3-year rapid assessment of reform programme in a public medical supplies corporation: lessons to be learned

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Central Medical Supplies Public Corporation

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Abstract

The Central Medical Supplies Public Corporation (CMS) is the national center for procurement and distribution of medicines in Sudan. CMS has implemented a comprehensive reform started in 2011. This report aims to describe the changes that have taken place in the CMS's medicine supply system. The study was based on document research of competitive bidding for medicines procurement in the public sector in Sudan. Bids that occurred before (2008) and after (2011) the reform have been used for comparison. The time to finalize the bidding process, the total cost of the purchased quantities, the number of medicines with market authorization, sources of medicines, failure rate of quality testing, the rate of expiration, and the availability of medicines were evaluated. During this period, the availability of medicines at CMS's warehouses increased from 43% in 2009 to 95% in 2013. 77% of medicines have market authorization in 2011 compared with only 4% in the tender conducted in 2008. Despite the sources of 51% of medicines were well-regulated markets in 2011, compared to 26% in 2008 there is no price increase. The time obtained to declare the result of the tender adjudication has been reduced from 6 months in 2008 to 4 months in 2011. In 2010 and 2013 respectively, the failure rate of quality tests dropped from 9% to only 0.5% of items. Similarly, the value of expired medicines decreased from 7% in 2010 to only 1% in 2013. Implementing the CMS's reform has improved the availability of quality of medicines without increasing the costs and therefore achieved its objective: the value for money.

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Abbreviations

BNF	British National Formulary
CIF	Cost, Insurance and Freight
CMS	Central Medical Supplies Public Corporation
DG	Director General
ERP	Enterprises Resources Planning
FMOF	Federal Ministry of Health
GDP	General Directorate of Pharmacy
GF	Global Fund
GFATM	Global Fund for AIDS, Tuberculosis and Malaria
HAI	Health Action International
HE	His Excellence
HERA	Health Research for Action
HINARI	Health Internetwork Access to Research Initiative
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
IRP	International Reference Price
LC	Letter of Credit
MDS-3	Managing Drug Supply - Edition 3
MOF	Ministry of Finance and National Economy
MOU	Memorandums of Understanding
MSF	Medical Supply Fund
MSH	Management Science for Health
NBHSC	National Board for Health Services Coordination
NCA	New CMS's Administration
NCIHD	Nuffield Centre of International Health and Development
NGOs	Non Governmental Organisations
NHIF	National Health Insurance Fund
NMP	National Medicines Policy
NMPB	National Medicines and Poisons Board
NMQCL	National Medicines Quality Control Laboratories
OECD	Organization for Economic and Cooperation Development
PMSP	Post-Marketing Surveillance Programme
PR	Principal Recipient
PSM	Procurement and Supply Management
RDF	Revolving Drug Fund
SDG	Sudanese Pound
SMS	Short Message System
TB	Tuberculosis
UNDP	United Nation Development Programme
US$	United States of America Dollars
WHO	World Health Organization

1. Introduction

Central Medical Supplies Public Corporation also known as CMS, established since 1991 as a semi-autonomous organization to facilitate the selection, procurement, storage and distribution of medical supplies for the public sector. The establishment of the CMS is a result of various reforms and transformations that have been taking place since 1937 when the first Central Medical Stores was established with a view to provide more effective and efficient delivery of services to the public. CMS was incorporated under the public corporations' act of 2003 (Corporations' Act 2003), with the responsibility for all activities related to the supply of medicines and medical appliances for entire government health facilities at both central and state levels. CMS is supervised by a 9-member board of administration, which chaired by the federal minister of health. At implementation level, CMS is governed by an 11-member board of directors. The day to day administration of the corporation is looked after by the Director General (DG), who is appointed by the president of the republic based on a recommendation made by the federal minister of health (Corporations' Act 2003). In order to execute his functions, the DG is assisted by four general directorates, four specialized departments and various technical committees. Efficient professionals, mainly pharmacists, from various disciplines (for example, biomedical engineers, administrators, accountants and storekeepers) comprise the manpower of the CMS (more than 400 employees).

To achieve its objectives of ensuring that essential medicines and medical supplies of proven safety, efficacy and quality are available to the population at reasonable prices, CMS conducts its activities in accordance to government policies, laws and regulations that govern quality assurance of medicines. CMS also pursues public procurement and financial laws and regulations. Although it is the policy of CMS to focus mainly on the public sector, currently CMS is also supplying the private sector.

The Global Fund for AIDS, Tuberculosis and Malaria (GFATM) designated United Nation Development Programme (UNDP) Sudan as the Principal Recipient (PR) for all Global Fund grants since 2005, in light of the additional safeguard policy that is applicable for Sudan. In its role as PR, UNDP Sudan strives to ensure quality financial management, timely procurement of supplies and service delivery as well as efficient monitoring and evaluation of grant implementation. A dedicated Project Management Unit is currently managing four ongoing grants (2009-2014) with an approved budget of over US$ 400 million since 2005. The overall goal of the projects is to prevent deaths caused by these diseases, to reduce the burden of HIV, Malaria and Tuberculosis, as well as to strengthen the Health System. The PR works with relevant government establishments, such as Sudanese AIDS Control Programme, National Tuberculosis Programme and National Malaria Control Programme for the establishment of an agile and sound logistics system capable of guaranteeing consistent and un-interrupted flow of all program commodities. Despite the existence of the CMS, the Federal Ministry of

Health (FMOH) has undertaken efforts to achieve this through the establishment of a separate Procurement and Supply Management (PSM) Unit, which was under the General Directorate of Pharmacy (GDP). Similar to what has been reported by Dowling (2011) in developing countries, the motivations for establishing this unit and other vertical supply chains for national health programmes were driven by concerns of FMOH about the ability of the CMS in doing the job, desire for improved performance and accountability for programme priorities, and the additional attention and resources the vertical programmes receive often thought to enhance performance than the typical bureaucratic public organizations, such as CMS.

In 2007, the FMOH has mandated the Global Funds Medicines supply unit with the responsibilities for oversight roles on supply chain management for all commodities sponsored by the Global Fund (GF). The roles of the GF Medicines unit covers all such functions that would ensure a viable supply chain that can guarantee the availability of the right quantity and quality commodities at the right time, delivered to the right places, in the right condition and at prices that are affordable to the consumers. The medicines supply unit under the GDP has formed a binding partnership with the states' Ministry of Health supply system in the country and is currently implementing a pilot logistics system designed for GF supported commodities (HIV/AIDS and Malaria programs).

In an effort to improve public health supply chain in Sudan, CMS initiated a reform programme in 2011, to ensure Sudanese accessibility to quality medicines at affordable prices. This reform is inline with the national medicine policy, which aims to ensure the availability of safe, efficacious, quality medicines at a reasonable cost to the society and to promote the growth and development of the domestic pharmaceutical industry. According to the World Health Organization (WHO 2004), the public expenditure on medicines is relatively very low (about US$4 per capita per annum).

Strengthening the public sector availability of quality medicines of affordable prices is one of the long-term, sustainable strategies to relieve a half number of Sudanese who may have no access to medicine (MSH 2013). CMS had adopted well-designed, thoroughly planned and scientifically streamlined procedures for quality assurance, procurement, storage and distribution of medicines. For example, in the first tender after the reform, CMS had taken a decision of purchasing quality medicines at competitive prices in a transparent manner.

Sudan depends for its supplies mainly upon import of medicines from various countries. In public sector, this is done by tender invitations every two years and drug consignments are imported at six-month intervals. Imported drugs are transported by sea (mainly from Asia) to the sea port of Port Sudan. From Port Sudan, they are transported by open long vehicles to the CMS's warehouses in Khartoum and then distributed to the various parts of the country. However, the climatic conditions at the harbor in Port Sudan are very drastic, especially

during summer when relative humidity is up to 60% and the maximum temperature is over 45°C. The shipping and unloading time is usually of considerable length. In addition, Sudan is large country with a total area of about 1.9 million km^2. Consequently, medicines are transported for considerable distance from warehouses in Khartoum to the various parts (e.g. El Fashir, Dongla, Damazin, Port Sudan and so on). The climatic conditions are unfavorable to vulnerable medicines (Abu-Reid et al 1991). Consequently, most of the medicines and pharmaceuticals used in Sudan may suffer greatly from instability problems and deteriorate considerably under the prevalent conditions of transportation and storage along the supply chain. Such deteriorated medicines are not only ineffective but are sometimes unsafe. Consequently, the limited foreign currencies available to the country may not only be wasted on the purchase of useless medicines but, in fact, on harmful ones (Abu-Reid et al 1991). Therefore, CMS in its reform of transportation and warehousing system aims to prevent the possible deterioration of medicines through the supply chain. In this regard, CMS has signed a contract with Sudapost (the public owned mail company) to transport CMS medicines in a temperature controlled vehicles and clearly stated in its tender documents that temperature controlled containers must be used (see section 8)

The aim of this study was to assess the first three years of the CMS's reform on its performance as a largest public medicine supply agency in Sudan with US$125 million turnover (CMS 2013). In this regard, the study will analyze the financial impact of medicines procurement with the requirement of marketing authorization (registration) in the CMS's Tender 2011. It will also analyze the last CMS's tender that has been conducted 2011. In addition to the analysis of the last tender, the study provides an overview of the main areas of the reform, such as warehousing and transportation, quality assurance and human resources. Finally, the paper discusses the success factors and lessons learned from the experience of CMS in implementing the reform to share them with international readership. Such experience may help similar organizations in resource-limited settings to ensure more reliable and efficient ways for supplying medicines to public health facilities.

2. Methods

A retrospective study, based on document research of the archival records, is undertaken by a group of CMS employees. For the assessment of the procurement policy, the year 2008 was chosen because medicine procurement was performed without medicine registration that has been required in 2011, and both years were compared. The archival records were also verified to report changes in other areas of the CMS's reform. These areas include progress in storage and distribution facilities, account system, administrative and human resources. The information gathered from the CMS's archival records relating to the period from 2010 to 2013 (i.e. at least one year before the reform and back to the last report available, see for example data on quality of medicines, which dated back to 2000).

The evaluation criteria include, among others, the time to finalize the bidding process, the total cost of the purchased quantities, the number of medicines with market authorization, sources of medicines, number of bids made by importers, failure rate of quality testing, the rate of expiration, and the availability of medicines. These indicators are important to improve access to medicines. Although the rational usage of medicines is equally important to determine the success of the public procurement systems (Singh et al, 2013), this paper only deals with the supply side of the medicines access issue.

The archival and statistical records (For example, tender reports, CMS annual reports, action plans and so on) provided valuable insights about the reform of the CMS that cannot be observed or noted in other ways, such as availability of medicines, and quality of medicines distributed by the CMS. This allowed authors to trace changes during years prior and after the reform.

The study compares prices of awarded medicines with those that have been published in the International Price Indicator authored by Management Sciences for Health[1]widely known as IRP (MSH 2010). World Health Organization (WHO) set an arbitrary benchmark for the analysis of the medicine prices in the countries of its East Mediterranean Regional Office (WHO 2007). For the purposes of this study, we use the same benchmark to measure the efficiency of the tender by comparing the prices of awarded medicines with those have been published in the IRP.

3. Findings

3.1 Context when the reform started

This section presents the situation in Sudan when the new CMS's Director General has been appointed to familiarize the reader with context of the reform. It sheds light on local currency devaluation, decree for studying the possibility of CMS's privatization, the American-led economic sanctions, and the media campaign against the new CMS's Director General.

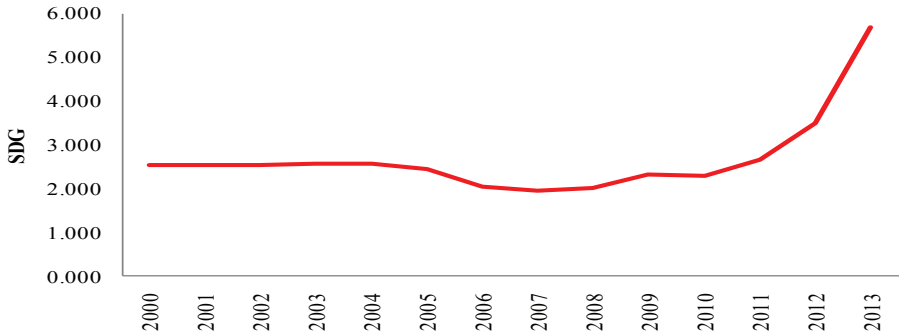
3.1.1 Local currency Devaluation

There was one major event dominated the scene in Sudan during the reform period. This was the separation of the South of Sudan in July 2011. Following the secession of South Sudan, Sudan has experienced a significant loss in oil revenue and exports and, as a result, a decline in growth (World Bank, 2011). The crisis is affecting the availability of foreign currency with subsequent effects on the foreign exchange rate: the black market rate is currently estimated to be SDG8.30 for US$1, while the official US$ rate is SDG 4.4 (and SDG5.7 for the Euro). The second event is the liberalization of the local currency in 2012. Foreign exchange is an extremely important issue that requires support and cooperation from government groups outside the health sector (Ministry of Finance and Central Bank) where local currency is not

1 The MSH reference prices are the medians of recent procurement or tender prices offered by not-for-profit suppliers to developing countries for multi-source products, and can be considered a useful gold standard for procurement prices in the developing world. Price analysis was carried out at wholesaling and retailing level.

freely convertible and demand for foreign exchange exceeds supply. Due to the economic crisis, the Central Bank of Sudan is restricting the availability of foreign exchange. These events have affected the CMS capital budget. The devaluation of the Sudanese pound during 2011 jumped to 15% and shot up to 146% by the end of 2013 (Figure 1), that is resulting in CMS experiencing barriers to access the foreign currency necessary for procuring medicines on the international market. To cope with this economic situation, which led to shortages of foreign currency, CMS negotiates with the Central Bank of Sudan on prioritizing orders. The lack of proper business accounting[2] poses a risk for working capital to be exhausted and threatening the sustainability of the medicines supply. An old SDG 71.24 million (US$30.71 million in 2009)[3] debt by National Health Programmes (SDG54.96 equal to US$23.69) and commercial customers, such as RDFs and community pharmacies (SDG16.28 equal to US$7.02) in the CMS financial books is affecting the available working capital. This situation was exacerbated by empty warehouses (average of medicine availability was not more than 46%) and the liberalisation of the Sudanese pound in 2012 and 2013. The devaluation of the local currency has resulted in a substantial (29%) decrease in the working capital of CMS (from US$57.5 million in 2010 to US$40.9 million in 2013, despite the 36% increase in the working capital in SDG (from SDG133.3 million in 2010 to SDG181.84 million in 2013). For comparison: after the 50% devaluation, the Central Medical Supply Organisations of the West Africa states were practically deprived of liquidity (essentially equivalent to bankruptcy) and had to ask the donor community for new capital investments (Massow, et al 1998). To cope with the devaluation, the CMS agreed with the suppliers to pay them 50% of the proforma invoice in advance and to complete it after the receiving of goods. The Central Bank of Sudan, as mentioned earlier, has agreed to finance CMS's purchases from abroad.

Figure 1: Annual Average of exchange rate of US$ to SDG



2 The Government accounting system lacks essential management data to run CMS efficiently

3 In 2009, the time of the debt, exchange rate to US$ was 2.28 and it is 5.7 by the end of 2013

3.1.2 Privatization decree

Some staff scare of the new Director General because he is an author of published article on the privatization of the CMS before his appointment as CMS director. They thought that he was coming to dissolve the CMS. The suspicious increased in 2011, when the government appointed a committee to study the feasibility of CMS privatization. The DG was a member of the committee. The committee on CMS Privatisation concluded that full privatisation of CMS is not an option as the public interest, in having essential medicines available and accessible all of the time, should prevail over profit-making. The committee recognised that a fully privatised CMS would have profit as it first goal and consequently would therefore, potentially, reduce its focus on products that are life-saving but commercially not interesting, such as vaccines, narcotics and other medicines with restricted use, emergency stocks, and others.

3.1.3 Economic Sanctions

The severities of the American-led economic sanction imposed on Sudan have limited the access to health services, in general, and resulted in the shortages of medications, in particular. CMS suffers a lot in making international banking transactions because banks are either afraid, or can't be bothered to try and do business with Sudan. As a result, there is an imminent crisis, especially for life saving medicines. These medicines include medicines for cancers e.g. 6-mercaptopurin for children (an American-made medicine), hemophilia, and so on, but also for anesthetics, different prostheses, dialysis solutions, some vaccines etc. As a result, many run out of stock. The complications in transactions are challenges that face the CMS reform. Although sanctions are not directly targeting Sudanese CMS, measures imposed on Sudanese banks and trade restrictions have made importation of medical supplies extremely difficult for CMS and thereby on patients across the country, who are facing difficulties in finding medicines imported from abroad. CMS believes that these sanctions are taking the health of Sudanese people hostage, especially in regards to children and women.

3.1.4 Media campaign against the new CMS's administration

CMS faced a media campaign against the new CMS's administration (NCA) by a group of pharmacists. These pharmacists tried to promote very isolated incidents to be a public issue through media. One example was Salbutamol solution (a medicine that used in hospital outpatient clinics to treat asthma) from a well-known supplier in Netherlands. The documents had been leaked by a member of staff of the National Medicines and Poisons Board (NMPB), the medicines regulatory authority of Sudan, who intentionally misled the media by claiming that CMS imported a low-quality medicine from India (the origin of the medicine is Netherlands). NMPB reacted to the newspapers' coverage and recalled the product. The NMPB tested the product, and it was found complying with Pharmacopeia specifications. Despite this fact and high quality of the product, the NMPB delayed the release of it for more

than 10 months, when it was too late. CMS has lost more than US$70,000 because the product passed its shelf life. Two persons, who have strong relation with the NMPB member of staff, took CMS to consumer protection prosecution for distribution of substandard Salbutamol solution. However, they failed to confirm their allegation that medicine distributed by the CMS was of low quality. The public prosecution acquitted the CMS.

3.2 Procurement system

An effective procurement process at any level must ensure that four strategic objectives are achieved: the procurement of the most cost effective medicines in the right quantities, the selection of reliable suppliers of high-quality products, procurement and distribution systems that ensure timely and undisturbed deliveries, and processes that ensure the lowest possible total costs (Ombaka, 2009).

In Sudan, according to the procurement act (Procurement Act 2010), all public institutions (including CMS) must tender for commodities and services obtainable from multi-sources. In addition, there are many legal mechanisms by which CMS purchases medicines and other medical supplies. However, the law allows direct purchase when medicine available only from a single source; price negotiation with pharmaceutical firms; and emergency purchase. As from its name, the latter, is made to meet an emergency situation. For example, emergency purchase is conducted due to the failure of the supplier to supply the ordered item in time. Recently, CMS starts signing 5-year contract to purchase certain medicines at fixed price.

Sudan has 19 pharmaceutical manufacturers, with an approximate market share of 20% (FMOH, 2010). In order to support the domestic pharmaceutical industry, it is the policy of CMS to give preference margins by conducted a separate tender restricted to local manufacturers. This is because the purchase of locally produced medicines from domestic manufacturing plants can be economically attractive, especially if they compete with overseas suppliers. In addition, the advantages of local manufacturers comprise the payment in local currency, the communication and transport cost are much cheaper, frequent inspection by the NMPB, and there is no need for a quality test, since items are only tested before release. Finally, the procurement act has required that public firms purchase their needs from local manufacturers, unless public firms could show that overall costs (including the landed cost) of imported goods is at least more than 10% less than those produced by the local firms. However, although support to local pharmaceutical manufacturers is a reasonable policy priority, this should not be at the cost of less access to essential medicines due to higher prices. Additionally, this policy may distort the market, as local small companies may not even attempt to be competitive (African Union 2007). It is therefore recommended that government seeks other ways of support to the national pharmaceutical industry without affecting accessibility to essential medicines.

Procurement of medications in the CMS is performed through a bidding process, with competition between participants. In its reform, CMS has shifted from a policy that emphasizes cost as the primary consideration when choosing between competing producers to a policy of quality-assured medicines. According to the new policy, cost becomes after the quality of the product and the performance of its supplier. Considering the limited resources, the challenge for CMS is to plan the medicines procurement process in order to achieve its objective: the value for money.

The National Medicines Policy (NMP 2005) has adopted the procurement of generic medicines provided that the efficacy, safety and quality are proven. This policy has been considered both nationally and internationally as a strategy to decrease costs and promote access to medicines (Homedes and Ugalde 2005; King and Kanavos 2002). CMS establishes preference for generic medicines in its purchases, when prices and other procurement conditions are equal. The registration of medicines and the use of International Nonproprietary Name in public health facilities are the must according to the medicines and poisons act (The Medicine Act 2009).

3.2.1 CMS's Tender procedures

Medicine procurement in public sector is a complex process. It involves many steps, such as selection and quantification. This is done in consultation with hospitals, and national health programmes. In the CMS, procurement of medicines is based on their generic names. However, suppliers of brand name may also compete, but their bids must be in generic names. The CMS policy requires certain medicines to be secured from their originators. These pharmaceuticals include medicines of narrow therapeutic index, biopharmaceuticals or medicines in a high-risk therapeutic category (e.g. anticoagulants).In addition to tender's documents that are legally required (such as, free tax certificate), bidders must provide 5 free samples of their products to be assessed by quality control pharmacists for evaluation purposes. Because most medicines are registered, the quality judgment is mostly based on the visual inspection of the sample and verification of technical documents, such as certificate of pharmaceutical product.

3.2.2 Updating of CMS list of medicines (Selection)

CMS committee for updating medicines' list depends on the current lists of national health programs. These programs include: free medicines program, national blood bank, renal dialysis and transplantation program, and National Centre for Oncology. The CMS' pharmacists were involved as a part of a multidisciplinary approach to medicine selection and updating. Initially, the series of negotiations with main public beneficiaries of CMS, including directors of free medicines project, national health programmes, the blood bank and leading clinicians, was performed to establish medicine and medical supplies tender lists. In such negotiations,

the CMS pharmacists insisted on several principles, which are considered essential for good medical practice, such as: implementation of WHO essential medicine policy and rational use of medicines as much as possible; and discussion within the framework of evidence-based medicine. When consensus was reached among all stakeholders and to address the quantities of necessary medicines as well as recent fluctuations in disease patterns or drug consumption, the tender list has been prepared immediately prior to the tender release.

3.2.3 Tender committee

The CMS's tender committee is chaired by the CMS's Director General and comprising 22 members from different government ministries (such as Federal Ministry of Health (FMOH), Ministry of Finance and National Economy (MOF), Ministry of Interior) and governmental agencies (For example, National Health Insurance Fund, National Medicines and Poisons Board). This committee approves the tender document, which states, among others, specifications and conditions of the tender, and its closing date. The procurement general directorate acts as a secretariat for the tender committee. It determines the required quantities based on past consumption data. The tender is conducted biannually and last tender overall value about 60 million Euros. The time obtained to declare the results of the tender adjudication has been reduced from 6 months in 2008 to 4 months in 2011.

Committee on Verification of bidder's documents: In the second step, the CMS tender committee granted a sub-committee from the procurement department the duty to verify legal documents that should be submitted with bidder's offers. To fulfill such a task successfully, the sub-committee's pharmacists worked closely with the legal advisor and internal auditor of the CMS, and representatives of the MOF.

Technical advisory committee: The tender committee appointed a technical advisory committee to lead the process of finding the best offering among tender applications and to make recommendations. In preparation for the tender adjudication, the technical committee collected and analyzed price data for medicines on the tender list. These data included: last tender price; last purchase price offered to the CMS; Cost, Insurance and Freight (CIF) price published by the NMPB; selling price of the medicine to the pharmacy shops in Sudan; the price of medicines in the International Price Indicator (MSH 2010); supposed CIF price according to the regulations on pricing of registered medicines marketed in Sudan; prices from domestic medicine manufacturers; and price of the medicine in latest edition of British National Formulary (BNF 2011). In addition to this information, the registration status of the medicines, whether it is prequalified by WHO (in the case of vaccines, anti-tuberculous and anti-malarial medicines) and the past performance of its supplier were also checked.

CMS has a policy that emphasizes overall cost as the primary consideration when choosing between competing suppliers of quality medicines. The analysis of the technical committee resulted in two types of recommendations: the first involved the purchase of registered

medicines whether generic or brand product and in both cases the committee considers quality of the product and performance of the supplier before the price in order to achieve the value for money goal. The second type of recommendations is for the purchase of un-registered medicines, despite the existence of registered one. The committee must support its recommendation with strong justifications, such as a registered medicine has no bioequivalence study; the supplier of the product has bad performance; the price is so high; the product has narrow therapeutic index or bio similar one. In this case the recommended medicine must be marketed in a country that has a well-established medicine regulatory authority, originator product or prequalified by WHO. Due to existence of number of medicines (e.g. narcotics) on the tender list which have no marketing authorization in Sudan, the tender committee decided to accept them on condition that their suppliers must complete the registration of such medicines. This is to avoid the possibility of stock-outs in the health system.

Table 1: Supplier's Performance Measure

Description	Score
1. Past experience of good performance	10
2. Substitution of rejected item(s) (in kind or in cash)	10
3. Response to enquiries	10
4. Delivery time	10
5. Adherence to delivery instructions	10
6. Provision of documents	10
7. Packing	10
8. Labeling (e.g. CMS and its Logo)	10
9. Expiring product policy (Shelf life)	7
10. Payment facilities	7
11. Cost improvement	6
Total	100

Negotiation committee: The tender committee also formulates a negotiation committee, to negotiate with winners for further discount. The main functions of the negotiation committee are to prepare in advance the information on prices; research the prices of the awarded medicines as part of background information for the negotiation; negotiate the winners for further discount; and execute appropriate negotiation strategies to get the maximum value for money. The negotiation has resulted in the saving of more than €2 million.

Table 2: Prices of medicines before and after negotiation

	Agent	Items	Amount (€)Before Negotiation	Amount (€) After Negotiation	Saving (€)	%
1	Africa Medical Company	1	180,000	162,500	17,500	11%
2	Afrodawn for Medical Enterprises	3	48,851	43,239	5,612	13%
3	AL Doma Pharma Co Ltd	1	69,000	63,000	6,000	10%
5	AL Rabwa	7	537,875	532,050	5,825	1%
6	Alpha Medical Agencies Co.Ltd.	8	940,894	742,740	198,154	27%
8	Atlas Logistic	36	599,062	515,066	83,996	16%
10	Cisuba Importer of Pharmaceuticals	9	291,021	245,082	45,939	19%
11	Dal Medical Company	34	7,198,776	6,999,612	199,164	3%
13	DR. Nabil Pharmaceutical Co.	6	4,016,166	3,792,166	224,000	6%
14	El Araby Drug Stores	7	138,567	135,796	2,771	2%
16	Elbarbary Medical Co. Ltd.	4	45,024	40,970	4,054	10%
20	K.A. Bodoruian	13	1,536,554	1,393,065	143,489	10%
21	Kambal International Co.	9	857,210	723,050	134,160	19%
22	Lillioum	11	72,900	69,255	3,645	5%
23	Marina	14	1,057,200	1,026,600	30,600	3%
24	Marwaco Commercial Enterprises Ltd.	15	2,787,013	2,645,464	141,549	5%
25	Medica Import and Export	13	2,677,467	2,676,657	810	0%
27	Pharma Trading Co. Ltd.	13	2,585,900	2,584,900	1,000	0%
29	Shanghai Pharmaceuticals Co. Ltd.	2	8,988,300	8,369,150	619,150	7%
31	Shima Medical	7	190,525	182,725	7,800	4%
32	Sudanese Medical Agencies	17	3,005,390	2,797,890	207,500	7%
Total		230	37,823,695	35,740,977	2,082,718	

3.2.4 Tender Analysis

The tender list consisted of 509 items. Unfortunately for 77 items (including 56 essential medicines), there were no offerings. Therefore, 432 (85%) tender items were selected for purchasing, which represented the total expenditure of about €6 million. This amount has been achieved after a successful negotiation, which resulted in a total cost savings of €2.0 million. It is also important to notice that if all tender medicines were purchased on the domestic market, the total costs would have been increased by 90%. The medicine list contains 277 pharmaceutical formulations. The remaining (155 items) were medical consumables. 178 manufacturers from abroad have participated in the tender of 2011 through 51 local agents. The winners included 87 (49%) manufacturers and 37 (73%) agents. The top three pharmacological groups (in terms of value) were medicines used for infections (29%), intravenous infusion solutions (16%) and antineoplastic drugs (11%). As shown in table 3, in this tender, for the first time in the past 20 years, CMS has managed to secure 51% of its medicines (€22.6 million) from countries that have well-established medicine regulatory agencies4 (i.e. well controlled pharmaceutical markets).

4 The list of these countries has been published by the NMPB

Table 3: Sources of medicines and medical consumables

	No. of items	%	Amount in €	%
Medicines:				
Regulated Markets	141	51	22,576,383	46
China, Egypt, India and Pakistan	89	32	18,531,246	38
Arab without Egypt	42	15	7,839,682	16
Others	5	2	162,657	0.3
Total	**277**	**64**	**49,109,968**	**82**
Consumables:				
Regulated Markets	68	44	3,066,567	29
China, Egypt, India and Pakistan	70	45	2,152,313	20
Local Market	4	3	1,018,780	10
Others	13	8	4,318,710	41
Total	**155**	**36**	**10,556,370**	**18**
Grand Total	**432**	**100**	**59,666,338**	**100**

Table 4: Top 10 Pharmaceutical Importing Countries in Africa, 1998

		Total (US$ million)	Industrialized country sources (US$ millions)	Imports from industrialized countries as % of Total	Developing country sources (US$ millions)	Imports from developing countries as % of Total
1	Senegal	51	49	96%	2	4%
2	Tunisia	172	164	95%	8	5%
3	South Africa	601	565	94%	36	6%
4	Togo	14	13	93%	1	7%
5	Mauritius	38	32	84%	6	16%
6	Madagascar	16	13	81%	3	19%
7	Kenya	105	78	74%	27	26%
8	Nigeria	118	79	67%	39	33%
9	Tanzania	41	19	46%	22	54%
10	Uganda	54	20	37%	34	63%
11	Sudan 2012	63	29	46%	34	54%

Modified by Gamal from table 3.2. Source: Roberts, MJ and Reich, MR 2011. *Pharmaceutical Reform: A Guide to Improving Performance and Equity*. World Bank, Washington DC.

Almost 80% (86% of the total amount) of the awarded medicines have marketing authorization (registered) in Sudan (Table 5) compared to only 4% in the tender of 2008. Unregistered items were 65 medicines in 2011, compared to 495 ones in 2008. In 2011, the CMS enforced to purchase unregistered medicines because there were no registered alternatives (87%), the local agent refused to participate in the tender (9%) or the local agent is black listed by CMS (4%).

Table 5: Registration status of awarded medicines

	No. of items	%	Amount in €	%
Registered Medicines				
Regulated Markets	103	49	16,985,819	40
China, Egypt, India and Pakistan	79	37	17,934,098	42
Arab without Egypt	29	14	7,539,867	18
Others	1	0	3,245	0
Subtotal	**212**	**77**	**42,463,028**	**86**
Unregistered Medicines				
Regulated Markets	38	58	5,590,564	84
China, Egypt, India and Pakistan	13	20	754,960	11
Arab without Egypt	13	20	299,815	5
Others	1	2	1,600	0
Subtotal	**65**	**23**	**6,646,939**	**14**
Grand Total	**277**	**100**	**49,109,968**	**100**

According to WHO (2007), prices of publicly procured medicines are considered "acceptable" if they have a median price ratio of 1 or less than 1, which means that the price of the awarded medicine is the same or less than the IRP of the same medicine. The analysis revealed that the prices of 64% of the awarded medicines were ≤ 1. It is important to notice that 85% of these medicines have marketing authorization in Sudan (Table 6). The findings also showed that only 9% and 15% of the prices of unregistered medicines were ≤ 1 in 2008 and 2011 respectively. According to the directions of the NMPB, 58% of unregistered medicines have been purchased from well-regulated markets. The remaining medicines have been imported either from licensed factories or from widely recognized European wholesalers. Further analysis of the awarded medicines with median price ratio less than one reveals that 31% (€13.0 million) of these medicines were originated from well-controlled markets. This means that shifting to quality medicines from well-controlled markets, instead of cheap medicines from less regulated markets is more cost-effective to achieve the goal of the medicine procurement.

Table 6: Comparison with IPI (i.e. awarded price/IPI) (Tender 2011 – 2013)

	Number	%	Amount in €	%	Registered items			
					Number	%	Amount in €	%
≤ 1	131	64	35,106,990	85	112	85	32,534,017	86
1.1 to 4.99	51	25	4,802,044	12	36	71	4,182,032	11
5 to 9.99	14	7	563,175	1	9	64	515,769	1
More than 10	9	4	858,305	2	4	44	698,020	2
Total	205	100	41,330,514	100	161	79	37,929,838	100

As shown in table 7, ABC-analysis reveals that 80% of the medicines in group A, were registered medicines (equivalent to 88% of the value) and more than half of the medicines in this group originated from developed world.

Table 7: ABC-Analysis for the awarded Medicines according to their registration status

Class	All medicines				Registered medicines only			
	Number (a)	% a/b	Amount in € (c)	% c/b	Number (d)	% d/a	Amount in € (e)	% e/c
A	55	20	39,886,446	81	44	80	35,198,656	88
B	55	20	6,294,391	13	44	80	5,009,041	83
C	167	60	3,064,491	6	124	74	2,390,691	78
Total (b)	277	100	49,245,328	100	212	77	42,598,388	87

3.3 Assured quality medicines

In this section, we present the findings related to quality assurance measures that have been put in place during CMS' reform to assure the quality of pharmaceuticals throughout supply chain. It highlights the outcomes of importing registered medicines. The section also presents the post-marketing surveillance programme. Finally, the section gives an overview of the recall system.

3.3.1 Importation of Registered Medicines

Samples of imported medicines have been tested at the National Medicine Quality Control Laboratory (NMQCL). The average failure rate of the samples that have been tested between 2001 and 2010 was 16%. However, the number of samples that found not complying dropped from 9% in 2010, to only 0.6% in 2013 (Figure 2). The low rate (less than 1%) of rejection of samples tested at NDQCL indicates that the CMS's measures to assure which include purchasing of registered medicines from reputable sources do work. The above findings indicate that the quality assurance system applied by the CMS prevents penetration of low quality or substandard medicines into its medicine supply chain. Authors, from their own experience, owed this huge reduction in the failure rate to the measures that have been put in place as a result of the CMS reform. These measures comprise restriction of the tender to registered medicines only; purchasing of biopharmaceuticals and narrow therapeutic drugs from their originators; and securing of medicines that are unregistered in Sudan from countries with well-establish medicine regulatory authorities, WHO pre-qualified manufacturers (e.g. vaccines) or from internationally well-known medicines supply agencies.

We have analyzed 100 medicines that had been rejected by the CMS because they failed to pass quality testing during the period 2001 to 2010 (Table 8). The analysis has shown that only 9 out of 100 medicines were registered products. The total value of the rejected items was US$4.8 million. More than half of this amount was accounted for by medicines originating from India (34%) and China (22%). These two countries were reported as a source of counterfeit medicines detected in 2005 (OECD, 2008). Only 8 importing companies out of 34 replaced their rejected items equivalent to 48% (i.e. US$ 2.3 million) of the total amount. However, the CMS is still fighting to get its money (US$2.5 million) back from 26 importing

companies. Three of them are now blacklisted. It is important to notice that all rejected items (9 medicines) in 2011, 2012 and 2013 have been replaced (value = €0.7 million). This is because CMS agreed with its suppliers to submit a letter of guarantee and a cheque equivalent to the total amount of the consignment. The cheque is returned to the supplier after receiving positive results of samples that have been sent to NMQCL for quality testing.

Figure2 : Percentage of medicines that passed Quality Control Tests

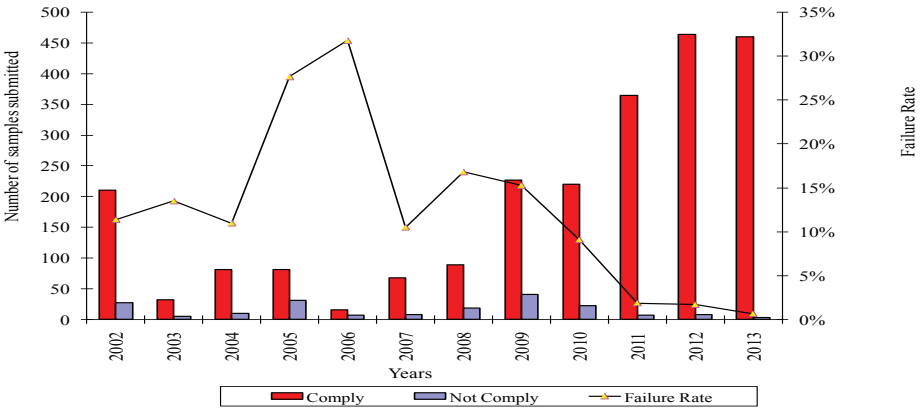


Table 8: Sources and registration status of the rejected items from 2001 to 2010

	Country of Origin	Total No. of Items	Amount $	%	Registered	Unregistered
1	India	31	1,620,036.97	33.78%		31
2	China	21	1,039,078.60	21.67%	1	20
3	Jordan	4	269,902.77	5.63%	1	3
4	Egypt	13	179,841.17	3.75%	3	10
5	Kenya	1	161,979.02	3.38%		1
6	Turkey	2	144,337.01	3.01%		2
7	Saudi Arabia	2	86,947.94	1.81%	1	1
8	Italy	2	86,296.80	1.80%		2
9	Germany	2	83,386.96	1.74%		2
10	Pakistan	4	62,465.67	1.30%		4
11	Sudan	3	58,091.95	1.21%	3	0
12	Iran	1	46,811.71	0.98%		1
13	UAE	2	25,784.80	0.54%		2
14	Switzerland	1	23,892.80	0.50%		1
15	Greece	1	21,909.69	0.46%		1
16	UK	3	6,909.53	0.14%		3
17	Malaysia	1	5,124.55	0.11%		1
18	Others	6	873,226.24	18.21%		6
	Total	**100**	**4,796,024.18**	**100%**	**9**	**91**

3.3.2 Post-Marketing Surveillance Programme

Pre-marketing quality testing is conducted to ensure the quality of unregistered medicines. CMS has initiated a Post-Marketing Surveillance Programme (PMSP) as a part of the reform. The aim of this programme is to monitor the quality of CMS's medicines during their shelf-lives. It provides effective support and adequate basis for CMS to make any subsequent administrative and legal action. The PMSP also fosters the trust of the customers in CMS medicines and other medical supplies. The CMS achieves this by testing samples collected from different levels in the supply chain. According to this programme, samples will be taken from CMS and MSFs' warehouses and health facilities. The samples will then being sent to the NMQCL for quality check. CMS takes appropriate action based on the results of the analysis of the samples and/or verification of the complaints. The action is communicated to the relevant organizations, health facilities and supplier of the defective product. Suppliers whose medicines are regularly failed the quality testing will be black listed.

A Retained Sample Pharmacy has been established and well equipped for the correct storage of samples, if necessary, under refrigeration (2–8° C) and securely locked. All specified storage conditions is controlled, monitored and records maintained. Access is restricted to designated personnel. A sufficient amount of retained sample of each targeted medicines is kept in its final pack to enable, if required, a number of replicate tests to be carried out. The samples are retained until all batches of a product are expired.

CMS establishes a process for collecting samples from MSFs' warehouses as well as from health facilities and community pharmacies as part of its PMSP often undertake after medicines are sold. CMS is currently in the process of implementing the programme by quality control department. It will work closely with NMPB to design optimal methods to collect the samples.

3.3.3 Recall and complaint system

Despite the measures that have been set by the CMS, mistakes happen. CMS has developed a recall and complaint system. CMS receives reports of suspected defective medicines from its customers. An action is taken, as far as necessary, to recall a defective pharmaceutical that makes its way into the supply chain. The system aims to minimize the hazard to patients arising from using defective medicines. It also provides a good communication system between CMS and its partners (i.e. NMPB, customers and users) on defective medicines. To achieve this, health facilities need to know fast. The CMS has written SOPs in order to quickly communicate the presence of defective medicine batches and to ensure that in the event of a necessary recall, the recall operations are efficiently and effectively carried out to safeguard public health. A medicine or a medical device is withdrawn or removed from the supply chain because of defects or complaints of serious adverse reaction. The recall might be initiated by the CMS, manufacturers, local agents or NMPB.

Before 2011, CMS did not print batch number in its invoices, so it had been having great difficulty in tracing defective products in the event of recall. As a prerequisite to efficient and effective recall, CMS generating batch numbers in its invoices, to tie in with the products it sells. CMS also reorganizes products in the warehouses according to their batch numbers in order to expedite shipping according to the batches written in the invoices. CMS has designed a form for receiving complaints, if any, about its products. The form is accessible from the CMS's website. It is important to notice that the CMS does not receive any complaint during the past two years. This should be carefully interpreted, because it did not mean that there was no problem, but the culture of reporting complaints is not very common in Sudan. The CMS is very conservative about promoting this reporting system, because the local media is so sensitive towards medicines quality.

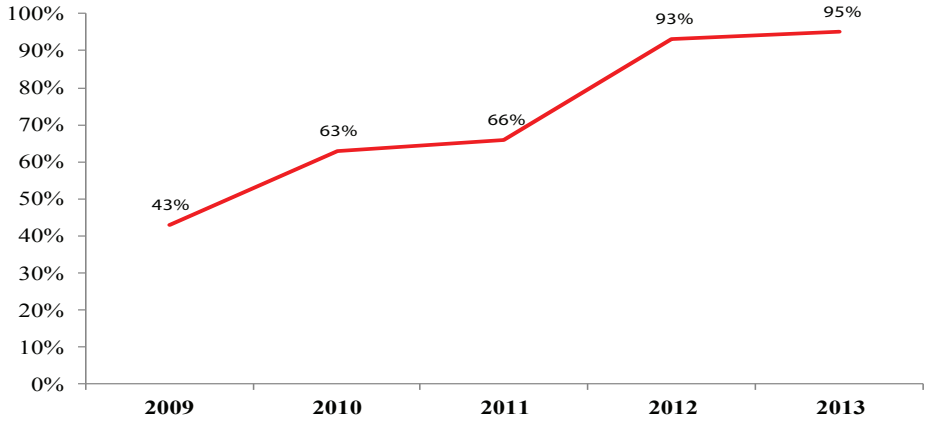
4. Focus on improving medicine supply chain

Despite its new policy of focusing on improving medicine supply, CMS retains its shares in Shanghai-Sudan Pharmaceutical Company based in Khartoum. This company manufactures a number of capsules and tablets formulations. In this joint venture, the CMS, on behalf of the government of Sudan, has 45% share, while the government of China has 55%. Pharmaceutical production is rightfully regarded not to be CMS' core business. As a result, CMS has sold its shares in an intravenous fluid manufacturing company (still being commissioned). It also cancelled other two projects for pharmaceutical production. These procedures have resulted in the improvement in the CMS's performance indicators, such as availability of medicines (see bellow). CMS still can support local medicines manufacturing by buying their products (without compromising quality and prices). The government could also support domestic pharmaceutical industry by investing in better manufacturing techniques or an alternative form of market protection that does not affect accessibility to essential medicines in a negative way.

4.1 Availability of medicines

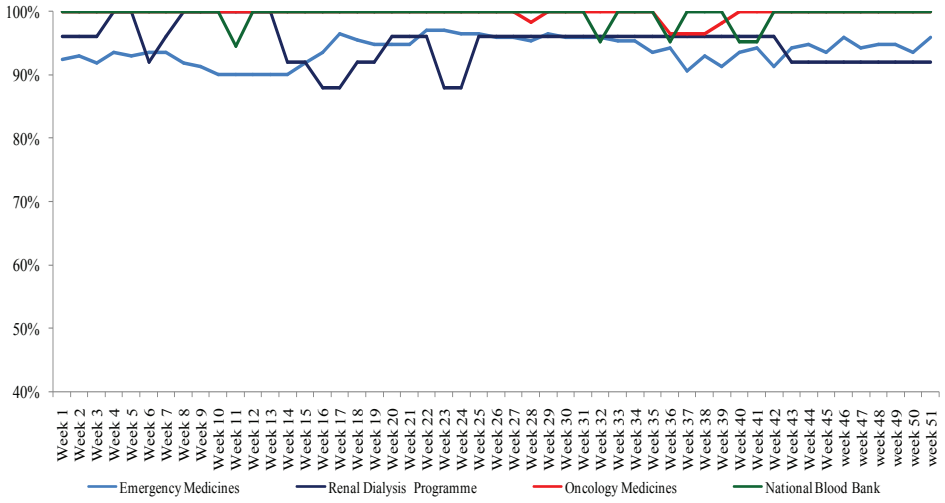
As shown in figure 3, there were severe medicine shortages at CMS in 2009 and 2010. CMS staff blamed such shortage mainly on the weak management during this period. Other factors include irrational selection, poor quantification and forecasting, lack of accurate delivery time, loss of focus and waste of medicines due to expiration. However, according to the CMS annual reports (2009 to 2013), the average availability rate of medicines on the CMS list, was greater (95%) in contrast to the situation prevailing before the reform (43% in 2009 and 63% in 2010).

Figure 3: Availability of Medicines at CMS's Warehouses



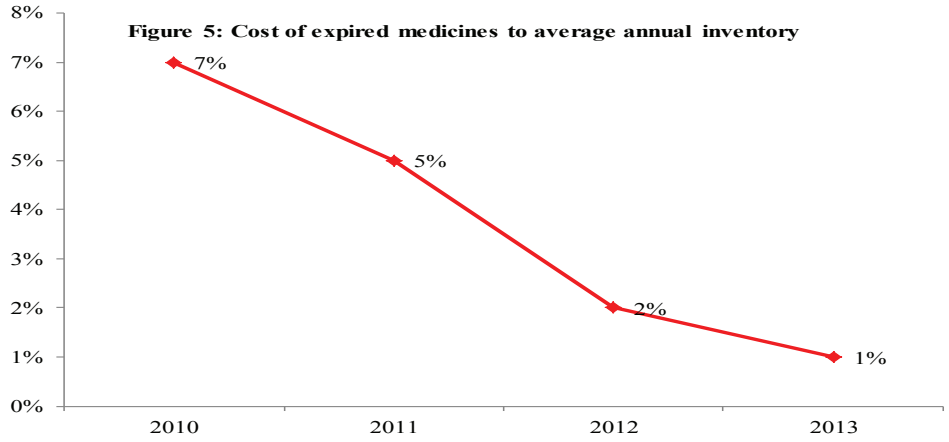
As presented in figure 4, CMS strives to make the medicines and consumables of Certain National Curative Programmes available all the time (i.e. 100%). The items in these groups are vital and for most of them, there is no alternative source. The total number of the items is 270. Stock-out of any item of these products may cause a serious health problem and a very negative political effect. Despite all out of control circumstances, such as economic sanction, scarcity of hard currency, the CMS has succeeded to achieve high level (on average 97%) of availability of these items in 2013.

Figure 4: Availability of medicines of national programmes in 2013



4.2 Expired medicines

First-expired first-out principles have been applied for distribution from CMS's warehouses to its customers. Medicines of three months shelf-life were freely distributed to public health facilities of high consumption to minimize expired stocks. As a consequence, the percentage of expired medicines to the annual average stock dropped from 7% in 2010 to only 1% (SDG2.8 million out of average medicine stocks SDG219.4 million) in 2013 (Figure 5). This is below the range of acceptable value of annual expiry medicines which is 3% to 5% of drug stocks (MSH 2013). The measures adopted by the management of the CMS suggest that the quality of medicines was of high concern in the CMS. The monitoring good storage condition and reduction in the percentage of expired medicines confirm the quality of the pharmaceutical supply systems at the CMS.



4.3 Integration of the public medical supply systems

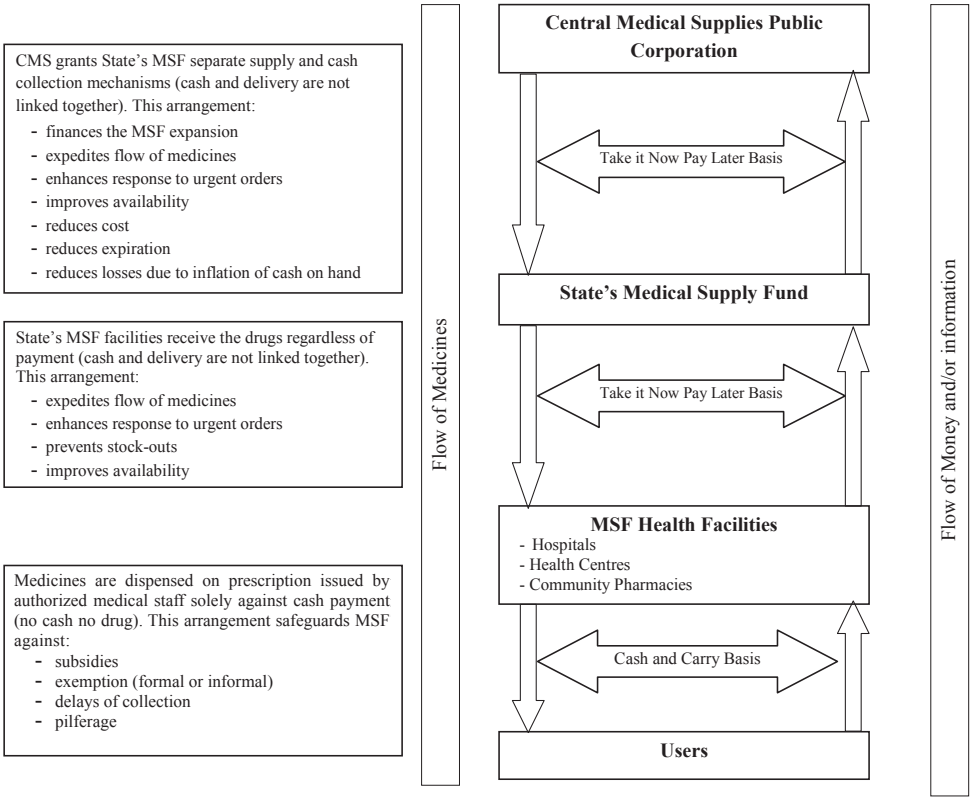
The medical supplies system in Sudan suffers from several inefficiencies. These include each state and within the MOH each health programme has its own supply system. The states and national programmes do their procurement, storage and distribution on their own. This fragmentation resulted in the absence of planning for needed quantities of medicines. It also missed economy of scale opportunities of having good prices. The government incurred additional financial burdens amounting as a result of the purchase price disparity among the different public health sector. While CMS procures and stores, distribution is done through a "pull" system in which customers have to quantify their needs, place their orders and pick up their packages (with exception of MSFs and customers in Khartoum State who make their order electronically). Thus, it will be extremely important to build capacity for drug quantification and stock management at all levels. Before the reform, medicines of national health programmes were managed separately. One of the largest supply chain reforms has

been the integration of these medicines into CMS system. As for other elements in the health system, it is extremely important to streamline and consolidate key elements of the health supply chain in order to maximize the benefit from the limited resources available. The supply chain management of health commodities, including medicines, has been improved by reducing fragmentation and ensuring strong coordination and collaboration between CMS, public health programs and private institutions responsible for drug procurement, storage and distribution.

4.3.1 Improving access to medicines

It is a reality that the availability of medicines at public health facilities is always remaining a problem. CMS realises that it will not do much good to bring more medicines into the country, if the distribution system fails to ship supplies to the periphery. Recognizing the gravity of the problem of lack of quality medicines, especially at primary health care facilities, CMS has launched a new model for integrated supply system of medicines to the states. According to this model, CMS separates supply of medicines from the cash collection (Figure 6).

Figure 6: CMS Supply Chain Model: States' Medical Supply Fund (MSF)



By the end of 2013, 12 states have signed bilateral agreement with the CMS. This agreement entitles the CMS to manage the supply chain through establishment of Medical Supply Fund (MSF) in each state. According to its obligations set out in the agreement with the states, CMS provided the capital seed stock of medicines as a revolving fund. CMS investment was not only in medicines but also included human resources training, infrastructure development, such as vehicles (11 pick-up double cabinet Toyota) for supervision and trucks (11 temperature controlled trucks) for delivery of medicines to health facilities, and the establishment of an operational system of MSF management (Photo 1).

Photo 1: Vehicles for delivery and supervision

The MSF is under direct supervision of the state minister for health. The MSF is also responsible for the distribution of medicines that treat HIV/AIDs, TB and Malaria donated by the Global Fund (GFATM); medicines that are dispensed free of charge during the first 24-hour in hospital outpatient clinics; and very recently, free medicines project for children under-five years of age. The CMS, according to the agreement, is responsible for the availability of quality medicines at health facilities and is taken accountable to the MOH for any shortcomings or failure in the system.

The MOH at state level obliged through administration board (chaired by the state minister for health) of the MSF to make sure that medicines are regularly available and are sold at the prices determined by the CMS. The income generated from selling medicines (the difference between whole and retail prices) to patients is used by the state's MSF to cover its running costs, including staff incentives. The key objective of the MSF is to ensure uninterrupted availability of safe, effective and quality medicines in public health facilities at cost determined by CMS. MSF also promotes rational use of medicines based on their generic

names. Through the new model, CMS could introduce pooled procurement of medicines for states that signed the agreement. Additionally, CMS avoids the drawbacks of the old pricing system (see reform of the CMS pricing) by unifying the retail price to the public across the country (i.e. CMS bears the transportation cost). It also manages to establish efficient and effective distribution systems to ensure that quality medicines reach the intended users. Finally, any issue of cost recovery, such as cost of expired medicines, is the responsibility of CMS.

4.3.2 GFATM

The long-term goal of the government of Sudan is to have a unified and harmonized logistics system for all Global Fund supported commodities, especially those used for the mitigation of the impacts of HIV/AIDS, Malaria and TB to ensure consistent availability of medicines and other medical supplies at all levels for successful treatment outcomes. In 2010, before proposing the bases for an integrated system, undersecretary of the FMOH, appointed a committee chaired by Dr Isameldin Mohamed (Later, in 2011, he promoted to be undersecretary of FMOH). The committee comprised the Director General of CMS, Secretary General of NMPB, and heads of National Programmes (TB, AIDS and Malaria). The committee conducted a study designed to identify critical problems in supply chain management. The study revealed evidence of fragmentation in distribution process and poor storage. The committee also affirmed that the fragmentation of public health supply chain lead to high costs. The results of the study were presented at a meeting chaired by undersecretary and attended by executives and technical staff from the National Programmes, different departments within FMOH, and the deputy Director of CMS and the Secretary General of NMPB. The evidence presented substantiated the need for the integration of existing supply programmes of all commodities at FMOH and state levels, including GFATM ones, into CMS. This recommendation aimed to improve public access to quality medicines and medical supplies at lowest administrative costs possible. It also aimed to reduce waste and to maximize the benefit from the limited resources available to the national supply chain for health commodities, to remove the parallel system, to utilize the already existed CMS and its logistics (i.e. warehousing, vehicles, human resources …etc.).

At the end of the meeting, attendees gave their support to the integration of all systems for managing medicine supply into the already existing, well-established CMS. The integration has been organized around the following principles:

1. Strengthening of the CMS and its revolving funds at state levels (After the integration of all systems in the states' revolving drug funds, they are renamed Medical Supply Funds to accommodate managing the free medicines, such as GFATM medicines). These states' funds (see section 4.3, for further details) would be responsible for ensuring the appropriate selection and use of medicines and for carrying out

periodic exercises for planning purchases and distributions throughout the entire health network.

2. Integration of the inventories and distribution systems of all vertical programs under CMS at the central and state levels through MSFs.
3. Execution of the Presidential Decree of the unification of public procurement through CMS. The decree empowers the CMS to act as the sole manager of purchases of medicines and health supplies for the entire public health system. The CMS collaborates with all stakeholders to decide on medicines and medical supplies to be purchased. All partners are members of the CMS tender committee.
4. Improvement of storage and transportation conditions.

In June 2011, based on the committee recommendation, the FMOH has made the decree No.30. According to this decree, all GFATM and other national programmes' commodities have been integrated in the CMS. CMS has been reorganized to accommodate these commodities in its system by establishing a new general directorate named states' medical supplies. A separate bank account has been opened for GFATM reimbursement through UNDP (the Principle Recipient).

4.4 Warehousing and distribution reform

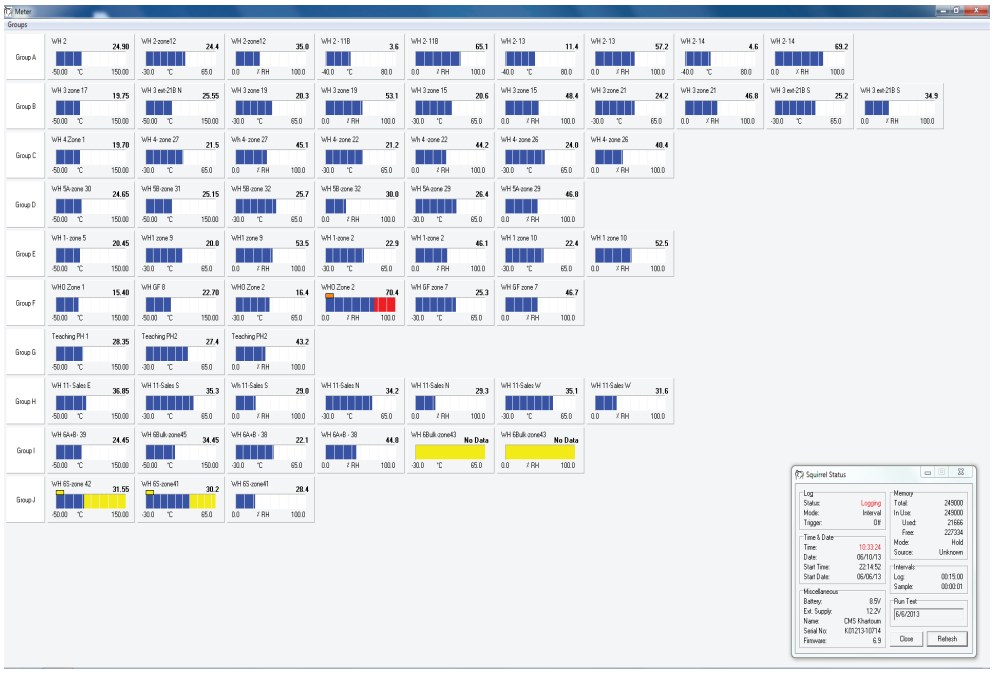
In this section, authors present the reform of the warehousing and transportation of pharmaceuticals and medical devices. The transportation of pharmaceuticals in temperature controlled vehicles to CMS and from CMS to its customers, and the electronic monitoring of temperature and humidity in CMS's warehouses are among the major developments in the reform of the CMS.

4.4.1 Warehousing reforms

CMS comprises 14 warehouses ranging from cold to normal storage conditions (2-8°C, 8-15°C and 15-30°C). One of the requirements of Good Distribution Practice is the control of temperature and humidity of the warehouses. As all warehouses are air-conditioned, a system to monitor and report temperature and humidity in all warehouses has been installed in the late 2012. Before the installation of the system, two daily temperature readings were noted on papers but were not reported or monitored to demonstrate the quality of storage conditions over the year. In the new system, real-time temperature and humidity data are transmitted and saved on the data logger, which interrogated by a computer in 14 warehouses. These data saved in a folder on a central server accessible by computers in the stock control room. The room is equipped with a big flat screen to enable staff to view the data for all stores. Each member of staff in the control room could open the saved temperature and humidity data files using the computer. Temperature and humidity in each store are monitored and checked against low and high alarm values by the system. Each warehouse is divided in

a number of zones (i.e. Temperature mapping). As shown in photo 2, each zone appears on the screen around the clock as blue bar. When there is a problem the colour changes to yellow and if there is no intervention after 30 minutes the colour changes to red. The system registers an audible warning at each zone in the store (local alarm). If the default continues without correction, an SMS will be sent to a list of registered senior managers and there will still be an audible warning at each store. SMS alarms contain the time, name of the store and more importantly the temperature measured. This system enables CMS to monitor its warehouses' environmental conditions. It also helps CMS to keep records of the storage conditions. For example, the Stock Control staff report the temperature and humidity at all zones throughout the year to demonstrate good storage conditions. This report is a good tool for CMS to demonstrate its quality assurance to its customers.

Photo 2: Temperature and Humidity Screen



The use of a barcode system on the outer cartons is generalised for the bulk area warehouses in 2011. On the arrival of pharmaceuticals into the store, the ERP system prints a bar code label containing the CMS code, the expiry date, the batch number and the quantity of the received product. Once unpacked and accepted by Quality Control, all cartons of the consignment are labelled with bar code labels (stickers) and are registered into the ERP system. Portable scanners are used to check cartons and boxes befoere delivered to customers.

4.4.2 CMS transportation of medical products

In its reform to assure quality of medicines, CMS transports its medicines from Port Sudan to Khartoum and from its warehouses in Khartoum to customers elsewhere in Sudan in temperature controlled vehicles (Photo 3). The receiving and the delivery are made through an outsourced service (by Sudapost, Sudan Mail Company). However, some customers still collect their orders at the CMS using their own vehicles.

Photo 3: Temperature controlled long vehicle

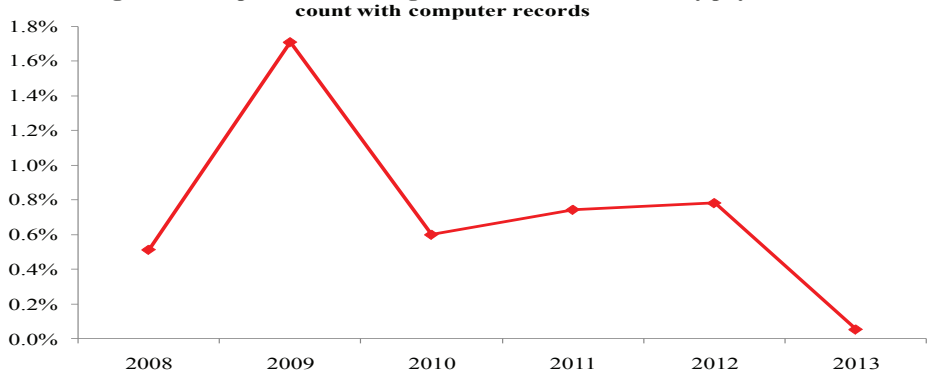
4.4.3 Inventory Physical Count

A committee assigned by the DG takes the annual inventory. The committee comprises a number of pharmacists, accountants, internal audit, National General Auditor Office in addition to the warehouses' staff. Before the reform, the deficit reported by the committee was compensated for by the surplus found in the same warehouse. In 2013, the board of directors decided that the deficit and the surplus should be considered by the committee as a deviation from what should be found in the warehouse (i.e. the inventory according to the computer system). The responsible storekeeper is taken accountable in the case of surplus, deficit or both. The board of directors also has introduced, for the first time, a mid-year inventory in addition to the surprising inventory for each warehouse at least twice per year to reconcile the physical stock with the theoretical one reported by the computer. The consequences of implementing the new inventory system and incentive paid for the responsible storekeeper on monthly basis, have not only been an improvement in the area of the performance, but also on the reduction of level of stock losses. The stock absolute value of non-compliance between value of stock on the system and that actually found at CMS's warehouses began to reduce from around 2% of the inventory value in December 2009 to 0% by the end of 2013

(Figure 7). By achieving 0% of the inventory, CMS has managed to hit the target set by MSH (MSH 1997)

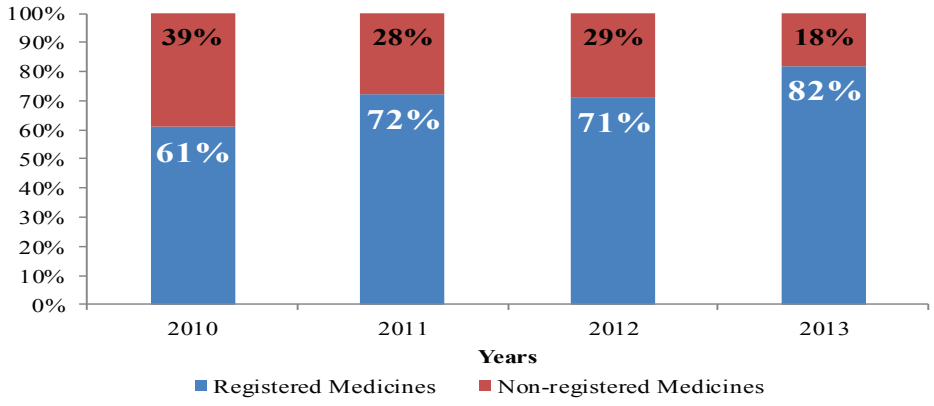
Additional advantages of stock inventory include: enforcing procedures and regulations designed to prevent loss and wage; ensuring that security measures and records of received stock and issuing of medical products are adequate; verification of registration status of the medicines (Figure 8); identification of surplus, expired and obsolete stock; and to tighten loopholes suspected of creating loss through leakage.

Figure 7: Compliance Percentage of the amount of inventory physical count with computer records



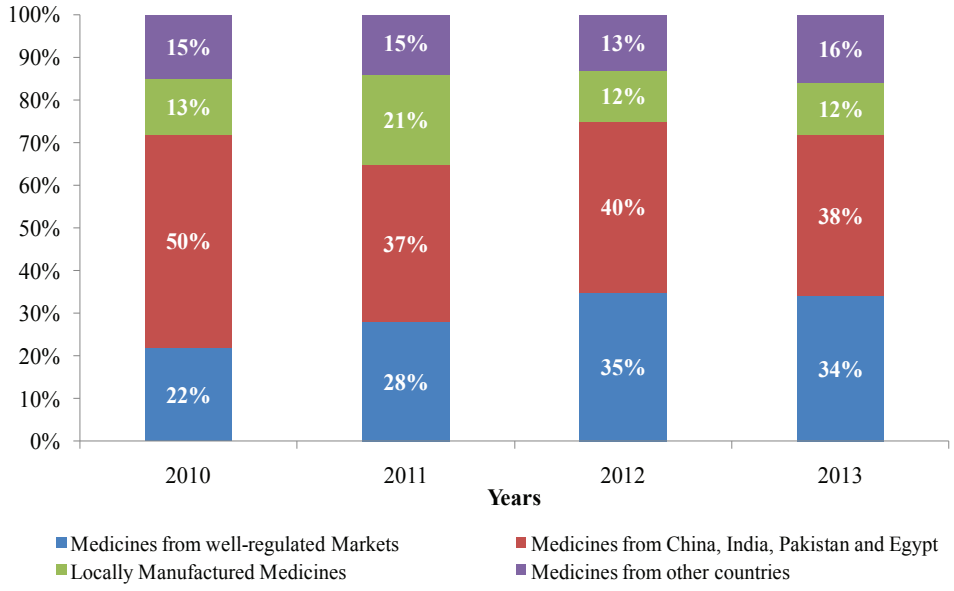
Annual inventory also identifies the main sources of CMS medicine, which are India, China, Pakistan and Egypt (Figure 9). It is the policy of the CMS to shift to the well-regulated markets. Despite slight progress in this area, the trend shows the shift of CMS from its historical sources India, Egypt, China and Pakistan, which are the main sources of reported cases of counterfeit medicines (WHO 2010 and OECD 2008) to European manufacturers of generic medicines.

Figure 8: Percentage of CMS'sRegistered Medicines



CMS, for the first time, identifies priorities by using the well-known ABC- analysis (2o / 80 per cent rule). The ABC-method classifies medicines of CMS list in decreasing order of cost of the volume issued and those in the warehouses on annual basis and places them in three categories: class A-items 10- 20% of the items usually accounting for 75- 80% of the fund. B-items another 10 –20% of the items represent 15- 20 % of the fund and C-items account for 60% to 80% of the items but only 5-10% of the value of the annual consumption and the hold inventory.

Figure 9: Sources of CMS's Medicines

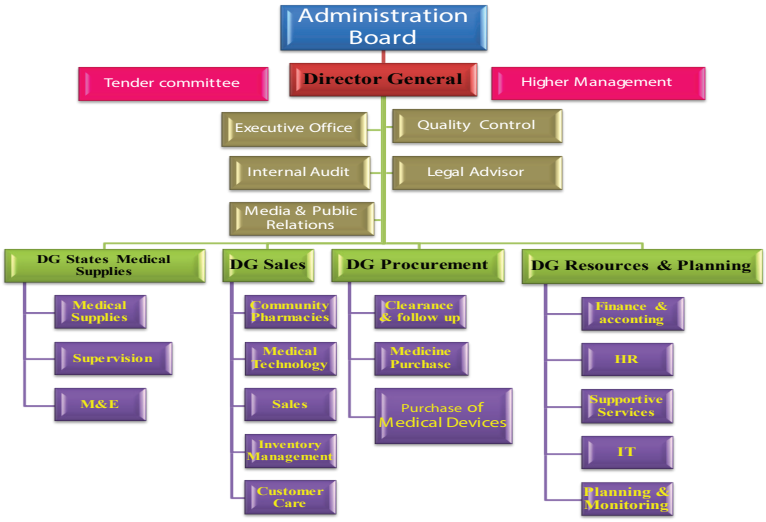


5. Administration and Human Resources Reform

5.1 CMS's Organogram

CMS was a typical bureaucratic public organization, with very flat organizational structure. The old CMS organogram comprised 8 general directorates and 5 specialized departments. The council of ministers has circulated a model organogram for all ministries and government organizations requiring the reduction of organograms into only 4 general directorates (one of them is finance and resources department). Accordingly and in light of the CMS's assessors proposed structure, CMS's board of director decided to merge the flat structure into only 4 general directorates and 5 specialized departments. The reorganization aims to better address priority areas, avoid bureaucracy, achieve the efficiency and flexibility, concentrate resources, and streamline operations, in line with the CMS programme of reform (Figure 10).

Figure 10: CMS organogramme



Employers are empowered to make decisions at their level instead of passing things up line. After the restructuring, managers, head of departments and divisions can go and talk to their colleagues face to face, if they need to. The reform stops the circ. and change the culture of 'write it down and I will respond in writing to you'. This expedites communications and builds trust among CMS staff. CMS has some good people who are loyal, knowledgeable and committed. They have done a lot during the reform.

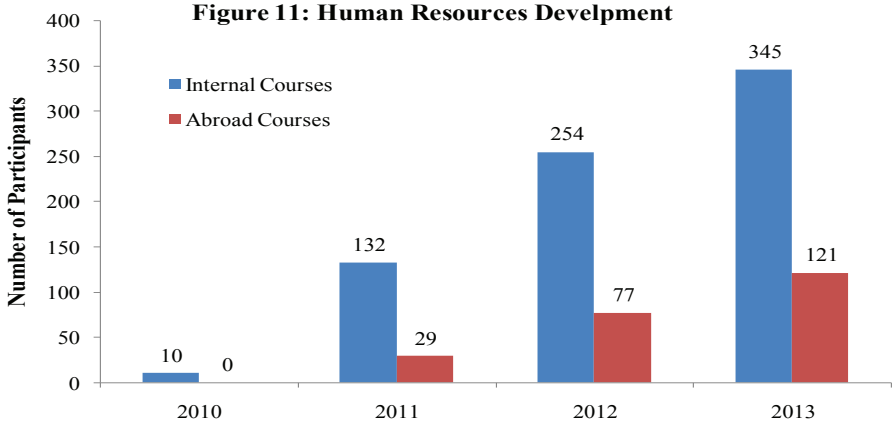
CMS has adopted a system for staff motivation. Performance-based incentives, and systematic supervision and monitoring were established to ensure that duties are completed. CMS continues to help its head of departments to bring out the best performance from their staff by running an effective appraisal process providing clear and honest feedback about their performance on monthly basis. It also improves working conditions by offering staff health insurance coverage by a private insurance company, and free transportation from their residences to the place of work and vice versa. To increase staff motivation and their productivity, CMS equipped all employees, whose jobs require deskwork, with computers with very advanced programme called Enterprise Resources Planning (ERP). They are now networking with each other using the Microsoft Outlook, for the first time, since the late 2010.

5.2 Human Resources Development Programme

To strengthen the team work and maintain consistency, CMS has printed job description and management manual, which specifies staff responsibilities and roles in the teams, and CMS operating procedures. In addition, the CMS has provided a wide variety of external and internal training and development opportunities for its staff. More than 460 members of staff

have benefited of this programme in 2013, compare to less than 10 in 2010 (Figure 11). The CMS has continued to provide computer skill training for all staff. Additionally, CMS has published a CMS's medicines datasheet book for pharmacists and other health professionals to equip them with needed information about CMS's medicines. This information include: indications, side effects, contraindications and precautions. CMS also gives free copy of the latest edition of the British National Formulary (BNF) to its pharmacists, senior pharmacists in big hospitals and MSF's pharmacists to keep their knowledge about medicines up to date. Moreover, in its staff development programme, CMS has distributed more than 200 copies of a book entitled *MDS-3 Managing Access to Medicines and Health Technologies*[5] to all CMS pharmacists and managers of the MSFs, General Directorate of Pharmacies at federal and state levels, and libraries of government owned schools of pharmacies and postgraduate medical institutions. The CMS will arrange a monthly session for pharmacists in order to study the relevant chapters of the book. Being deficient in the curricula of schools of pharmacy, the donation of a number of copies of the MDS-3 may help pharmacy graduates to be acquainted in pharmacy practice, in general, and management of health supply chain, in particular. The CMS in its medicine supply systems relies very much on the procedures laid down in this book. Finally, The DG of the CMS volunteered to provide a 10-hour pharmacoeconomics course to the pharmacists.

Figure 11: Human Resources Develpment



Since October 2010, CMS has two different weekly meetings to monitor the performance (board of directors and departmental meetings). In the board of directors' meeting, head of different departments presents brief weekly written reports. This meeting also monitors CMS performance on weekly basis. In the second meeting, which attended by heads of general directorates, departments and divisions, 3-month performance reports are presented. In fact,

5 This book authored by MSH and published in 2013. It is highly recommended by WHO as a manual for those who have a responsibility in pharmaceutical services, in general, and managing drug supplies, in particular.

the DG has given them the opportunity and encouraged them to voice out their views at weekly meetings. This practice gives the staff the feeling of ownership and makes them very keen to do good job. The meetings are very valuable in keeping up personal and departmental motivation and momentum. They help promote and embed a common approach to solve problems and to work practice across CMS. In addition, the CMS DG presents an accumulative 6-month report together with a financial report to the meeting of CMS board of administration, which started to meet regularly, since 2011.

In accordance with CMS Ordinance for the establishment of CMS (2007) and the National Medicines Policy (2005), the main objective of CMS is the provision of the needed medical supplies at the minimum possible cost to health facilities. The CMS is facing challenging conditions in performing this job, especially after establishing medicine supply funds' agreement has been signed with more than 10 states. The establishment of states' funds opening newly accessed areas for health service that have long been inaccessible. Thus, newly accessed areas need service provision, and human resources are the corner-stone. As well, the CMS is struggling to collaborate with internationally-recognized entities in order to use the best available knowledge, experience and methods in managing the medicine supply chain, including training, consultancies, technical assistances and setting policies and strategic plans to guide the CMS activities, as well as monitoring and evaluation of supply chain. With limited resources, facing huge responsibilities, the CMS is exerting its best efforts to effectively and efficiently establish systems and setting priority policies, plans and strategic plans to improve the public supply chain in Sudan.

In its effort to institutionalize the HR development and to make its staff more modern and professionals, CMS has signed two Memorandums of Understanding (MOU) to improve supply chain of health technologies in Sudan public sector. One MOU has been signed between the CMS and Health Research for Action (HERA)[6]. The parties have agreed to initiate cooperation in conducting training and public health consultancies in the field of medicine supply. This will be implemented by establishing a National Training Centre, specialized in health supply chain. The centre will be equipped with small library furnished with hard and electronic learning resources. The centre will accommodate the Continuous Pharmacy Professionals Development Programme founded by Pharmacists Union in collaboration with Coacs, which is a British company that innovated the software. In this regard, HERA Foundation funded a mission 12-16 January 2014 to develop a technical proposal on the options for a National Training Centre in response to the CMS proposal, based on a better understanding of local needs, issues and capabilities.

The second MOU has been signed between CMS and Nuffield Centre of International Health

6 HERA has defined itself as an international multidisciplinary team based in Belgium. Active since 1990, HERA has contributed to strengthening the health sectors in more than 100 countries in different regions of the world. It has been transformed to a non-profit foundation working with a network of experts, research organizations, governments, NGOs and institutions to promote the right to health and development for all.

and Development (NCIHD) University of Leeds[7]. The CMS and the NCIHD have the desire to work together to develop a collaborative projects between the NCIHD and the CMS for strengthening Health Supply Chain in Sudan and to undertake joint research and consultancy assignment in a bid to develop and sustain the institutional capacity at the CMS and its MSFs at state levels. The parties shall explore the possibility of the training programmes that could be provided to Sudanese candidates in Leeds. These programmes include Postgraduate Training courses in health commodities supply chain management and certificate courses in relevant disciplines of the supply chain for CMS staff and its states' MSFs. NCIHD has appointed an expert to undertake the assignment on training and institutional needs assessment in collaboration with the national consultant who has been identified by CMS. This mission will start soon and its outputs will be shared with HERA.

Finally, CMS's DG approached the Health Internetwork Access to Research Initiative (HINARI) to get a user name and password for CMS. HINARI is the programme set up by WHO together with major publishers, enables low- and middle- income countries to gain access to one of the world's largest collections of biomedical and health literature. The HINARI team responded positively to the request of the DG. CMS staff are now, like many others in the HINARI countries, benefiting of having free access to up to 12,700 journals, up to 24,900 e-books, and up to 70 other information resources. This access clearly contributes to improve CMS's performance.

6. CMS Automation Programme

CMS embarks on a very comprehensive automation programme. Its main feature is the installation of ERP. Making use of such programme, CMS re-launched its new website. It also introduced the electronic purchases, for the first time in Sudan. This section will highlight the achievement of the CMS in this field.

6.1 CMS website

The CMS has relaunched its main website to try to tell its customers and Sudanese health professionals about the changes coming with implementation of the CMS reform. The main purpose of the website, *cms.gov.sd*, is to help patients who seek a medicine whether it is available in CMS's pharmacies or not. The revamped website also provides weekly updated information about the availability of medicines and other medical consumables. In addition, the website is designed to provide an online marketplace where public health institutions and community pharmacies can purchase their medicines. Customers are able to register their firms by online applications from January 2012 to get a user name and password to use them later for online purchase. Through the customer's web interface, the customer

7 The Nuffield Centre of International Health and Development was set up in 1978, at the request of the UK Department for International Development and the British Council, with a focus on health in middle and low-income countries. It is now a major international resource for education, research and technical assistance in health and development.

is assured of certain stocks and can place an order accordingly. Once the order has been released, the quantity ordered could be virtually reserved in the system (i.e. the quantity will not be available for sale to other customers) and once the order is confirmed by the payment, the quantity is taken out of the stock register in the system (the system means ERP). More than 500 customers are now using this service. They made 2,356 orders (SDG 63.0 million) through the on-line interface (Table 9). However, despite efforts to promote the online purchase service, many clients still know little about it. For the first time in Sudan, CMS introduces electronic payment in collaboration with Faisal Islamic Bank. This service enables electronic purchasers to pay their invoices online. Finally, the website gives opportunities to consumers and customers to ask questions and to send online complaints about the quality of the medicines distributed by CMS.

Table 9: Online supply service

Description	2012	2013	Progress
Number of users of online supply (customers)	266	542	276
% Of users to overall CMS's customers	9%	13%	4%
Number of electronic orders	535	3398	2863
% Electronic orders to the public sectors	93%	84%	-9%
% Electronic orders to the private sectors	7%	16%	9%
Amount of electronic orders in SDG million	30	167	137
% of the electronic sales to the total CMS's sales	9%	30%	21%

6.2 Telephone Line 5959 and SMS

The hot telephone line '5959' helps consumers to ask queries about the availability of certain medicines. During the first 10 months of the service, the department of pharmacies has received and answered 15,110 calls. Only 86 calls were missed. The average waiting time for reply was only 10 seconds. The CMS offers its customers the option of importing the requested item(s), if it is not available in Sudan, from neighbouring countries within 72 hours at costs without charging any additional fees. In 2013, 77% of the requested medicines (17 out of 22 medicines) have been secured from Saudi Arabia. The pharmacies department has signed a contract with an Egyptian and Jordanian pharmacies to avail medicines that do not exist on Sudanese market upon request and on prescription-base. This service is not for profit. The CMS has developed a Short Message System (SMS). The system automatically sends message to mobile phones of the CMS's customers, immediately after new items have been added to the inventory. This service updates the CMS's customers on the availability of medicines and other medical supplies.

7. Financial reform: Business oriented CMS

CMS was a typical public sector organization, whose thinking tends to revolve around costing and to equate costing with pricing. This is because the concern of public sector accountants is to balance the fiscal budget with expenditure. CMS's accountants were unfamiliar with

the classic income statement and balance sheet accounting that is conventionally used in business. The lack of proper business accounting[8] practices poses a risk for working capital to be exhausted and, consequently, threatening the sustainability of the medicines supply. This section, presents the reform of financial and accounting system of the CMS. It also highlights the growth of sales of CMS and its customers. Finally, the section presents the argument that has been made by the DG to waive the dividend paid annually to the MOF.

7.1 Commercial accounting system

One of the main areas of the CMS reform is that CMS decision-makers start viewing the CMS more as a commercial operation than a public service. In its reform, the CMS conducted a comprehensive training of accountants to make the CMS business oriented rather than mere public medicine supply department. This is because accurate statistics can only be obtained with a system that allows for double entry bookkeeping and for analytical accounting, such as common practice in the private business sector (i.e. balance sheet, and profit and loss account). From the beginning of 2011, the CMS has been using the new ERP system which is equipped with a proper accounting system, as used in commercial businesses. Formats of annual financial statements have been changed to be in accordance with the international accounting standards and reporting standards, and approved by all the stakeholders. The double entry system (debit & credit) allows the system to provide, on a regular basis, a profit and loss account (income statement) and a balance sheet. The very direct outcome of these efforts was the submission of the Annual Financial Statements (income statement and balance sheet) of 2012 to the National Auditor General within allowed period (i.e. only 45 days after the end of 2012). Prior to the reform, the submission of the fiscal account had an average lag-time of nine months (Table 10).

The reformers have changed the CMS to a commercially oriented organization to meet its objectives of recovering medicines costs and raising sufficient revenues to remain viable. The business thinking in the CMS allows it to make some surplus to substitute its debits and to finance its expansion. This change in the CMS behaviour makes it more efficient than being a public sector organization. As a result, the cost wastage and losses are significantly lower than they are prior to the reform. The leadership is found to be of paramount importance for the implementation of this kind of reform.

8 The Government accounting system lacks essential management data to run CMS efficiently

Table 10: Submission of the Annual Financial Statements (income and balance sheet) to the Auditor General

Year	Date of submission	Delay in Months	Date of receiving Audited Account	Waiting time in Months
2001	20 November 2003	22	07 February 2007	38
2002	15 July 2004	18	26 June 2008	47
2003	23 December 2004	11	26 June 2008	42
2004	09 March 2006	17	09 November 2008	30
2005	31 January 2007	13	03 May 2009	27
2006	20 June 2007	6	15 September 2010	38
2007	26 October 2008	9	25 January 2010	26
2008	17 May 2009	5	07 August 2011	26
2009	03 August 2010	7	03 July 2013	30
2010	24 October 2011	9	03 July 2013	21
2011	24 July 2012	6	Not Yet	17
2012	13 February 2013	1	Not Yet	12
2013	06 February 2014	1	Not Yet	2

7.2 CMS Sales

Despite the economic difficulties that face Sudan during the post-separation years, the CMS very soon regaining its market share and has continued to grow, in terms of volume of sales and assets, and remains in good financial health, in terms of its assets to liabilities ratios. For example, CMS's sales has jumped from US$69 million in 2010 to US$ 99 million in 2012 and shooting up to US$ 125 million in 2013 (Figure 12).

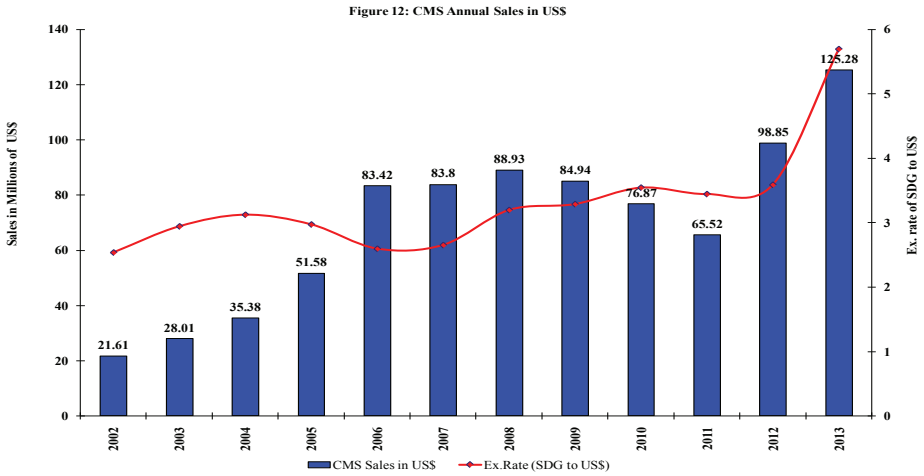


Table 11 shows the balance of revenue coming from sales of medicines and medical devices to different CMS's customers. Although medicines have a smaller mark-up, their contribution is higher than the medical devices (ranging from 93% to 98%). Nevertheless, the medical devices have very big potential market in Sudan. This side of the business is growing, and

there are no competitors in the market. In additional, the medical devices have no price control. CMS needs to do more in this area. The administration Board passed a resolution to hire a technical consultant from abroad to strengthen the supply chain for medical devices (Selection, Procurement, Storage, Maintenance and Disposal).

Table 11: Annual Sales of medicines and medical devices

Years	Sales of Medicines		Sales of Devices		Total in SDG	Total in US$
	Amount in SDG	%	Amount in SDG	%		
2007	170,118,385.81	96%	6,682,579.68	4%	176,800,965.49	89,792,262.82
2008	172,044,986.64	94%	10,679,043.35	6%	182,724,029.99	90,234,088.88
2009	187,443,003.85	94%	11,379,882.95	6%	198,822,886.80	84,930,750.45
2010	160,663,218.81	93%	12,243,734.71	7%	172,906,953.52	74,593,163.73
2011	164,479,601.15	94%	10,465,464.92	6%	174,945,066.07	65,517,588.97
2012	298,334,013.38	98%	6,211,337.53	2%	304,545,350.90	87,253,137.74
2013	539,463,327.57	97%	18,041,403.43	3%	557,504,731.00	125,281,962.02

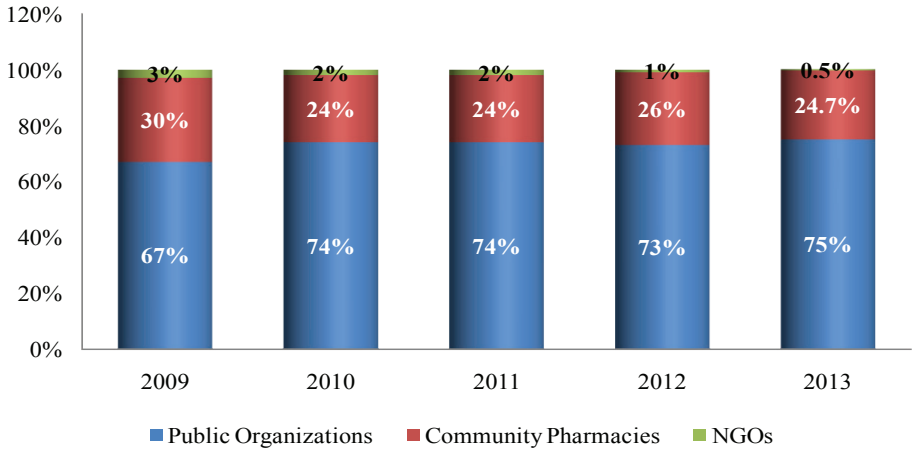
7.3 Selling medicines at debt

In 2008, the DG of CMS at that time and under pressure of the FMOH, started to distribute the needs of the certain national programmes, namely blood bank, free emergency medicines programme and renal dialysis and transplantation scheme at debt (i.e. beyond the allocated budget in 2008 and 2009). The CMS's report on financial performance for the 2009, revealed a huge debt SDG 51.00 million (US$ 22.4 million) equivalent to 38% of its working capital. This huge debt is currently covered by borrowing from the Central Bank of Sudan at high financing rate (10%). The evaluation revealed that if the Central Bank requested immediate settlement or cash against document for coming consignments, the CMS would have a real problem. However, the current DG, with the help of new undersecretary of the FMOH, has restricted selling medicines to these programmes within the annual allocated budget, since January 2011. To convince the MOF to pay the debt, is the real challenge that faces administration of the CMS.

7.4 CMS's Customers

Before the reform, CMS sold medicines to any customer, regardless of its eligibility. One of the former sales managers, argued we sell medicines, even to devil once he has money to pay. This was absolutely unlawful practice. In line with its new sales policy which prohibits selling of medicines to brokers and commercial NGOs, CMS restricts sales to eligible customers. These include MSF, national health programmes, public health facilities, licensed community pharmacies and to very limited extent genuine NGOS. The public organizations provide the bulk of the revenue. For example, in 2013, the shares of public organizations, community pharmacies and genuine NGOs were 75%, 25% and 0.5% respectively (Figure 13).

Figure 13: Customers of CMS



7.5 Waving of the monthly dividend to the MOF

In 2008, the Ministry of Finance and National Economy (MOF) had imposed a dividend, which has to be paid on monthly basis to the public treasury by CMS. In its fiscal year 2013, the Director General (DG) of the CMS has convinced the decision-makers at the MOF to drop the annual dividend paid to the public treasury. In its proposal on the waving of the dividend, the DG argued that the dividend often offend those who are poor and only when they are sick enough to seek curative care at public health facilities (well-off patients most probably using private health facilities). He added, this is against the government policy of fighting poverty. It also interferes with Sudan government economic goals, which are based on the principles of distributive justice. It is well-documented that the poor people use more service than the others (Mustard and Frohlich 1995). The DG concedes that user-fees policy disproportionately hit hard on poor people (Arhin-Tenkorang 2000). The user-fees policy was not adopted specifically to increase government revenues, instead it is imposed to increase government budget allocated for medicines. The last point, the DG mentioned in his argument to wave the dividend was the clear discrimination against those who use the system, instead of taxing general public.

8. Formulation of policies

In its reform, CMS has formulated a number of policies to improve the efficient use of limited public resources. In the formulation of CMS's policies, the major change was the shift from knowledge-based and individual experience to evidence-based policies and informed decision-making. The CMS also changed from sales-oriented and profit-making organization to focus on provision of service on cost-recovery basis. The procurement policy shifted from

the acquisition cost of the product as a base for tender adjudication to the quality and overall costs of the product and the performance of its supplier. Finally CMS policies moved from being working in different areas to focus on improving supply chain (i.e. from diffusion to focus).

The policies include the new procurement policy, which focuses on the quality of CMS's products. According to this policy, CMS runs three types of procurement. Open tender, restricted tender to support local manufacturers and long term contract for certain medicines. CMS adopted a scheme for prequalification of suppliers. The suppliers will be carefully screened, according to selection criteria that have been approved by the CMS board of administration. Those who pass the screening are invited to tender. Although initial screening can be time consuming, this approach will significantly reduce the administrative burdens of an open tender, particularly after the system has been established. More importantly, this approach is perceived as the most crucial element of quality assurance, as it is a powerful preventive measure.

8.1 Pooled purchasing resolution

For different allegations, the main public health organizations (e.g. NHIF, Military Services, National Health Programmes within FMOH and states' RDFs) have developed their own procurement systems. These allegations include high CMS prices; low quality medicines; CMS did not meet their requested quantities and needed items; frequent out of stocks; customers were not respected; and no facilities were offered except deferred payment. The reform focuses on how others view CMS's performance and the quality and price of its of products.

The former CMS's DG has presented a paper on the health supply chain in Sudan to the first meeting of the National Board for Health Services Coordination (NBHSC) chaired by HE the president at Khartoum Teaching Hospital in June 2009. The paper concluded that the potential opportunities inherited in pooled procurement outweigh any threats. In this meeting, the NBHSC has decided that all public organizations must unify the purchase of their needs to health commodities from CMS. The meeting considered the pooled procurement as one possibility to reduce the waste and maximize the benefit from the limited resources available. It also thought to be a mechanism for improving the national supply chain of health commodities. From our personal experiences as active members in policy-making teams at FMOH, and from the findings of the report of the committee appointed to study the public health supply chain in Sudan, it was clear that the purchasing of health commodities in the public sector is very fragmented. As a result, there are several inefficiencies in this sector. By unifying public purchase through CMS, the public organizations consolidate their purchasing power. In the unified purchase each supplier is expected to give the best price

possible in its offer, because if it does not win, it will be shut out of the public market for at least two years (the CMS's tender is conducted biannually). This is the key to the price reduction without compromising quality. Using such logical argument, CMS has led the committee that has been appointed by the Health Board Executive Secretariat to enforce the resolution of NBHSC. Some of the public organizations were very reluctant to the resolution of NBHSC with regard to the unification of public purchase of health commodities through CMS. To buy them in, CMS started to deal with them as partners rather than mere customers. The main public organizations are now implementing the resolution of the unified purchase of health commodities through the CMS. The best examples are National Health Insurance Fund, National Renal Dialysis and Kidney Transplantation Programme and National Blood Bank Services.

8.2 Reform of Pricing of Medicines and other Health Commodities

The pricing policy was built into the system as a routine administrative exercise from the very beginning of the CMS, because affordability is a critical factor in a country like Sudan (46% of its population are below the poverty line[9] as reported by the Central Bureau of Statistics). The old pricing system used a fixed percentage on the cost price of every batch being received, which resulted in price changes with every new consignment. In this system, CMS sold medicines to the 'RDFs' in other states which in turn sold them to the public health facilities. Each level added its own mark-up before the medicines were finally sold to end users. In this type of CMS drug supply system, any issues of cost recovery are problems for institutions not the CMS. And the original price of medicines was multiplied two to three times before reaching the end users. This is an important difference. In the old system, CMS and other states' 'RDFs', each level sells on (after putting its own mark-up) to the one below, rather than taking the full responsibility for the complete cycle to the end user. All potential risks are, therefore, passed down the line. As a result, in the public sector, although the tender's prices recorded were largely below the IRP, the mark-ups of CMS on generics were found to be higher than those of the private wholesalers (Ali and Yahya 2011). Therefore, lower prices at CMS do not help much in controlling of prices in private sector, because some retail pharmacies sell the low-cost tender items from CMS at the retail prices equal to those set by the wholesalers for the same medicines.

The reform of the medicine price aims to ensure provision of affordable medicines, in comparison to the alternative sources, and to maintain CMS's prices for as long as possible without change. It also introduces a unified pricing system across the country. This pricing system gives a new role to the CMS to closely monitor State-MSFs with a uniform pricing system to the patients using public health facilities. The CIF price is determined by the tender committee. As shown in Table 12, costing is done also by CMS pricing committee to all items,

9 To allow for international comparisons, the World Bank has established an international poverty line of $1.0 a day per person in 1985 (Soubbotina 2004). Despite being old, it is still used to measure the poverty.

immediately after the announcement of wining prices. After adding all costs, the medicines then sold on to public and private health facilities at a 15% mark-up. The overall topping ups (customs are excluded) dropped from 41% in 2010 to only 28%, since 2012. This led to the more than 20% reduction in the margin between CMS and private sources.

Table 12: CMS old and current costing and mark-ups

	2010	2012
Custom tax[10]	10%	0
Port fees	3%	3%
Clearance expenses	7%	1%
Insurance	2%	2%
Disposal, damaged products	3%	0%
Sudanese Metrology & Standards	1%	1.5%
Bank charges	2%	2.5%
Transportation	4%	3%
Total	31%	13%
Mark-up	20%	15%
Total Toping up on CIF	**51%**	**28%**

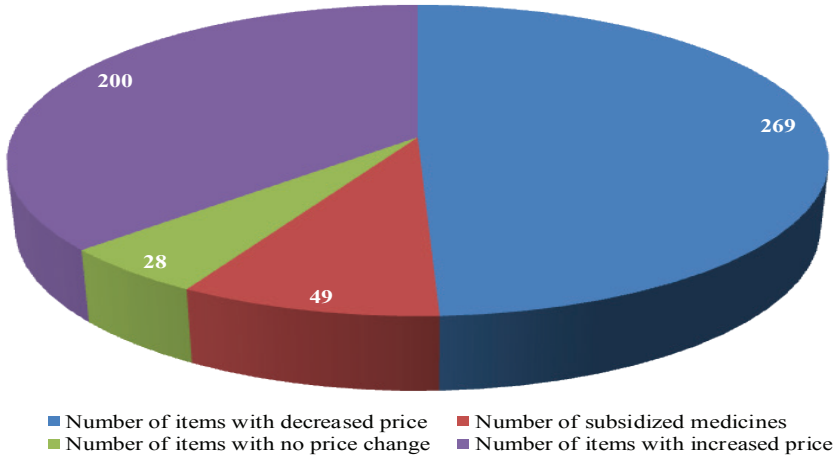
Yet the overall CMS charges amounted to 1.28 times the cost price. This mark-up rate was less than the range (two to three times) recommended by the Bamako Initiative to sustain the continuity of RDFs (Chisadza, et al 1995). Despite this, the average top-up (28%) on CIF prices that are charged by the CMS safeguarded the CMS during the hard time of local currency devaluation in the mid-2012, as a result of the separation of Sudan. By improving its procurement and supply management systems, CMS increases its market share considerably. Among other things, CMS is now making sure that its prices are competitive at the procurement stage by making sure that its procurement prices are substantially lower than the local market prices as well as the international medicines prices.

The lower costs, and thus lower sales prices, have downward effects on the private market prices when patients favour the lower prices in the public sector. To assure that mark-ups through the supply chain do not compromise affordability, thus hampering access, CMS unified the retail price of its products across the country. One of the major mechanisms to make medicines affordable to all is cross-subsidisation of more expensive, essential medicines, such as Clopidogrel bisulfate (Pelavix®) and Immunoglobulin, through a higher mark-up on less expensive, but fast moving items, such as Paracetamol tablets. The mark-up on the cost of the expensive drugs with great health impact is subsidised by increasing that of the cheapest ones. The average percentage of this subsidy is more than 40% (i.e. it ranges between 9% and 74%). The absolute amount of the subsidy in 2013 was more than SDG 33 million (US$5.8 million). The CMS also charges equal medicine prices for all health facilities throughout the country regardless of the distance from its warehouses in Khartoum

10 Removed in 2012

(i.e. there is a cross-subsidy from closer health facilities to more remote rural ones). The new system has resulted in a price reduction of 49% of the medicines on the CMS list (Figure 14). However, the CMS needs to review medicine prices regularly to keep pace with inflation. The price revision will enable the CMS to maintain its ability to replenish exhausted stocks and to adjust its prices to those of alternative sources. Finally, this adjustment prohibits leakage and convinces people that CMS medicines are not of low quality and at the same time keeps down the cost of obtaining medicines.

Figure 14: CMS price change after adoption of the new pricing system in 2012



9. Evaluation of CMS

In late 2011, CMS has made a call for interested specialized firms to submit a proposal for its evaluation. The announced evaluation includes development of procurement, logistics and delivery systems. It also includes development of accounting system and payment mechanisms and systems for human resources development. Later on, the evaluation has been conducted by Health Research for Action (HERA).

After 21 days of assessment, the evaluation team (HERA 2012) reported that the CMS has made a considerable progress in different areas of medicine supply chain. The team clearly highlighted the progress in the new procedures of forecasting and quantification; new, more transparent, tender documentation and procedures that ensure quality of the medicines and commodities by excluding non-registered medicines; and proper tender adjudication.

The evaluation team concluded CMS is on the right path for increased efficiency and cost-effectiveness. The central role of CMS in strengthening the State-RDFs supply management systems and infrastructure is expected to substantially increase access to essential medicines

and commodities at all levels. These conclusions are supported by the results of the basic performance indicators proposed by the Evaluation Team and for which results could be obtained. The increased efficiency and cost-effectiveness over the last 15 months has been expressed particularly by the increased availability of essential medicines and supplies (from 35% to 84% availability) and the procurement of quality products that represent good Value-for-Money, i.e. 68% of 183 items have prices that are less than the median international medicines prices. However, data in key areas are lacking or inaccurate which indicates inefficient or sub-standard performance, especially in financial, personnel and information management. However, the CMS evaluation founds that a complex mix of further interventions in all areas is needed. At different points of time in CMS's history, there has been no hesitation in making the changes necessary to maintain its mission (i.e. to serve the public interest by ensuring access to quality essential medicines and commodities at all times). Such a point of time has come again as its current status as public corporation is outdated and constrains further necessary improvements, especially in financial and personnel management. The change of the CMS' legal status is essential for it to be able to function as a proper business entity and continue its path of increased efficiency and cost-effectiveness. The change of legal status of CMS into that of a governmental company (i.e. the Evaluation Team's preferred option), is a pre-condition for successful implementation of the team's recommendations. In implementing such reforms, CMS would follow examples in various other countries in the Middle East and on the African continent where similar measures have been taken, clearly improving the performance of their public pharmaceutical procurement and supply organisations.

10. Appreciation of what has been achieved

What has been achieved by the CMS is highly appreciated by its Administration Board and the federal minister of health (the chairman of the board). To show this appreciation, the minister invited HE the President Omer Elbashier to visit CMS. The President, who was accompanied by Presidency of the republic Minister, Minister of health and minister of defence, made this visit during a ceremony marking the official launching of the MSF on Wednesday 28th August 2013 (Photo 4).

Photo 4: H.E. the President visited CMS

After inspection of warehouse of the keep-cool products and inventory control room, the President witnessed phase two of the handing over of vehicles (8 Toyota Pick-up) and temperature controlled trucks (8 Mitsubishi Canter) for medicines transportation from states' warehouses to the health facilities (Photo 5). He talked to the ministers of health of states who have received the vehicles and trucks to make sure that the vehicles and trucks are used for their purposes.

Photo 5: HE the President presented the vehicles' certificates donated by CMS to the states' ministers

After his 30 minutes historical and memorable visit, the President went to the CMS's meeting hall (Photo 6) to chair the first meeting of the National Board for Coordination of Health Services (NBCHS). The members of this meeting were: Ministers of Health, Defence, Interior, Social Security, Finance, Decentralization; Governors of States (North Kordufan, Khartoum, Sennar, White Nile); 16 States' Ministers of health and other senior government officials. NBHSC is a national forum initiated by the FMOH and chaired by the President himself, for coordination of health service in Sudan. This platform also seeks to build a sense of national and cross-sectorial ownership through coordinated leadership and action. Commenting on the implementation of the recommendations of the past meeting, President Elbashier made it clear that all government medical supplies organization, including the military ones, should meet their needs from CMS. He clearly said that he knows CMS very well, and he is sure that the quality and prices of CMS medicines are better than those from alternative sources.

Photo 6: HE the President chaired the meeting of the NBCHS at CMS's hall

In a related official engagement, First Vice President Ali Othman Taha visited CMS on Thursday 10th October 2013, where he launched a free medicines programme for children under-five year of age (Photo 7). Led on the tour by the Federal Minister of Health Mr Bahar Idris Abugarda, in the company of states' ministers of health, First Vice President Taha underscored the mobilization of resources for improvement of child health as everybody's business. The First Vice President described efforts gearing toward health improvement as an indication of Sudan's commitment to minimize the child mortality rates in the country and reiterated the involvement of other partners in the process. Addressing the states' ministers of health, Taha said "We must go beyond sensitization and make sure that these medicines

are distributed free and reach their targets. He added we can't afford to allow the selling of medicines". Asked by First Vice President for the safety of medicines, the health minister replied: security measures have been put in place to protect every quota of medicines being delivered to health facilities in the country. The minister said the process is fully decentralized and health workers will be trained by expert teachers identified by his ministry to undertake the distribution across the board. Responsible pharmacist, Tahani Gawish explained how data is collected on the distribution of free medicines; a system, she said, is replicated in all states in the country. She said receipts are given back to the CMS for every quantity of medicines delivered to any health facility anywhere the free medicine programme targets.

Photo 7: HE the First Vice President witnessed the launching of the under-5 free medicine project

During his visit to CMS, First Vice President received the minister of health of Chad Republic and his companies at the office of CMS's DG. The federal minister of health attended this meeting. He said the receiving of Chad minister at CMS affirmed the recognition of the First Vice President to what has been done in the CMS (Photo 8).

Photo 8: HE the First Vice President met the minister of health of the Republic of Chad

11. Discussion and Conclusion

11.1 Discussion

The success of health programmes largely depends on the quality of medicines (USP, 2007). Patients in wealthy, strictly-regulated countries can generally be confident about the efficacy, safety and intrinsic quality of their medicines. People in low resource countries however often only have access to substandard medicines. Ensuring that patients have access to quality medicines at reasonable prices is the one of the fundamental principles of the CMS reform. Although quality is one of the key components in the operational principles of good pharmaceutical procurement and distribution, it is highlighted here because of the increasing failure rate of samples tested by the NMQCL, during the first decade of this century. The CMS decision of purchasing registered medicines only ensures that medicines distributed by the CMS meet national standards of safety, efficacy and quality. The data presented in this study prove that purchasing of registered medicines by the CMS is strong indicator of quality of medicines. The data also confirmed the fact mentioned by the DG: that the previous international tender operated by CMS poses a number of quality issues. This must remind CMS pharmacists that the purchase of un-registered medicines before the reform, which they thought to be benefit to poor patients turned out to not be beneficial, or even to be harmful. Laboratory testing of medicines is carried out mainly to confirm the accuracy of content of active ingredients in the drug sample. It will not guarantee the quality of medicines with regard to stability and bioavailability, since pharmacopoeial specifications do not necessarily address these issues (WHO 1997). Given the alarming prevalence of counterfeit and substandard medicines in the global market (WHO 2006), restricted tender to the registered

medicines safeguards against the entry of substandard or counterfeit medicines to the CMS supply chain.

Access to price information, at the national and international levels, is important. It can improve the ability of procurement departments to make informed decision and to negotiate good medicine prices.

We identified at least three steps in the medicine procurement process in which the role of pharmacists is both necessary and useful: establishment of a medicine tender list, selection of the most appropriate offerings and analysis of the tender process and results. Reputable suppliers who are priced competitively have been awarded a contract. They usually win a contract award on the basis of quality, in combination with price and past service performance, and not on price or other sources of influence, legal or illegal.

The distinction between the two periods was the requirement of certificate of market authorization. This requirement was responsible for differences between the tenders 2008 and 2011 in the time to complete the bidding processes, failed items, per unit cost and total value to procure the medicines. The technical requirement to present the certificate of registration made the process faster. Due to existence of a number of medicines (e.g. narcotics) on the tender list, which have no marketing authorization in Sudan, the tender committee decided to accept them on condition that their suppliers must complete the registration of such medicines. This is to avoid the possibility of stock-outs in the health system.

Another valid issue to consider in this study is the basis for selecting medicines to be included in the tendering process in the public health sector in Sudan for the years 2011 and 2013. Each of the national programme has its own method of selecting medicines to be included in the bidding list. Each method is considered highly subjective because it is knowledge rather than evidence-based. On the one hand, rationality dictates that any government in a resource-constrained setting would expect that an effective procurement system would ensure availability of quality medicines while optimising the finances to ensure the best outcomes. It is also in the interest of the government to run this system transparently to promote competition and thus efficiency. In addition, patients expect that quality medicines are available at all times.

A successful reform requires both political skills, to develop and mobilize political support, and technical skills, to manage and promote the reform. It also requires strong leadership that is capable of managing the reform by adopting financial transparency and developing anticorruption measures. Finally, the usage of hard and soft data in decision making without forgetting the signs of denial and act on them are also necessary to make the change. This study shows that a firm commitment from the National Assembly, Ministry of Council of Ministers, FMOH, MOF and Central Bank of Sudan is vital to the success of the CMS reform. The authors recognize that political commitment is of paramount importance for

the success of the CMS reform. Examples of such commitment are supporting of CMS stand during importers resistance to the tender's conditions; waiving of annual dividend, and exemptions from customs which count up to 10% of the amount of imported medicines, business profit taxes (15%), and Zakat. These exemptions helped the CMS to provide low cost quality medicines. Much motivation has been also given for the CMS to succeed, by drawing attention to and praising its success, at the highest levels of the government. Examples of such praising include the visit of HE the President of the republic and in less than two month later, HE the First Vice President also visited CMS. Other public health organizations are not allowed to establish parallel procurement systems. This pooled procurement through CMS minimizes the tender costs and results in competitive prices through increasing purchased quantities (i.e. economy of scales).

Access to convertible currency remains one of the major planks of sustaining international procurement. This is more so for public sector procurement in developing countries, particularly in Sub-Saharan Africa, where governments in many cases may not be in a position easily to provide foreign currency (Wang'Ombe and Mwabu 1987; Knippenberg, et al 1997). The availability of hard currency, especially after the separation of Sudan, is the cornerstone for the success of the CMS reform. The commitment of the Central Bank of Sudan to secure the hard currency (which also reflected the commitment of the government) has helped the CMS to have access to hard currency at official rates. This allows a regular supply of medicines from abroad to the CMS, and from the CMS to public health facilities. It also enables the CMS to maintain its medicine costs at more than 20% less than the prices charged at alternative sources while making a surplus to finance its operating costs. Additionally, availability of foreign currency helps CMS to keep its price of medicines without change for longer period (more than 15 months, despite the very frequent changes in the private sector). As a result, National Health Programmes enjoy the same quantity of items based on annual budget (i.e. no need for asking for additional budget to meet patients demand as a consequence of price inccrease). Finally, the availability of hard currency has protected the CMS against excessive losses by devaluation of local cash in hand as a result of local currency inflation, particularly during 2012.

In many countries, a lack of trained staff is a frequent cause of supply chain system breakdown and poor performance, resulting in poorly maintained information systems, ill-functioning product management, and, ultimately, product stock-out. An effective public health supply chain requires motivated and skilled staff with competency in various essential logistics functions; staff must be empowered to make decisions that positively impact health supplies and supply chains. The CMS, as a leader in medical supplies, fully recognized that its success and reform are achieved through people's expertise, and that appropriate training and development is the key to the success of its reform. The CMS's reform based

on shifting the way of doing things from knowledge-based to evidence-based and learning from others' successful stories. To do this, CMS conducted a very comprehensive human resources development programme. The participation of the key pharmacists in regional and international training courses, conferences and workshops helps them, for example, to change their minds about purchasing cheap un-registered medicines.

In the early stages of the reform, the board of directors took bold decisions deviating from the traditional way of doing things in the CMS raising, *changing the way of doing things,* as slogan for the first year. It was that courage and the political commitment, which enabled the DG to encounter the fierce resistance to the reform of the procurement system led by the association of the importers of medicines. This resistance due to the fact that the CMS, in its first tender after the reform, stopped the previous practice of giving preference to cheap un-registered medicines and regardless of the performance of the suppliers. It also stopped prepayment to manufacturers through letters of credit, and took their agents responsible for delivering of medicines to the CMS's warehouse. However, the CMS reached agreement with association of the importers to pay them in hard currency up to 50% of proforma invoices in advance and to complete the payment after receiving of shipments in CMS's warehouse. One year later, and due to the scarcity of hard currency, the Central Bank of Sudan obliged itself to charge the CMS only 25% of the proforma invoice in advance and to be completed on the receiving of the shipping documents. As a result, CMS re-started opening LCs, except in cases that the corresponding bank refuses to make transactions with the Central Bank of Sudan.

Strong leadership and calibre of the CMS Director General enables him to lead the change. His long experience in managing drug supply and pharmaceutical regulation were an asset. It is interesting to note that the DG himself spares enough time to meet with all members of staff of different department twice per year to monitor the reform; listen to their ideas and complaints, if any; and motivate personnel from bottom to the top. It was the team spirit and the honesty, dedication of the highly motivated team members, dominated by pharmacists that made the CMS's reform programme a great success in a hard time in Sudan (i.e. during post separation period).

Continuing to evaluate pharmaceuticals after they have distributed as well as the routine collection of bottom line information from MSFs is an important part of ensuring their quality and therefore their safety and learning new things about their benefits.

11.1.1 Study limitation

The perceived assumption is that, any public archival documents represent the imprint of the organisation that produced it, and thus bias arises simultaneously from both the author and the organization (Denzin 1989). However, the fact that official records were not prepared for the

purpose of the evaluation gave authors more confidence in them. Some of these documents are stock records and tender reports which are more likely to be accurate; because the stocks of medicines at CMS's warehouses were taken annually by committees comprise CMS staff, in addition to external members (e.g. auditor general, representative of MOF, legal advisor and internal auditor). Moreover, all authors, except the first one, are working with CMS at least since 2009, some of them since the early 1990s. The danger is that staff may be too willing to provide good image about their organization. To counter the inbuilt bias resulting from being members of CMS staff, evaluation team set indicators and decided to report findings when there is a consensus prior to assessment. We thought that these measures secure the accuracy of the information, and thereby, the credibility of the findings and conclusions.

11.2 Conclusion

The revolutionary programme aims to make CMS efficient organization. This strategy might bring general benefits to Sudanese people by reducing cost of quality medicines. Such revolutionary change will not come about unless CMS's leaders persuade policy-makers and other stakeholders to welcome 21st century style of management and develop system for unified medicine supply chain. Sometimes, changing existing structures for new procedures may be a herculean task, which needs to be well thought out before undertaking (Singh, et al, 2013). Clarity of the vision and knowing the targets are of paramount importance in making the dream of the CMS reality. The empowerment of the senior employees and selection of teams with a mix of analytical and action-oriented members are another important lesson to be learned from the experience of the CMS. Having gone through the training programme and participation in a number of regional meetings and conferences and being part of the reform, managers were more committed to making this reform happened.

In its reform, CMS considers price after the quality of the product and the performance of its supplier. CMS has adopted well-designed, thoroughly planned and scientifically streamlined procedures for quality assurance, procurement, storage and distribution of medicines. The tender is a lengthy, laborious and risky exercise (Milovanovic, et al, 2004), which consumes many resources and needs monitoring and audit. The new tender procedures have ensured lower possible total costs without making any compromise for quality. Such procedures have helped the CMS to increase availability of medicines from 46% before reform to 95% in the third year of the reform. The CMS experience has also shown that the value for money can be achieved, if objective adjudication is built in through continuous review and monitoring of prices of medicines circulated in the market. The best value for money was achieved not by the selection of cheap items, but by considering overall costs, which may sometimes lead to accepting higher prices. The new tender procedures also proved that, the purchasing system will become cost-effective, if measures are put in place to have a transparent and corruption free process and follow WHO guidelines on good procurement practice (WHO 1999). Access

to price information, at the national and international levels, is important. It can improve the ability of procurement departments to make informed decision and to negotiate good medicine prices.

The focus of the CMS is now on the quality and not only on the price. In this regard, purchasing of registered medicines from reliable sources is one step to avoid human suffering, and even death because of ineffective medicines. CMS staff need to be trained to notice a suspected product if a large number of batches is received, if the label is not in good order, if the expiry date is not stamped or unreadable.

The efficiency of a procurement system requires special skills, both pharmaceutical and administrative. The experience of the CMS has proved that the trained pharmacists are the cornerstone in pharmaceutical purchasing system. Such system, in similar situations to that of the CMS, cannot be established and maintained without the support of pharmacists.

Innovation, like publication of CMS's medicine datasheet book; donation of MDS-3: managing access to medicines and health technologies to the CMS and MSFs' pharmacists, departments of pharmacy at federal and state levels, and schools of pharmacy; and distribution latest edition of the BNF (free of charge) every year, aims to improve the capacity of the pharmacists work in the national medical supply chain and to promote rational use of medicines and keeping pharmacists at CMS, MSF, and big hospitals up to date.

Based on the qualitative observations made, the authors assert that some of the critical success factors of the experience of CMS include strong leadership and political support; well-qualified motivated staff; sufficient budget allocation to meet drug demand and administrative costs, scientific quantification and forecasting, and objective adjudication; outsourcing of non-core services like transportation and cleaning; mandatory external quality testing; prompt payment to suppliers; scientific warehousing and inventory management; real-time stock monitoring (both at the warehouse and facility levels); and robust IT systems.

The website's redesign was based on consumer search for medicines and "online purchase". The new website, SMS system and toll- number have a simple mission: to make sure every Sudanese who needs medicines has the information they need, to make choices that are right for themselves and their families or their businesses.

DG enables faster and better decision-making, such as stop selling to non-licenced customers, commercial NGOs, stop CMS commercial activities (e.g. investment in pharmaceutical manufacturing firms), focus on medical supplies to the public health facilities and organizations (For example, RDFs, free emergency medicines), restricted purchase to registered medicines only unless under certain circumstances, pricing system, and open tender for medical devices.

ERP was in trial stage, when the reformer DG has been appointed. The high commitment of the new DG, who used to visit IT department on daily basis, made this programme gone live rapidly. Although the DG plays some part in all this, it would be remiss of him not to credit

his colleagues, especially the directors of different directorates, and the predecessors CMS's DGs (who set foundation and the current DG only built on it) for the CMS's phenomenal reform. Without the sound cooperation and foresight of his colleagues, the reform would not have been achieved, at least it would have taken the DG a longer time to make his vision a reality.

While much has been achieved in the first 3-year of CMS reform, much remains to be done. Improved supply chain at all levels (i.e. central, state, locality and facility levels); quality use of medicines; approval of the CMS bill; independent sources of medicine information; the widespread use of new technologies, such as electronic payment are just examples.

Conflict of interest: The authors are members of staff in the CMS

References

Abu-Reid, S. A., et al 1991. Stability of drugs in the tropics. A study in Sudan. *International Pharmacy Journal*; 4(1): 6 – 10.

African Union 2007. Pharmaceutical Manufacturing Plan for Africa. Third Session of the African Union Conference of Ministers of Health; 9– 13 APRIL 2007; Johannesburg, South Africa

Alfadl, A.A., 2005. Quality assurance and quality control in central Medical Supplies Public Organization (CMS). A report submitted to the Federal Ministry of Health, Khartoum, Sudan.

Ali, G.K. M., Yahia, A.Y., 2012. Controlling medicine prices in Sudan: the challenge of the recently established Medicines Regulatory Authority. *East Mediterranean Health Journal;*18(8): 811-820.

Arhin-Tenkorang, D., 2000. Mobilizing resources for health: the case of user fees revisited. Commission on Macroeconomics and Health Working Paper Series No WG3:6. World Health Organization, Geneva [online]. Available at: www.cmhealth.org/docs/wg3_paper6.pdf. [Accessed December 2005].

BNF 2011. *British National Formulary,* 62nd *ed*. London, BMJ Group and Pharmaceutical Press.

CBS 2012. Sudan in Figures: 2005–2009. Khartoum, Sudan, Central Bureau of Statistics, 2012

Chisadza, E., Maponga, C.C., and Nazerali, H., 1995. User fees and drug pricing policies: a study at Harare Central Hospital Zimbabwe. *Health Policy and Planning*; 10(3): 319-326.

CMS 2010. Annual report. CMS, Federal Ministry of Health, Khartoum, Sudan. (Arabic only; not published).

CMS 2011. Annual report. CMS, Federal Ministry of Health, Khartoum, Sudan. (Arabic only; not published).

CMS 2012. Annual report. CMS, Federal Ministry of Health, Khartoum, Sudan. (Arabic only; not published).

CMS 2013. Annual report. CMS, Federal Ministry of Health, Khartoum, Sudan. (Arabic only; not published).

Committee on CMS Privatization. Report. 2011 (Arabic only; not published).

Public Corporations Act 2003. Ministry of Finance and national Economy, Khartoum, Sudan.

Denzin, N.K., 1989. *The Research act. A Theoretical Introduction to Sociological Methods*. 3rd ed. London: Prentice-Hall (UK) Limited.

Dowling, P., (2011). *Healthcare Supply Chains in Developing Countries: Situational Analysis*. Arlington, Va: USAID| DELIVER PROJECT, Task Order 4.

FMOH, 2010. The WHO published the Sudan Pharmaceutical Country Profile (PCP-S). Available at: http://www.who.int/medicines/areas/coordination/sudan_pharmaceuticalprofile_december2010.pdf . . [Accessed May 2009].

HERA 2012. CMS Evaluation: Blowing Winds of Change. Health Research for Action. (not published).

Homedes N., Ugalde A., 2005. Multisource drug policies in Latin America: survey of 10 countries. *World Health Bulletin*; 83(1): 64-70.

King DR, Kanavos P., 2002. Encouraging the Use of generic medicines: implications for transition economies. *Croatian medical journal*; 43(4): 462-469.

Knippenberg, R., et al., 1997. Implementation of the Bamako Initiative: Strategies in Benin and Guinea. *International Journal of Health Planning and Management*; 12(Suppl.1): S29-S47.

Medicines, Cosmetics and Poisons Act 2009. Federal Ministry of Health, Khartoum, Sudan.

Milovanovic, DR., et al, 2004. Public drug procurement: the lessons from a drug tender in a teaching hospital of a transition country. *European Journal of Clinical Pharmacology*; 60: 149–153

MSH 1997. Inventory Management Assessment Tool (IMAT). Management Science for Health. Available at: http://www.msh.org/resources/inventory-management-assessment-tool-imat. [Accessed February 2014].

MSH 2010. *International Drug Price Indicator*. Management Science for Health & World Health Organization. Available at: http://erc.msh.org/mainpage.cfm?file=1.0.htm&module=DMP&language=English. [Accessed September 2011].

MSH 2013. *MDS-3 Managing Access to Medicines and Health Technologies. 3rd* ed. Management Science for Health. West Hardford, CT: Kumarian Press.

Mustard, CA. and Frohlich, N., 1995. Socio-economic status and the health of the population. *Medical Care*; 33 (12 Suppl): DS43-54.

NMP 2005. National Medicine Policy. Federal Ministry of Health, Khartoum, Sudan.

OECD 2008. *The Economic Impact of Counterfeiting and Piracy*. Organization for Economic Co-operation and Development, Marston Gate.

Ombaka, E. 2009. Current status of medicines procurement. *American Journal of Health-system Pharmacy*; 66 [Suppl 3]: S21 – S28.

Procurement, Contracting and disposal of Surplus Act 2010. Ministry of Finance and national Economy, Khartoum, Sudan.

Singh, PV., et al, 2013. Understanding public drug procurement in India: a comparative qualitative study of five Indian states. *British Medical Journal Open*; 3: doi:10.1136/bmjopen-2012-001987

Soubbotina, T.P., 2004. *Beyond Economic Growth: an Introduction to Sustainable Development*. 2nd ed. WBI Learning Resources Series. World Bank, Washington, DC.

Trebucq, A., Caudron, JM., Pinel J., 1999. Requirements for anti tuberculosis drug tender requests. *The International Journal of Tuberculosis and Lung Disease*; 11[Suppl 3]: S358–S361

USP, 2007. Ensuring the Quality of Medicines in Resource-Limited Countries: An Operational Guide. Rockville, Md.: The United States Pharmacopeial Convention. United States Pharmacopeia Drug Quality and Information Program and collaborators. Available at: www.usp.org/worldwide/dqi/resources/technicalReports. [Accessed January 20012].

von Massow, F., et al., 1998. Financially independent primary health care drug supply system in Cameroon. Tropical Medicine and International Health; 3(10), 788-801.

Wang'Ombe, J.K., and Mwabu, G.M., 1987. Economics of essential drugs schemes: the perspectives of the developing countries. *Social Science & Medicine*, 25(6), 625-630.

WHO 1997. *Quality Assurance of Pharmaceuticals: a Compendium of Guidelines and Related Materials*. Volume 1. World Health Organization. Geneva.

WHO 1999. *Operational principles for good pharmaceutical procurement*. Geneva, World Health Organization. WHO/EDM/PAR/99.5 [online]. Available at:

http://www.who.int/3by5/en/who-edm-par-99-5.pdf [Accessed August 1999].

WHO 2006. Substandard and counterfeit medicines [online]. Available at: http://www.who.int/mediacentre/factsheets/fs275/en/print.html. [Accessed January 2006].

WHO 2007. *Technical discussion on Medicine prices and access to medicines in the Eastern Mediterranean Region*. Cairo, World Health Organization, Regional Office for the East Mediterranean. (EM/RC54/Tech.Disc.1). Available at: http://www.emro.who.int/emp/media/pdf/EMRC54TECHDISC01en.pdf. [Accessed May 2009].

WHO 2010. Growing threat from counterfeit medicines. *World Health Organization Bulletin*, 88, 247 -248.

World Bank 2011. Sudan Country Economic Brief. December 2011.

Appendix 1: List of subsidized medicines in 2013

	Description	UNIT	Whole Price in SDG	Subsidized Whole Price in SDG	Subsidy %
1	Acetyl cystine 200mg/ml in 10ml injection	AMP	279.7088	217.55	-22%
2	Amino Acid 10% Solution (500ml) bottle	BOTT	100.9384	80.00	-21%
3	Amiodarone hydrochloride50mg/ml in 3ml injection	AMP	4.3829	3.50	-20%
4	Amphotricin B USP 50mg powder for inj (lyophilized)	BOTT	48.6450	37.90	-22%
5	L.asaraginase powder for inj 10000iu/vial		273.6281	250.00	-9%
6	Clomipramine HCl 25mg/2ml inj	AMP	16.2961	12.67	-22%
7	Digoxin 50mcg/ml Elixir		43.7805	34.00	-22%
8	Docetaxel 20mg/0.5ml vial	VIAL	583.7400	200.00	-66%
9	Docetaxel 80mg/2ml vial	VIAL	2,018.7675	750.00	-63%
10	Doxorubicin 10 mg	VIAL	23.5928	18.40	-22%
11	Flupenthixoldecanoate 20mg/ml, 2ml Amp	AMP	62.6304	49.00	-22%
12	GelatinPolysuccinate 4%W/V solution for IV use 500ml /bottle	A	52.1462	40.50	-22%
13	Glucagon HCL 1gm powder for inj	VIAL	243.2250	190.00	-22%
14	Haloperidol 5mg/ml(1ml) ampule	AMP	2.4201	2.00	-17%
15	Heparin sodium 5000 IU/ml in 5ml vial for I.V/ S.C use		43.7805	35.00	-20%
16	Hepatitis B Immunoglobulin	VIAL	643.9382	430.00	-33%
17	Human albumin 20% w/v in 100ml	BOTT	413.4825	260.00	-37%
18	Human albumin 20% w/v in 100ml	BOTT	407.4019	260.00	-36%
19	Human albumin 20% w/v in 50ml	BOTT	206.7413	150.00	-27%
20	Human normal Immunoglobulin 5gm/100ml for i.v use	BOTT	2,366.5793	700.00	-70%
21	Human normal Immunoglobulin 5gm/100ml for i.v use	BOTT	2,675.4750	700.00	-74%
22	Interferon alfa-2a 3000000iu/ml for sc only		271.0937	211.00	-22%
23	Iron dextran 50 mg/ml inj 2ml	AMP	30.4031	15.00	-51%
24	lipid emulsion 20% 500ml iv infusion	BOTT	109.4513	65.00	-41%
25	Methotrexate sodium salt 2.5mg tablet.	TAB	1.9458	0.90	-54%
26	Methyl Phenidate 10 mg tablet	TAB	1.5323	1.00	-35%
27	Monoclonal Anti-Rho-D immunoglobulin 300mcg/2ml (1500iu) for i.v	VIAL	304.0313	225.00	-26%
28	Ondansterone HCL USP 2mg/1ml 2ml amp	AMP	30.4031	23.60	-22%
29	Oxaliplatin For intravenouse injection 50mg/Vial	VIAL	1,556.6400	750.00	-52%
30	Oxaliplatin 100 mg	VIAL	3,101.1188	1,200.00	-61%
31	Oxaliplatin 100 mg	VIAL	1,767.6377	900.00	-49%
32	Paclitaxel 6mg /ml .50ml vial	VIAL	486.4500	400.00	-18%
33	Rabies immunoglobulin 150IU/ml 2ml amp.	AMP	462.1275	300.00	-35%
34	Rabies vaccine single dose liquid 1ml/amp. (Human diploid cell)	AMP	76.6159	65.00	-15%
35	Recombinant human erythropoietin 4000iu/1ml for i.v,s.c	VIAL	128.9093	70.00	-46%
36	Somatropin5 mg (15 IU) /1.5 ml Solution for S.C Use	VIAL	547.2563	200.00	-63%
37	Streptokinase 1.500.000 iu lyophilized for i.vinj	VIAL	971.6839	500.00	-49%
38	Temozolamide 100 mg caps	CAP.	645.3975	450.00	-30%
39	Temozolamide 20 mg caps	CAP.	127.8147	90.00	-30%
40	Terlipressin Acetate 1mg powder for i.vinj	VIAL	279.7088	150.00	-46%
41	Tinzaprin Sodium 10000 IU/ml , 1 ml	PFS	87.8042	74.75	-15%
42	Topotecan HCL 1mg/ml in 2.5ml single dose for i.v use	VIAL	194.5800	151.40	-22%
43	travoprost 40mcg/ml eye drop 2.5ml bottle	BOTT	118.5722	90.00	-24%
44	Vincristine Sulphate 2mg powder for inj, for I.V only	VIAL	61.6575	48.00	-22%
45	Vinoreline(as tartrate)50mg	VIAL	729.6750	600.00	-18%
46	Zoledronic acid 800 microgm/ml, 5ml VIA	VIAL	1,903.2356	1,480.00	-22%
47	C.S.F Flow contoured Shunt High Pressure	PCS	1,580.9625	1,000.00	-37%
48	C.S.F Flow contoured Shunt Small Medium Pressure	PCS	1,580.9625	1,000.00	-37%
49	Ventricular Shunt Low Pressure	PCS	1,580.9625	1,000.00	-37%

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