>27. Fatasha Pharmacy</td>
<td>42163</td>
</tr>
<tr>
<td>13. Wadi Saidna Pharmacy</td>
<td>336210</td>
<td>28. Markh iat Pharmacy</td>
<td>39763</td>
</tr>
<tr>
<td>14. Tegana Pharmacy</td>
<td>154431</td>
<td>29. Military prison Pharmacy</td>
<td>21506</td>
</tr>
<tr>
<td>15. Mazalat Pharmacy</td>
<td>195021</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Medical Corps compound pharmacies 8 pharmacies collects monthly 5038171
B. The States:
The 25% of drugs cost collected for the year 2003 according to the military regions.

<table>
<thead>
<tr>
<th>Region/ pharmacy</th>
<th>N- outlets</th>
<th>Value SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Equatorial M.A.</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>2 South of Blue Nile M.A.</td>
<td>2</td>
<td>427724</td>
</tr>
<tr>
<td>3 Eastern M.A.</td>
<td>6</td>
<td>2088952</td>
</tr>
<tr>
<td>4 Western M.A.</td>
<td>3</td>
<td>500316</td>
</tr>
<tr>
<td>5 Northern Newair M.A.</td>
<td>2</td>
<td>134990</td>
</tr>
<tr>
<td>6 Northern M.A.</td>
<td>3</td>
<td>410090</td>
</tr>
<tr>
<td>7 Middle M.A.</td>
<td>7</td>
<td>884307</td>
</tr>
<tr>
<td>8 Buhur el Ghazal M.A.</td>
<td>1</td>
<td>96154.5</td>
</tr>
<tr>
<td>9 White Nile M.A.</td>
<td>1</td>
<td>226221</td>
</tr>
<tr>
<td>10 Gezira M.A.</td>
<td>2</td>
<td>248985</td>
</tr>
<tr>
<td>11 Red sea M.A.</td>
<td>2</td>
<td>196459</td>
</tr>
<tr>
<td>12 High Niles M.A. Malakal</td>
<td>1</td>
<td>145454</td>
</tr>
</tbody>
</table>

Total 5,359,652,50

The total 25% collection appeared in the budget declaration in December 2003 was 128,736,337,58SD in a pool account not differentiated.

In a study 2001 from 1/1/2001 to 13/3/2001 the total 25% collection was: 12,226,868,39 SD for the year 2003.

Collection of economic service fees for doctors was 5,700,000SD investigation and x-rays was 20,700,000SD

In the payment schedules some areas need a follow up for depositing.

Operation cost could not be obtained because all depend on the cash method procedures.

5.11.9 The Deficits in cost coverage:
The records deficits are not available. The delivers costs was obtained. Then it had been sorted, arranged on the outlet column on Excel program. The sum for every outlet is obtained.
The 25% collected by the Financial Department was obtained and entered to the work sheet, multiplied by four to get the full cost of drugs.
The percentage of the money collected to the total cost was calculated for every outlet. Then the deficit was obtained ( Table 26).
<table>
<thead>
<tr>
<th>Pharmacy &amp; region</th>
<th>Location</th>
<th>Pharmacy &amp; region</th>
<th>location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central pharmacy</td>
<td></td>
<td>Kosti</td>
<td></td>
</tr>
<tr>
<td>Offic. families ward</td>
<td></td>
<td>Gadarif</td>
<td></td>
</tr>
<tr>
<td>Internal pharmacy</td>
<td></td>
<td>Demazin</td>
<td></td>
</tr>
<tr>
<td>Psychiatric</td>
<td></td>
<td>Ribkona</td>
<td></td>
</tr>
<tr>
<td>Referred clinic</td>
<td></td>
<td>Atbara</td>
<td></td>
</tr>
<tr>
<td>Families</td>
<td></td>
<td>Hantoup</td>
<td></td>
</tr>
<tr>
<td>Pediatrics</td>
<td></td>
<td>Medani</td>
<td></td>
</tr>
<tr>
<td>Dental Hosp.</td>
<td></td>
<td>Genana</td>
<td></td>
</tr>
<tr>
<td>Mohandiseen</td>
<td></td>
<td>Fashir</td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td></td>
<td>Fawo</td>
<td></td>
</tr>
<tr>
<td>Mahlaj</td>
<td></td>
<td>Abo Gebaiha</td>
<td></td>
</tr>
<tr>
<td>Labal Awlia</td>
<td></td>
<td>Obeid</td>
<td></td>
</tr>
<tr>
<td>Shagara</td>
<td></td>
<td>Singa</td>
<td></td>
</tr>
<tr>
<td>Kalakla</td>
<td></td>
<td>Malakal</td>
<td></td>
</tr>
<tr>
<td>General Warehouse</td>
<td></td>
<td>Aroma</td>
<td></td>
</tr>
<tr>
<td>Gyada</td>
<td></td>
<td>Dordaib</td>
<td></td>
</tr>
<tr>
<td>Public Defense</td>
<td></td>
<td>Neyala</td>
<td></td>
</tr>
<tr>
<td>Mazalat</td>
<td></td>
<td>Girba</td>
<td></td>
</tr>
<tr>
<td>Fatasha</td>
<td></td>
<td>Dalang</td>
<td></td>
</tr>
<tr>
<td>Khalid Ibn Walied</td>
<td></td>
<td>Tulodi</td>
<td></td>
</tr>
<tr>
<td>Dar el-Salam</td>
<td></td>
<td>Liri</td>
<td></td>
</tr>
<tr>
<td>Tehgana</td>
<td></td>
<td>Abyay</td>
<td></td>
</tr>
<tr>
<td>Military Prison</td>
<td></td>
<td>Babanasa</td>
<td></td>
</tr>
<tr>
<td>Wadi Saidnna</td>
<td></td>
<td>Jabait</td>
<td></td>
</tr>
<tr>
<td>Shambat</td>
<td></td>
<td>Slalab</td>
<td></td>
</tr>
<tr>
<td>Kadaro</td>
<td></td>
<td>Halfa</td>
<td></td>
</tr>
<tr>
<td>Gayli</td>
<td></td>
<td>Wawo</td>
<td></td>
</tr>
<tr>
<td>Bahri</td>
<td></td>
<td>Sinkat</td>
<td></td>
</tr>
<tr>
<td>Markheyat</td>
<td></td>
<td>Aweel</td>
<td></td>
</tr>
<tr>
<td>Migrous</td>
<td></td>
<td>Tokar</td>
<td></td>
</tr>
<tr>
<td>Port Sudan</td>
<td></td>
<td>Abo Gabra</td>
<td></td>
</tr>
<tr>
<td>Kasala</td>
<td></td>
<td>Almairam</td>
<td></td>
</tr>
<tr>
<td>Shendi</td>
<td></td>
<td>Mojlad</td>
<td></td>
</tr>
</tbody>
</table>

These results necessitate the isolation of free drugs from the reimbursed drug. The pharmacies should work in financial aspects similar to that of the business style. Contraction for the pharmaceutical service to a military organization will save all these deficits for Takaful.

**B- Table (27)Regional Pharmacies:-**

```
<table>
<thead>
<tr>
<th>Region</th>
<th>pharmacies</th>
<th>Region</th>
<th>pharmacies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern military region</td>
<td>Faow modern ph. 1, Gadrif public ph. 2, Girba people’s ph. 3, Medical corps ph. 4, Shifa pharmacy 5, New Halfa ph. 6, Halfa sugar factory 7, Dordiab pharmacy 8, Aroma pharmacy 9, Tokar pharmacy 10</td>
<td>Western military region</td>
<td>Hilal pharmacy 1, Masara pharmacy 2, Seventh brigade ph. 3, Safaa pharmacy 4, Kawthar pharmacy 5, Amjad pharmacy 6, Hammas pharmacy 7, Public pharmacy 8, Noman pharmacy 9, Shifa pharmacy 6, New Halfa ph. 7, Gadrif public ph. 2, Girba people’s ph. 3, Medical corps ph. 4, Shifa pharmacy 5, New Halfa ph. 6, Halfa sugar factory 7, Dordiab pharmacy 8, Aroma pharmacy 9, Tokar pharmacy 10</td>
</tr>
<tr>
<td>Baher El Ghazal region</td>
<td>Tusheen pharmacy 1, Social services ph. 2</td>
<td>Red Sea military region</td>
<td>sea forces pharmacy 1, sea forces pharmacy 2, Hilal pharmacy 1, Masara pharmacy 2, Seventh brigade ph. 3, Safaa pharmacy 4, Kawthar pharmacy 5, Amjad pharmacy 6, Hammas pharmacy 7, Public pharmacy 8, Noman pharmacy 9, Shifa pharmacy 6, New Halfa ph. 7, Gadrif public ph. 2, Girba people’s ph. 3, Medical corps ph. 4, Shifa pharmacy 5, New Halfa ph. 6, Halfa sugar factory 7, Dordiab pharmacy 8, Aroma pharmacy 9, Tokar pharmacy 10</td>
</tr>
<tr>
<td>Jazzira military region</td>
<td>Medani public ph. 1, Shaheed public ph. 2</td>
<td>White Nile military region</td>
<td>Rahma public pharmacy 1, Soltan hospital ph. 2, Health insurance ph. 3, Hilal pharmacy 1, Masara pharmacy 2, Seventh brigade ph. 3, Safaa pharmacy 4, Kawthar pharmacy 5, Amjad pharmacy 6, Hammas pharmacy 7, Public pharmacy 8, Noman pharmacy 9, Shifa pharmacy 6, New Halfa ph. 7, Gadrif public ph. 2, Girba people’s ph. 3, Medical corps ph. 4, Shifa pharmacy 5, New Halfa ph. 6, Halfa sugar factory 7, Dordiab pharmacy 8, Aroma pharmacy 9, Tokar pharmacy 10</td>
</tr>
<tr>
<td>South of Blue Nile military region</td>
<td>Rabi pharmacy 1, Zamala public ph. 2, Afia pharmacy 3, Saliehen pharmacy 4, Yahgeen pharmacy 5</td>
<td>Meddle military region</td>
<td>Bon Gadeed ph. 1, Sandos store 2, Lagawa hospital ph. 3, Hilal pharmacy 1, Masara pharmacy 2, Seventh brigade ph. 3, Safaa pharmacy 4, Kawthar pharmacy 5, Amjad pharmacy 6, Hammas pharmacy 7, Public pharmacy 8, Noman pharmacy 9, Shifa pharmacy 6, New Halfa ph. 7, Gadrif public ph. 2, Girba people’s ph. 3, Medical corps ph. 4, Shifa pharmacy 5, New Halfa ph. 6, Halfa sugar factory 7, Dordiab pharmacy 8, Aroma pharmacy 9, Tokar pharmacy 10</td>
</tr>
<tr>
<td>Majulad and west of Newir m. region</td>
<td>Elbir public ph. 1, Shaheed public ph. 2</td>
<td>Equatorial Military region</td>
<td>Nil, Juba, Obied, Rehaid, Lagawa, Bara, Abugebaiha, Talodi</td>
</tr>
<tr>
<td>Northern military region</td>
<td>Salam public ph. 1, Deba public ph. 2, Nur public ph. 3</td>
<td>High Niles military region</td>
<td>Nil, Malakal</td>
</tr>
</tbody>
</table>

A total of 47 pharmacies under contract of Takaful at the states plus 4 pharmacies at the center, the total is 51 pharmacies under contract.

5.11.10 Assessment:

1- The Governmental Budget:
On studying the annual government budget, the results revealed that the approved budgets are figures of no value. The percentage of the actual budget to the approved one decline from 55% in the year 1998 to 1.20% in the year 2002, it was 0.86% for the year 2003 till December when jumped to 6.05% by purchasing Mengiocccocal vaccine from the fund.

By interviewing the Head Department of the Financial Affairs of the Army, he clarifies the issue. He collects the monthly premiums for Takaful and gets the government share, 70 millions SD and 80 millions SD respectively. He was convinced that there should be no need for extra funds, or allocations for the Medical Corps, but if there is any need, the NFDMS should cover. There is enough money circulating in the SMC. He justified the figures appeared in the general army budget that they use to fill these figures to advocate for the general army budget from Ministry of Finance.

But, there are three main reasons for this budget:

1. Fighters and who are in the war areas can not pay the premium share of the 25%, and many mobile troops tend to lose their drug stock in battles.
2. Logistic preparation for war operations, lost stocks, high risk of soldiers and great expenses for battles, who will pay for this?
3. Casualties, the 24 hours drugs, the government allows the MOF to recover this issue, for instance, Khartoum Educational Hospital gain a budget of 16 millions SD monthly to cover the casualties drug expenditures. The MOF allows the CMSPO to issue the drugs within this budget. This is true for all other civilian hospitals.

For these reasons the system should make use of this fact either to pay the invoices for the war areas or paying the share of the 25% or pay the invoices of free casualties drugs or all of them, but respectful invoices should be delivered.

On the questionnaire, no other alternative for the monthly budget of Takaful, it could not be given in advance for half the year or even for 3 months.

2- Resources: (1) The available resources could be extended by including extra categories of related activities to the service coverage

(2) Full charge service to civilians.

(3) pharmacies may work in the basis of full charge value of drugs extra revenue can take place.
3- Operational cost:

The report of the Army General Inspector 2001, stated that 40% of the budget is a working cost, 60% is for drugs. The total monthly budget is 157 millions SD while the drug budget is 70 millions SD represents about 50%. The remaining 50% is for the other expenses.

This situation is not true, provided that the rest of the budget includes:

1- Public pharmacies working under contract.
2- Contracts for services in many regions.
3- Salaries and incentives.
4- Operation cost.

4- Drug expenditure:

The total annual collection of the 25% of drug cost is: 128,736,337.5 SD

The total cost of drugs issued against this value is: 514,945,650 SD

**Contracted pharmacies:**

a. The center = 150millions.SD
b. The states = \( \frac{250 \text{millions.SD}}{400 \text{millions.SD}} \)

This represents the total shortage of drugs of the system that is replenished by contracted pharmacies.

Comparing the cost of drugs issued by the systemic pharmacies to that issued by contracted pharmacies state the ratio of 5.1:4

That the contracted pharmacies services represents 44% of drug expenditure.

The supply system looses 20% which is the revenue of the retail pharmacy, this means that the drug expenditure on whole price is 322 millions SD as the transportation for the states increase the cost considerably, we can say the actual drug expenditure at the source is 30 millions SD the loss will be 25%.

As these pharmacies purchase the drugs directly, the price will differ from that of the tender by 46%.

That means this drugs could be obtained by approximately 140millions SD the total loss will be 65%.

The actual total expenditures is 140 + 510 = 650 millions SD.

So, if contracting for the whole pharmaceutical service, setting the prices according to a tender process, on 15% profit for the service provider, 25% will be the least saving and the whole operation cost. The National Health Insurance contracts for the pharmaceutical service with the RDF and yields appreciated results. (Annex. 13).
5.12 Security Measures

1. There are no security measures at the selection, procurement, purchasing levels and on receiving consignments.

2. **Shelves**: Staff and workers acquiring their own needs, friends and relatives in a narrow limits and little quantities, being subtracted from pharmacies quantities on delivery.
   
   Workers: expensive known items only. (April 2004, a reported case of the cefuroxime 750 mg I.M.)

3. **Delivery problems**: Subtracting from the request and inquiring the representative. Theft from goods that had been signed by the hospital representative. Improper quantities.

4. **Packaging and shipping**: Packed drugs in cartons waiting for transportation as much as it stays as more as its available for theft from the stores staff especially expensive drugs. Reports on ciprofloxacin.

   No measures for the shipping staff.

5. **Transportation**: Lorries and trucks; quantities is the responsibility of the shipping office. Heat, weather conditions and technical measures had no security and quality assurance for drugs after transportation on lorries for 5-7 day? Consignment for one facility transferred to other was common.

6. **Receipt at the pharmacies**: No measures, no forms for discrepancies. A voucher filled by the affiliated unit of control and security, should be signed and stamped by the executive manager at the health facility declaring the receipt of consignment. The health facility should be allowed to take new consignments when returning this voucher. Commonly these vouchers were accumulated at the health facilities in the states and they took new consignment that, many excuses were advocated. The peripheral hospitals and health centers in the capital city region, receives their drugs without this voucher.

7. **Pharmacies**: Theft was common, staff by the aid of others as patients. Many cases were reported. No measures adopted.

8. **Insurance cards**: Many cards were issued with false documents. 30% of cards at one station were false. New magnetic cards with new documents were planned to be applied.

   The actual total number of the cards issued at the Center and different states could not be obtained. Bias was common.

9. **Prescribing**: Patients without cards. Patients with cards of other person. A card without attendance of the patient. Patients with prescription from other doctors, the prescriber fills the form with another prescription. Patients requesting certain drugs. Drugs for one person with the prescribed drugs for the patient. Prescribing drugs that could be passed to the private contracted pharmacy.
Over prescribing. There was a bill for every ill and drugs for all forms. If the
doctor did not prescribe drugs he will not have the fees.

10-Dispensing: Dispensing unprescribed drugs for relatives. Dispensing more
quantities, extra courses. Dispensing drugs without prescriptions. Dispensing for
staff. By passing prescription for the referred pharmacy. Wrong pricing,
Dispensing without payment. Cases were reported on the Legal Affairs records.
The annually physical stock taking leads to continuous corruption during the
year without discovery.

11-Outpatient security measures: Declaring the insurance card to get
prescription form. Obtaining a voucher to get the drugs. Cheating in the
insurance card, prescribing and dispensing had been mentioned. The patient,
nurse and assistant staff may add some drugs to a patient prescription, addition
of items had been reported.

12-Inpatient security measures: Obtaining the file on a request from the
physician. Obtaining an inpatient prescription form from the Statistical Unit
whenever drugs were required. Cheating in the file by nurse or the co-patients
cannot be ruled out.

13-Nursing staff: Having prescription in the outpatient clinics where they work
every now and then using their cards and their families’ card. Using the
inpatient files for expensive drugs. The nurses retained files of discharged
patients and they did not deliver them to the statistical unit.
Narcotics cheating were not reported.

14-Surgical operations theatres: No measures to catch theft of sutures, tools
and drugs. Many cases were reported on the easily theft of sutures Sackets,
anesthetics, tools, drugs and consumables by the medical staff.

15-Laboratories: no measures.

16-Referred pharmacies:
Addition of drugs to the prescription had been reported.
Dispensing of expensive drugs was reported. Cheating in prices is difficult
to be discovered. Increasing the quantities was reported. Non-covered
drugs being dispensed.

17-Security in approval of drug request: No measures.

18-Safety measures: - at the stores; the stores as in fig (27) was adjacent to
combustibles and the garage and workshops of floors and fuel stores.
- Water drainage and water lines, electricity were close.
- Connected to other buildings.
- No fire or smoke alarms.
- One air condition being working 24hours without security measures.
No training in fire frightening, no facilities except water cylinders.
Explosives could not be avoided or discovered.

19- Security in the employment against fraud and employment of relatives.
No measures on the person who should be employed.

20-Security in the financial affairs: Deposits of the 25% being collected from
the different pharmacies; no measures to assure that it had been added to the
account that the collector may deceive on this, in spite of being given on book
and he have to deposit the money collected to have a new book. Peripheral and states pharmacies, often not delivering the collected revenue in accounting basis. Expenses: No measures.

21- Night guarding: No special guard but on the guard of the whole medical corps compound.

22- Security in the quality assurance: No measures.

23-Site security: Building being adjacent to other buildings. Center of walkers’ roads. No boundaries. No locked area.

24-Procedures security: No measures for the flow of papers and work and load of work in the clinics or the pharmacies.

25- Document security: None.

26- Security in disposing expired or spoiled drugs: No technical reports are available due to confidential reasons.

27- Security at the inlet and outlets of visitors: Any body can enter at anytime during the day. Any one can exit at any time. Cars and motorcycles usually enter the hospital area, casualties and private economical therapy at El-Taheel Health Center.

28-Entrance and exit visitors control: Open gates with guards at the main gate of the whole complex.

29-Penalties and judging: A judge man is in duty. Penalties on drugs are usually for theft of workers and biased insurance cards. Cheating in cards. General penalty; discharge from the military service.

30- Pharmaceutical inspection: The reports of annual stock taking is always perfect no discrepancies. Unannounced stock taking had not been held. Cupboards in the patient wards of the nurses, clinics and operation theaters of no control. Expired drugs are not taken in consideration. The prices are taken in 25% basis. Nurse in the night services at the peripheral health centers are not under any control. No evaluation reports being held.

31- General trend:

- Rumors or shouting cries within the armed forces written by the Department of Intelligence and Information every month, raised to the General Command of the Army.
- Constant point of drug shortage is always included without judgment of the matter.

Organized theft of a gang-like theft was not reported but simple theft, according to the regulations. It is reported that some drug cartons had been delivered with consignment to peripheral hospitals.

The theft of remainders of the dressings and suture contribute the most common phenomenon, patients and their families especially in peripheral hospitals tend to attend daily for prescribing, little quantities of drug then being accumulated and sell it. The Judge was convinced that all of the discrepancies he judged were due to managerial errors and leakage in the system. Due to aggressive punishment and continuous follow up of the penalties, the discrepancies declined to a reasonable extend, but the system leakage exists.

32-The Public Pharmacy conflicts:
When the prescribed drugs are famous brand names, the pharmacy dispense a low price drug and announce payment of those expensive famous drugs.

The patient may not have money or refuse to take all prescribed drugs, but the pharmacy announce for payment of the whole prescriptions. The workers in the pharmacy may take the difference. Patients may sell the prescription to the pharmacy staff. Whom they may resell it to the pharmacy.

How much the patient pays for the 25% is not known. Securing this stage is a matter of discussion.

At the public pharmacy, the patient may calculate the 75% of the prescription value and take cosmetics, perfumes, creams, and shampoos.
Chapter 6

Conclusion and Recommendations
6. Conclusion and Recommendations:

6.1 Conclusion:
The problems related to the medical supply in the Sudanese Medical Corps lie on three dimensions:

6.1.1 Organizational & managerial problems:
The pharmaceutical activities are carried out within three bodies working in the same field, the Medical Corps, the Health Insurance Program (Takaful) and the NFDMS. They act jointly in sometimes and parallel in others. The Health Insurance of the managed care type provides the services and drugs in 75% reimbursement. The pharmaceutical activities of these bodies overlap either at the managerial levels or at the utilization levels. Pharmacists in these bodies possess different authorities, responsibilities, and facilities not corresponding to the military ranking or the professional experience levels. The lack of one organizational and managerial hierarchy leads to conflicts in objectives. The ordinance 1994 needs to be updated. There is no unity of command or in charged senior pharmacist terminating the usual organizational and managerial hierarchy. The losses due to this disorganization are 25-30% of total drug expenditure. The opportunities of elaborating and establishing a dependable innovated one pharmaceutical organization are available and highly cost-effective. It needs only a managerial command.

6.1.2 Financial problems:
Lack of funds paralyzes the activities of the supply unit for years. Lack of enough funds for the war areas costs fighters lives, and may defeat the forces in actions. Fighters in the war areas fulfill the Takaful deductibles without gaining a service except after being referred to the main hospital. However, their dependents receive the service. The Medical Corps do not receive the usual hospitals budget that had been funded for casualties. It is 16 millions SD monthly for Khartoum Educational Hospital.

Direct purchases method is against the governmental regulations leading to many complexities, elevation of prices and indents which in turn elevates prices. The Takaful may run the same cycle, because of the 150 millions SD, 70-80 millions are allocated monthly for drugs. The shortage (45%) covered by referring to the unaffiliated pharmacies together with the continuous direct purchases the supply system may collapse sooner. The tender average drug prices is 46% of the direct purchases drug prices.

There are problems in collecting the revenue of drugs (the 25%). Audit procedures for this purpose are difficult because the free drugs are consolidated with those reimbursed by 75% and the availability of the Actions Supplies together with Takaful drugs at one outlet.
The monthly allowance of the budget is the main obstacle to carry out a tender except in the basis of scheduled payment which is a form of indention and may slightly elevates prices (Malaysia). Joint efforts and joint purchases with the CMSPO are cost-effective.

6.1.3 Professional practice problems:

1- Personnel:

Lack of qualified personnel is a chronic problem. Pharmacists are refusing to be in uniform due to the long term contract or the non-contract employment and also due to the low governmental payment. There are 135 enlisted pharmacists at the JRMS and 35 pharmacists at Omdurman Educational Hospital, while there are only 13 military pharmacists in the Sudanese Medical Corps, 7 of them are working in the NFDMS facilities.

2- Selection of drugs:

All trials aimed to define a list of drugs required to be available at the Medical Corps had failed due to lack of consensus, the informal procedures, non-scientific basis and the ignorance of the authoritarian level of the army and users. The rational preparation of such a list needs the evolution and involvement of all sectors. Without a list, physicians will continue prescribing specific trade names, new unapproved-efficacy drugs, follow medical representatives information, self-interest could not be excluded, and obeying patients demands. Prescribing of vitamins which reaches 85-90% of the filled prescriptions will lead to depletion of resources and lastly the supply system could not be able to get all drugs in the market and shortage will continue. The National Act 2001 for the Health Insurance instructs for the formulation of a selected list. The corner stone of the supply success is the Pharmacy and Therapeutics Committee. In JRMS this committee results in the Military Drug and Therapeutics Formulary.

2- Procurement of drugs:

Quantification was based on the bin cards which did not reflect the shortage. The inventory records are not available at all outlets. The improvement of quantification requires good practice of consumption records. The statistical form of Takaful ignores the prevalence of diseases and age of patients making it useless in quantification of drugs.

Direct purchases are illegal according to the governmental and military regulations, competitive and restricted tenders may solve the problem to some extend. The requirements should be priced before opening a tender. Calculations of the lead time and the safety stocks are basic elements in drug quantification. On therapeutic categories analysis, the antibiotics constitute 31% of the total drug expenditure, I.V fluids equal to 14% of the total budget. Price analysis indicates the stability of drug prices of domestic drugs and the feasibility of purchasing from the CMSPO. In one week the contribution of the public pharmacy in 1013 prescriptions represents 82% of the total value of these jointly filled prescriptions. The average item price at the affiliated pharmacies is 12.5% that of unaffiliated pharmacies.
Contracting for supplies is essential as practiced at the JRMS to guarantee the quality. Penalties usually provide good performance.

3- Distribution of drugs:
There is no meaning to spend billions of Dinars in purchasing good quality drugs and having an appropriate storage facility. Boundaries, gates, security measures, receipt area, packaging and shipping area, storage area, cold chain, controlled room, inflammables area, pallets and shelves, aeration and personnel facilities are issues to be considered. Receipt committee, allocations committee and delivery committee provides transparency and good warehousing practices. The stores of the Medical Corps are scattered units in the area of the Medical Corps Compound, with no boundaries and entrance control. The new building of Takaful blocks the only probable way for the plant to comply the official requirements. The distribution system of sunshine type makes the load of work reaches 6-8 requisitions to be filled daily. Transportation of drugs for 5-7 days on inappropriate conditions may affect the quality. Transportation from all health facilities in the country to the centre, waiting for a week and then return back, necessitates the establishment of the regional stores. The efforts in controlling these regional stores will be less expensive than the problems arise on centralization.

Computerization of the inventory records allows the fast accessibility of information. The information from the facilities is fundamental for monitoring the process. Unannounced stock taking provides trust in the system

4- Prescribing:
The prescribing habits are a physician professional and educational issue. The heavy prescribers in the Sudanese Medical Corps particularly at the centre are on the housemanship and the National Service. The physicians in uniform are only 25% of the house officers and the Native Service physicians. House officers may stay for one or two medical shifts. Recruited physicians may stay for 8months. Implementation of training programs may be difficult, so the regulatory booklet could be effective. Over prescribing of vitamins, duplicative prescribing, trade names, spelling mistakes are common. The non-stamped prescriptions with unknown signatures of the prescriber represent 70% of the prescriptions reviewed. The bad habit of a bill for every ill is getting worse and became there is a bill for every Takaful form. The form is a financial voucher rather than a treatment sheet. Prescribing for the inpatient requires a new Takaful form and the co-patient must get the form and refer to the pharmacy to get the full course of therapy. The prescribing sheet of the Heart Centre follows the British Hospitals method where the inpatient receives the daily dose. Dispensers, the nurses and the prescribers sign in their specific positions.

5- Dispensing:
None of the pharmacies comply the official design. The dispensing time at the day time is 1-1/2 minute for the prescription. Records for consumption and prescription registration had not been carried out. The dispensing cycle is inverted. The free drugs
are consolidated with the reimbursed ones. Costing of prescriptions follows a list which is not corresponding to the invoices.

6.2 Recommendations:
6.2.1 Organization:

A semiautonomous pharmaceutical agency is recommended aggregating the different pharmaceutical activities in the Sudanese Armed Forces resembling the Malaysian style and the British Royal Army Pharmaceutical Agency.

Takaful can contribute in the financial capital. The agency should be a semiautonomous organization whose General Director is the Medical Corps Deputy for the Medical Supply complying the ordinance 1994.(Fig.30)
Departments of Security, fire fighting and prevention, training and research, computer and information and personnel should be included. The agency can work with Takaful, War Areas and Actions Supply on contracts similar to that of the National Health Insurance and RDF of KH State (annex13).

6.2.2 Selection of drugs:-

Issuing a higher command launching a highly authorized committee defined as The Pharmacy and Therapeutics Higher Military Committee (PTHMC). Charged on the command of the Deputy Chief of Staff -Administration or the Military Medical Services Manager, achieved by the second rank in the Medical Corps, senior pharmacist is the secretary, seniors of medical departments are members, Takaful Manager is the Deputy, NFDMS, hospital pharmacist are members. One pharmacist from the procurement unit is a member of no vote. Pharmacologist, nursing staff representative, Microbiologist and expertise could be invited in discussing a corresponding matter. Representatives of the Army Headquarter and the users are essential participants. The command should state the duties, responsibilities, authorities and meetings of the committee. The key of the solution of most of the supply problems lie upon the success of this committee.

6.2.3 Procurement:

(1) Complying with the GPPP, stated in chapter (2.5).
(2) Separation of drug procurement from the annual cycle.
(3) Systematic preparation of tender list complying the cycle stated in chapter (2.5).
(4) Separate committees for the list preparation, quantification of drugs and tender adjudication.
(5) Enough budget should be stated according to the cost of quantities required prior the tender process starts.
(6) Classification of items.
   a. Domestically manufactured item. In a separate tender.
   b. Therapeutic categories supplied only by the CMSPO should be directly purchased from the CMSPO.
   c. The rest of the list should firstly be priced in the CMSPO to obtain prices that could be compared by those obtained from the tender.
(7) Better prices could be obtained if practicing group purchasing in joint efforts with CMSPO.
(8) Reports described on chapter (2.5.17.5) should be provided.
(9) Computerizing the whole process.
(10) Drugs those exhibiting bioavailability problems should be purchased through CMSPO.

(11) Quality assurance through requisition of WHO certificate.
    Quality assessment of JRMS practice, that the contract should guarantee the drug quality prior their receipt, quality testing is essential rather than registration.

(12) Drugs possessing less than 2/3 of their shelf life could not be purchased unless under forcing condition and those possessing more than ½ of their shelf life are accepted only on donation.

(13) Donation list should be prepared; donation should not enter the system records.

(14) Great attention should be paid for the lead-time. Delivery date is better to be specified by the procurement unit.

6.2.4 Distribution:

(1) Regional warehouse to be supplied every three month. Regional logistic unit to follow up and control the distribution and consumption within the region.

(2) Establishing theater pharmacy.

(3) Departments, wards and clinics should be supplied form the hospital pharmacy or the theatres pharmacy.

(4) Receipt committee using a check list.

(5) Frequent unannounced stock taking.

(6) Use of generic only in the invoice and receipt.

(7) Cold chain maintenance and room of controlled temperature.

(8) The Bin Card is better to show the unit price, package quantity, expiration date and batch number.

(9) Receipt should contain also expiration date, unit price, package size, batch number, the total quantity and supplier.

(10) Requisition should contain the code number.

(11) Design in the warehouse to contain:
    1. Cold chain area.  2. Receipt area.  3. Delivery area.
    4. Import store.  5. Expand store.  6. Secured room
    6. Seemed area.

(12) Rehabilitation of the B1,B2,B3,B4,B7 buildings ( Fig 27) and constructing a boundary walls considering the parking area, green area, gate and cafeteria.

(13) Register book for entrance and exit.

(14) Good communications to confirm the receipt of the consignment at the regional warehouse.

(15) Dependable records at the drug outlet to enhance calculation of drug consumption at each outlet.

(16) Using the computer program attached for approval of quantities and providing specific reports on the regional consumption.

(17) Prompt announce and action should be taken when shortage, expiration and other problem appears.

(18) Using the kit system for the moving troop and specifying each military area needs and demands and distribution of forces to ease the logistic process.
(19) A dependable staff in each region continuous inspection and visits of the Supply Manager and certain structured monthly reports should be supplied.
(20) Statistical morbidity records regarding diseases prevalence and age should be provided.
(21) Receipt form should differ from delivery form and both of them should contain:
   1. Name of drug, concentration and dosage form.
   2. Basic unit.
   3. Unit price.
   4. Total price.
   5. Batch number.
   6. Expiration date.
   7. Quantity of the basic unit issued the first of all is the code number, date of delivery and signature and manager stamp.
(22) Code number based on the selection list.
(23) Safety measures against fire, theft and drainage.
(24) Use of pallets storage system.
(25) Feedback information should be submitted.
(26) The new warehouse should be affiliated to the drug production plant and in turn the plant should pay for rehabilitation of the exiting ware houses and constructing a new one beyond them.

6.2.5 Prescribing:

(1) The Pharmacy and Therapeutic Committee or the Selection Committee should issue a list for selection and set regulations.
   a. Leveling of prescribers (professional levels).
   b. Obligations to fill the diagnosis.
(2) Treatment Guidelines could be done by the efforts of the committee and the Drug Information Center.
(3) Establishing Drug Information Center.
(4) Leveling of health facilities and determine what drugs could be supplied.
(5) Structured drug order form for certain therapeutic group targeted to be controlled.
(6) One course of therapy was allowed only for one visit.
(7) Training program, a booklet of the list and general regulations for prescribing, and treatment guidelines for more prevalent diseases should be issued for every new prescriber.
(8) Financial strategies: Many financial trials could be considered by the Higher Authorized Committee or the Board of Directors of Takaful to encourage rational prescription – of these strategies:
   - Classifying drugs to A,B and C or Vital, Essential and Nonessential.
     Rates of reimbursement could be as follows:

     A- 75% for Vital drugs.
     B- 50% for Essential drugs.
C- 25% for Non-essential drugs.

- Or may be according to the therapeutic benefits:
  1. **Antibiotics:**
     - 1st choice drug by 75%
     - 2nd choice by 50%
     - New generations by 25%
  2. **Analgesics for example:**
     - Simple 75%
     - Moderate 50%
     - Expensive 25%
  3. **Hormones:**
     - Hormones deficiency resulting in diseases – 25%.
     - Not threatening life but hormonal disturbance resulting in illness – 50%
     - Hormones defects not resulting in threatening illness – 25%.
  4. **GIT example:**
     - Cimitidine 75%
     - Ranitidine 50%
     - Ominiprazol 25%

- Cytotoxic drugs could be reimbursed only for the insurer himself by the usual rate but for his dependents by a lower range.
- Vitamins could be in full charge payments, and Haematinic compounds could be reimbursed by 50%.
- Computerized prescribing can solve many problems. The list of the drugs available could be installed in the computer program and the doctor can click on the items he wants to select. The printed prescription may either be received by the patient or directly received by the pharmacy. The same program for the doctor visit instead of issuing a lot of papers by Takaful officers. The process does not need special skills for computer operation, just to fill the patient names, age, number, date, diagnosis, and click for drugs. Each prescriber of certain professional level and specific path word can prescribe the only allowable list. Drugs out of the list could not be printed. The pharmacist dispenses only programmed prescriptions. This issue needs more study and its establishment needs further work.

(9) Continuous monitoring of the prescribing habits.
6.2.6 Dispensing:-

1) Establishing additional pharmacies in the referred clinics, the casualties ward and the theaters as follows:
   a. Pharmacy for chronic disease, monthly courses.
   b. A separate Causality Ward Pharmacy for the free drugs, to dispense doses for 24 hours.
   c. Operations theaters pharmacy for the theaters demands and the different departments.
2) Using the inpatient treatment sheet like that of the Heart Center, that the nurse collects the doses for 24 hours. A deposit of money against the cost of drugs may be required.
3) Drugs are better to be delivered in plastic Sackets, bags and stamped by the SAF, MC identifiers.
4) Daily drug utilization record book should be filled. Monthly records and annual structured reports for the supply manager should be filled. Computers are a preferable tool.
5) Rehabilitation and redesigning of the pharmacies.
6) Continuous analysis of prescriptions to evaluate the prescribing habits to concentrate the efforts of improvement.
7) Extension of Takaful activities to all remaining areas.
8) The army should pay the 25% share of fighters.
9) All drugs should be available in the affiliated pharmacies to minimize the expenditure.

6.2.7 Finance :

1) Extra resources are needed, by adding extra groups to be covered by Takaful.
2) Contracting for the whole pharmaceutical services.
3) Bulk purchasing on tender basis.
4) Enough annual budgets for the bulk purchases should be allocated. If not, the periodical payments are the alternative.
5) The pharmaceutical services should be extrapolated according to the military areas.
6) Selling drugs to uncovered patients in a reasonable markup.

6.2.8 Security :

1- The use of committees for the all supply processes.
2- Rehabilitation of the warehouses and securing the area.
3- Continuous, unannounced stock taking.
4- Keeping very strong instructions for inventory records at all levels.
5- Proper transportation.
6- Keeping appropriate safety measures.
7- Tough penalties for discrepancies and conflicts.
Chapter 7

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