

## **Rapid Assessment of Pharmaceutical Management of Medicines and Supplies for Preventing and Managing Emergency Obstetric and Newborn Conditions in Rwanda: September 2012**

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## **Key Words**

pharmaceutical management, Rwanda, assessment, obstetric, maternal, newborn,

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## ACRONYMS

AMTSL	active management of third stage of labor
BUFMAR	<i>Bureau des Formations Médicales Agréées du Rwanda</i>
DH	district hospital
DP	district pharmacy
HC	health center
LMIS	Logistics Management Information System
LMO	Logistics Management Office
MCH	Maternal and Child Health [Department of MoH]
MCHIP	Maternal and Child Health Integrated Program
MNH	maternal and newborn health
MoH	Ministry of Health
MSH	Management Sciences for Health
MVA	manual vacuum aspiration
NEML	national essential medicines list
PE/E	pre-eclampsia/eclampsia
PPH	postpartum hemorrhage
PTF	Pharmacy Task Force
RH	referral hospital
RwFr	Rwandan franc
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SONU	<i>soins obstétricaux et néonataux d'urgence</i>
SSA	Sub-Saharan Africa
STG	standard treatment guideline
USAID	US Agency for International Development
WHO	World Health Organization



## FOREWORD

The Government of Rwanda/Ministry of Health, with assistance from development partners, is committed to strengthening the health sector in Rwanda and implementing evidence-based interventions to attain the Millennium Development Goals.

In the area of maternal and child health in particular, the Government of Rwanda has made advances implementing interventions such as quality prenatal care, delivery assisted by a skilled attendant, and the active management of the third stage of labor to reduce maternal and newborn mortality. The success of these interventions, however, is dependent on the constant availability of quality medicines and commodities.

This rapid assessment to evaluate the pharmaceutical management of medicines and supplies for preventing and managing emergency obstetric and newborn conditions is timely and addresses critical issues for effective implementation of these key life-saving interventions. The findings and recommendations from the assessment will help the Ministry of Health develop actions to improve the supply chain, not only of medicines and commodities for maternal and newborn conditions, but also for all essential medicines so quality care services can be provided in the health facilities.

The Ministry of Health acknowledges the members of the Maternal Health Technical Working Group for their valuable comments during the preparation of the assessment, the review of the instruments, and the data collection. The recommendations presented in the report were generated in an options analysis meeting with participants from the Ministry of Health's Maternal and Child Health Department, district hospitals, district pharmacies, and storekeepers from district hospitals and health centers as well as members of the Maternal Health Technical Working Group.

The assessment would not have been possible without the work of the data collectors and the data analyst as well as the respondents at the facility level in the districts surveyed and the key informants at the district and central levels.

Dr. Agnes Binagwaho  
Minister of Health



## EXECUTIVE SUMMARY

The rapid assessment was conducted in 10 districts of Rwanda in a sample of 60 health facilities, including district pharmacies (DPs), district hospitals (DHs), and health centers (HCs) plus the central medical store Medicines Procurement and Distribution Division (MPDD) to evaluate pharmaceutical management of medicines and commodities for preventing and managing maternal and newborn emergency conditions, in particular postpartum hemorrhage (PPH), pre-eclampsia and eclampsia (PE/E), and maternal and newborn sepsis. The data collectors conducted observations and interviews with storekeepers and personnel in charge of the delivery suite, and in addition, data were gathered from key informants at the central level. The aspects assessed in the survey included selection and quantification, the supply chain (i.e., order process and frequency, stock management, record-keeping, storage conditions, and availability), knowledge of standard treatment guidelines (STGs), reporting, training and supervision, and a comparison of sales and purchase prices of the tracer medicines.

### Overview of the Findings

- Although the initiative of the Ministry of Health (MoH) to implement standard guidelines on emergency obstetric and newborn care (*soins obstétricaux et néonataux d'urgence*, SONU) is commendable, some inconsistencies are evident between the recommended use of medicines and the national essential medicines list (NEML).
- The process for ordering medicines and supplies has been standardized, and the existence of the Logistics Management Information System (LMIS) forms facilitates the order calculation.
  - Transport of medicines to facilities and supplier availability, however, were problems noted in the assessment.
  - Many facilities resort to purchasing their medicines from private wholesalers because of the lack of availability in the DP or the MPDD.
- Storage conditions in the majority of pharmacy stores were adequate; however, confusion was noted concerning the storage of oxytocin and ergometrine. The medicines procurement and distribution division (MPDD) wisely procured a type of oxytocin that does not require cold storage; the ergometrine, however, does require cold storage, and data collectors found it stored in the refrigerator in only 22 percent of facilities. (Ergometrine may be stored out of the refrigerator at temperatures under 30°C for no more than 4 weeks without losing its potency.)
- Although most facilities reported having uterotonics (both oxytocin and ergometrine) available in the delivery suite, the lack of ordering and tracking systems for the medicines stored in the delivery suite makes it difficult for those facilities to ensure that the ergometrine is used in less than 4 weeks to assure its quality. Oxytocin was available at all facilities; ergometrine was not so widely available. Medicines for PE/E were not

widely available at the HC level because of the inconsistencies between the guidelines and the NEML. Problems with the availability of key tracer medicines were noted at the MPDD level and could be due, in part, to problems in the quantification either at the central level or in the district level needs estimates that are carried out. Since the start of the LMIS in March 2011, health facilities are advised to maintain a stock level between a minimum of a month's consumption and a maximum of twice the previous month's consumption. Data collectors noted that, in general, this recommendation was respected by the HCs; however, they also found stock levels of up to 10 months in hospitals for some medicines.

- In general, the record-keeping in the stores of the health facilities was up to date, as assessed by comparing the stock cards with the physical stock, although more problems were noted in the DPs than in the HCs and hospitals. The good record-keeping is reflected in the positive findings that in all the 60 pharmacy stores assessed, an expired product was found in only one hospital, and only one HC had some expired ergometrine in the delivery suite area. Furthermore, stock-outs, although observed during the last 6 months at all levels, were not for extended periods; the maximum period of time out of stock was 23 days for nifedipine tablets at the DP level.
- In general, access to reference material such as the NEML or the STGs, was limited in all facilities surveyed. Most of the staff in charge of the delivery suites knew the correct treatment for the prevention of PPH, but were less familiar with the correct recommended treatments for PE/E and for maternal and newborn sepsis.
- Supervision of storekeepers at all levels of facilities was neither frequent nor consistent in its content, especially at the DP level.
- Data collectors report a wide variation of prices, with a mark-up applied of over 100 percent in some cases, in both the purchase and sales prices in all facilities showing a weakness in the application of the mark-up guidelines circulated by the MoH, in which a mark-up of 20 percent is recommended.

### **Areas Needing Improvement**

- Many of the weak points identified in the assessment can be easily rectified by providing appropriate orientation to standard procedures in management of essential medicines including uterotonics and other key medicines required for maternal and newborn emergency conditions.
  - Additionally, refresher orientation is required in the SONU to ensure all providers are familiar with the correct treatments for emergency maternal and obstetric conditions.
  - Supervision of store management, including the price margins that are applied, is required at all levels, however. This supervision should include the DPs as well as supervision or review of practices to ensure adherence to the SONU guidelines.

- At the central level, more coordination is needed to ensure that NEML and SONU recommendations are aligned and that quantification and procedures take into account the current recommendations. Additionally, the district level quantification process should be standardized to ensure that the same method is being applied in each district.
  - Because oxytocin is the first-line uterotonic recommended for administration to every woman delivering to prevent PPH.
  - Ergometrine, which is more complicated to administer and store, should be used less often and, thus, smaller quantities are required in the supply chain. In the interim period, however, care should be taken to ensure that the large quantities of ergometrine already in the system are appropriately stored and used before their expiry dates.
  - It is important to ensure that all future procurements of oxytocin are for the type of product that does not need to be refrigerated—this requirement should be included in the technical specifications of the product.

The MoH Maternal and Child Health (MCH) Department has validated and adopted the above recommendations and, in coordination with other entities of the MoH such as the Pharmacy Task Force (PTF) and Logistics Management Office (LMO) as well as development partners members of the MH technical working group, will implement the necessary action steps to improve the access and use of quality medicines for emergency obstetric and newborn conditions.



# GENERAL INTRODUCTION

## Background

In recent years, the Government of Rwanda has implemented a number of successful interventions in the area of maternal and newborn care, but reduction of maternal and newborn mortality remains a priority for the Ministry of Health.

## *Maternal Health*

Every day, approximately 800 women worldwide die of complications related to pregnancy or delivery. According to estimates, in 2010 there were 287,000 maternal deaths worldwide, a decline of 47 percent from levels in 1990. Most of these deaths occurred in developing countries, with 56 percent of them occurring in Sub-Saharan Africa (SSA).<sup>1</sup> Despite this decline, few countries will be able to reach the target for the fifth Millennium Development Goal, a reduction of maternal mortality by 75 percent by 2015. The major causes of maternal mortality in SSA are as follows:

- Severe hemorrhage (most often PPH): 45 percent of maternal deaths in SSA
- Infections (principally septicemia): 13 percent of maternal deaths in SSA
- Hypertensive disorders during pregnancy (generally eclampsia): 12 percent of maternal deaths in SSA

In Rwanda, the maternal mortality ratio remains high at an estimated 476 per 100,000 live births.<sup>2</sup> The major causes of maternal mortality in Rwanda for the period 1997–2007 based on regional estimates<sup>3</sup> are as follows:

- Hemorrhage: 34 percent
- Hypertensive disorders (including PE/E): 19 percent
- Sepsis: 9 percent

Maternal deaths from these major causes avoided; medical solutions to prevent or treat them are well known.

## *Postpartum Hemorrhage*

According to the *2003 Joint Statement of the International Confederation of Midwives and the International Federation of Gynecologists and Obstetricians* and the 2000 protocols of WHO, the active management of the third stage of labor (AMTSL) strategy is effective in reducing PPH. AMTSL comprises interventions designed to facilitate the delivery of the placenta by increasing uterine contractions and reducing uterine atony to prevent PPH. To effectively reduce

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<sup>1</sup> WHO, UNICEF, UNFPA, and The World Bank. 2012. *Trends in maternal mortality: 1990 to 2010*. Geneva: WHO [http://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/Trends\\_in\\_maternal\\_mortality\\_A4-1.pdf](http://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/Trends_in_maternal_mortality_A4-1.pdf)

<sup>2</sup> Rwanda Demographic and Health Survey. 2010. National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. 2012. Calverton, Maryland, USA: NISR, MOH, and ICF International. <http://www.measuredhs.com/pubs/pdf/FR259/FR259.pdf>

<sup>3</sup> WHO and UNICEF. 2012. *Countdown to 2015*. Geneva: WHO. <http://www.countdown2015mnch.org/documents/2012Report/2012-Complete.pdf>.

PPH, AMTSL must be carried out systematically for every woman during delivery and must be performed by a qualified health care provider.

The principal components of AMTSL include—

- Administration of an uterotonic (preferably oxytocin) 1 minute after delivery
- Controlled cord traction
- Uterine massage following delivery of the placenta

The availability of uterotonics is a key component of any AMTSL intervention. Even well-trained health care providers are unable to provide quality care unless effective uterotonics are available. Although oxytocin is the most commonly used uterotonic, it is imperative that appropriate storage conditions are respected throughout the distribution chain for it to be effective. Where these storage conditions are not available, WHO recommends that misoprostol should be considered.<sup>4</sup>

### *Pre-Eclampsia/Eclampsia*

In 1995, magnesium sulfate was shown to be the best anticonvulsant for reducing the risk of recurrence following eclampsia.<sup>5</sup> The “Magpie” Trial, which ran from 1998 to 2002 and was the broadest study conducted on hypertensive disorders linked to pregnancy in both industrial and developing countries. Follow-up studies further proved that administering magnesium sulfate to women in the pre-eclampsia stage reduced the risk of developing eclampsia.<sup>6</sup> Monitoring of treatment is clinical only, including the assessment of (a) osteotendinous reflexes, (b) respiratory rate, and (c) urine output. In the case of overdose after the magnesium sulfate administration is stopped, an injection of calcium gluconate is recommended. Benzodiazepines are effective; however, their indication remains immediate treatment of an attack with a single dose or for recalcitrant forms.

Antihypertensive treatment, which modifies the fetal prognosis only slightly, must be reserved for hypertension threatening the maternal prognosis. The choice of an antihypertensive is based on the absence of fetal toxicity and good tolerance of the product.

### ***Newborn Health and Neonatal Infections***

Globally, mortality in children under 5 years is estimated at approximately 8.8 million with approximately 3.5 million deaths attributed to neonates primarily in the first week of life.<sup>7</sup> In

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<sup>4</sup> WHO. 2009. *WHO Statement Regarding the Use of Misoprostol for Postpartum Hemorrhage Prevention and Treatment*. WHO/RHR/09.22. Geneva: WHO.

<sup>5</sup> The Eclampsia Trial Collaborative Group. 1995. “Which Anticonvulsant for Women with Eclampsia? Evidence from the Collaborative Eclampsia Trial.” *Lancet* 345(8963):1455–63.

<sup>6</sup> The Magpie Trial Collaborative Group, Corresponding Author. 2002. “Do Women with Pre-eclampsia, and their Babies, Benefit from Magnesium Sulfate? The Magpie Trial: A Randomized Placebo-Controlled Trial.” *Lancet* 359(9321): 1877–90.

<sup>7</sup> Jeffrey Smith, Joseph de Graft-Johnson, Galina Stolarsky, and Rachel Taylor (eds.). N.D. *Meeting Report: Interventions for Impact in Essential Obstetric and Newborn Care Africa Regional Meeting. 21–25 February 2011. Addis Ababa, Ethiopia. Maternal and Child Health Integrated Program (MCHIP)*.

[http://www.mchip.net/sites/default/files/mchipfiles/FINAL%20AddisMeetingReport\\_0627.pdf](http://www.mchip.net/sites/default/files/mchipfiles/FINAL%20AddisMeetingReport_0627.pdf).

Rwanda, the three main causes of neonatal mortality are infection (32 percent), asphyxia (26 percent), and prematurity (20 percent).<sup>8</sup>

Diagnosis and management of neonatal infections remains challenging because the neonate often presents with nonspecific signs and symptoms, even in situations where advanced diagnostic resources exist. Maternal risk factors for neonatal infections include maternal urinary tract infections, genital tract colonization with  $\beta$ -streptococcus, premature rupture of membranes, and prolonged rupture of membranes. Environmental factors, including unhygienic birth, and postnatal factors, including poor cord care, are also risk factors for neonatal infections.

Management therefore depends both on preventive strategies during the prenatal and delivery periods and on the therapeutic interventions. Preventive strategies include improved prenatal care, maternal antibiotic prophylaxis where indicated, hygiene during and after delivery, clean delivery kits, and appropriate cord care. Therapeutic strategies depend on early recognition and care-seeking and treatment with appropriate antibiotics.

## **Financing of Health Services**

An insurance scheme (*mutuelle*) covers 95 percent<sup>9</sup> of the population. The few patients not covered by *mutuelle* use other insurance schemes or must pay themselves for their medicines in the health facilities.

On arrival at the HC, the patient who is enrolled in the *mutuelle*, pays 200 RwFr, receives a receipt, and is then entitled to consultation, laboratory tests, and medicines. A patient under the *mutuelle* scheme can go to the hospital only through referral from the HC. In the hospital, the patient receives services (consultation, laboratory tests, medicines, and in-patient care if necessary) and pays 10 percent of the total bill.

The cost of the service provision for patients under the *mutuelle* is reimbursed within the HC by the *mutuelle* section of the HC. The bill consists of the cost of service provided as per the standard MoH tariff and the cost of the medicines. Once the *mutuelle* section of the HC checks and agrees with the services and amount being invoiced, it pays the HC before the 15<sup>th</sup> of the following month (by consensus of the *mutuelle* sections of each district at a meeting in July 2012). Each HC contributes 45 percent of all its *mutuelle* enrollment fees to the district level as risk-pooling for the services provided at the hospital level according to a ministerial circular.<sup>10</sup> Similarly, the district level contributes 10 percent of all it receives as a risk-pooling payment to the national hospital level.

The mark-up added to the purchase price of the medicine to calculate the sales prices was set at not more than 20 percent by the MoH in a ministerial circular<sup>11</sup> on procurement and distribution of medicine and other medical supplies on national territory.

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<sup>8</sup> UNICEF. 2008. *Countdown to 2015, 2008 Report*. New York: UNICEF.

<sup>9</sup> Enrollment rate of 95 percent is for July 2011 to June 2012.

<sup>10</sup> Instruction ministérielle 20/55 30 November 2011. *Amabwiriza ya Ministiri y'ubuzima* N° 20/55 yo kuwa 30/11/2011 *Agenga UBWISUNGANE MU KWIVUZA*. (Available in Kinyarwanda only.)

<sup>11</sup> Ministerial Circular No. 20/1658/PTF/2007 of 15/JUNE/2007.

## **The Supply Management System for Medicines and Supplies**

The medicine and supplies required for obstetric emergencies and neonatal infections are distributed as part of the national system of essential medicines and supplies. The medicines and supplies are procured nationally by the MPDD using government funds. They are stored in the stores of the MPDD in Kigali. From there, the medicines are distributed to DPs, according to orders placed by the DPs, and from the DPs, the HCs order and come to collect their medicines. At each level, the medicines are purchased. For example, HCs purchase their medicines from the DP using funds from the cost recovery system and *mutuelle* insurance scheme in place. DPs purchase their stock from MPDD using their funds from the sale of medicines to health facilities. The DP has 1 month in which to pay its bill at MPDD, and 1 month later, at the next order, it must show proof of payment to be able to order more medicines. No such standard system is in place for the DPs supplying HCs; some require payment on receiving the products, and some DPs grant a period of credit. In contrast to other programs, no parallel distribution system exists for the medicines and supplies for obstetric emergencies and neonatal infections, and no external source of funding exists.

The PTF oversees all activities related to the handling of medicines at all levels. It provides the legal and policy framework governing management of pharmaceuticals, inspects the private sector pharmacies and manufacturers, and provides guidance on supervision of public facilities.

An LMIS has been in operation in Rwanda since March 2011. The LMIS reporting tool combines the monthly reporting of information with ordering medicines and supplies. Currently, four printed tools are used at both DPs and health facilities:

- *Antiretrovirals and Opportunistic Infections*
- *Essential Medicines (EMs) and Mental Health*
- *Malaria and Tuberculosis*
- *Maternal and Child Health (MCH) and Family Planning and Emergency Obstetric Complications*

The data from the reports are compiled by the newly formed LMO, which was previously based in the MPDD and now has its own office within the PTF, but there is often a delay of several months until the data are available.

## **Rationale for Assessment**

The availability of quality pharmaceuticals for (a) the prevention of PPH and the management of emergency obstetric conditions such as eclampsia and maternal sepsis and (b) the prevention and management of neonatal infections is a prerequisite for implementing interventions to reduce maternal and neonatal mortality. In addition, the efficient management of these pharmaceuticals at all levels of the health system requires compliance with the steps of product selection, supply,

storage (storage conditions), distribution, and use, supported by a policy and regulatory environment that promotes the widespread supply of high-quality products.

The availability and appropriate use of good-quality medicines depends on adherence to procedures of appropriate selection and quantification, appropriate distribution, good inventory management practices, rational prescribing, and correct dispensing.

Logistical problems and the insufficiency of knowledge and managerial competence, among other factors, can negatively affect the constant availability of medicines in the HCs, and consequently, the quality of management of obstetric and newborn conditions is affected. This evaluation allows the identification of strengths and weaknesses related to the availability and management of medicines for these conditions.

This assessment complements the findings of the recent quality of care study for prevention and management of common maternal and newborn complications<sup>12</sup> (MCHIP 2011), which assessed knowledge and practices of providers in the prevention and management of PPH, PE/E, and newborn sepsis. Although the survey also assessed availability of supplies, it did not assess their management throughout the supply chain; effective management of these supplies throughout the chain is essential to assure their quality at the point of use.

## **Objectives**

This USAID-funded rapid assessment, which was initiated by the Strengthening Pharmaceutical Systems Program and then continued under the SIAPS Program seeks to determine the availability and management of maternal and newborn health (MNH) pharmaceuticals, building on information obtained through the LMIS, the recent Maternal and Child Health Integrated Program (MCHIP) national level multicountry study,<sup>13</sup> and the Quality of Care Survey (MCHIP 2011).

### **Overall Objectives**

This assessment seeks to answer three main questions—

- What is the availability of MNH pharmaceuticals and supplies in the medical stores and at the health facilities?
- Are the pharmaceuticals stored and managed appropriately throughout the chain of distribution to ensure they are effective on administration?

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<sup>12</sup> MCHIP. 2011. *Quality of Care for Prevention and Management of Common Maternal and Newborn Complications, Rwanda*. Maryland, USA: JHPIEGO. [http://www.mchip.net/sites/default/files/Rwanda\\_QoC.PDF](http://www.mchip.net/sites/default/files/Rwanda_QoC.PDF).

<sup>13</sup> MCHIP. 2011. *Prevention and Management of Post-partum Hemorrhage and Pre-eclampsia/Eclampsia: National Programs in Selected USAID Supported Countries.(Status Report March 2011.)* Maryland, USA: JHPIEGO. [http://www.mchip.net/sites/default/files/mchipfiles/PPH\\_PEE%20Program%20Status%20Report.pdf](http://www.mchip.net/sites/default/files/mchipfiles/PPH_PEE%20Program%20Status%20Report.pdf).

- What are the problems, in terms of the organization and function of the pharmaceutical supply system, in assuring the availability and appropriate storage conditions for MNH pharmaceuticals?

### **Specific Objectives**

The specific objectives of the rapid assessment were to—

- Determine the availability, stock-outs, and stock on hand of MNH pharmaceuticals at the moment of the interviewer's visit and for the 6 months before the assessment
- Review the procurement and quantification procedures
- Describe the distribution chain
- Evaluate the storage conditions and inventory management of MNH pharmaceuticals along the distribution chain both in pharmacies and storage facilities as well as in the delivery suite
- Assess the training and supervision related to managing MNH pharmaceuticals

## METHODOLOGY

The rapid assessment methodology is intended to provide relevant information in a relatively quick and cost-efficient way to serve as an essential tool for programming. This rapid assessment used both quantitative and qualitative methods of study, namely background desk reviews, key informant interviews, observation, semi-structured questionnaires, in-depth interviews, and conversations with staff in health facilities.

The information gathered during this study made it possible to achieve the specific objectives defined above and to calculate basic indicators from which the recommendations have been deduced.

The first phase of the assessment was consultation with the MCH Technical Working Group, which consists of MoH MCH staff and development partners working in MCH, to finalize the methodology, sampling, tracer lists, and questionnaires, which were based on surveys previously conducted by the Strengthening Pharmaceutical Systems Program in the Democratic Republic of Congo and Mali. The protocol for the survey together with the instruments to be applied was approved by the Rwanda National Ethics Committee on February 23, 2012.

### Sampling

The study was conducted in 10 selected districts. Two districts were selected randomly from each of the country's five provinces, so the selection represented the different geographic areas of the country.

Within each district, a number of health facilities were visited; the facilities were selected at random but planners ensured that they conduct deliveries. Ten districts were randomly selected, and in each district, the DP, the DH, three public HCs, and one accredited HC selected at random were surveyed. Because the selection of HCs was random, it was possible that urban or rural HCs be selected because the design was not skewed to sample more urban or rural HCs. In addition, the (MPDD) was included in the sample. The total sample was 60 facilities (40 HCs, 10 DHs, 10 DPs) and 1 MPDD (as shown in table 1).

The survey's sample size was not designed to produce results for each region or district or to allow comparisons between regions or districts, but rather to allow an analysis of the system in general.

**Table 1. Survey Sample**

Province	District	DP	DH	Type of Facility	
				Public	HC Faith-Based Organization (Agréées) <sup>a</sup>
East	Rwamagana	Rwamamaga	Rwamagana	1. Karenge 2. Rubona 3. Muyumbu	Munyaga
	Ngoma	Ngoma	Kibungo	1. Kibungo 2. Rukumberi 3. Mutendeli	Rukoma-Sake
West	Rubavu	Rubavu	Gisenyi	1. Byahi 2. Busasamana 3. Karambo	Nyundo
	Rutsiro	Rutsiro	Murunda	1. Kayove 2. Karumbi 3. Kinihira	Kivumu
South	Nyamagabe	Nyamagabe	Kigeme	1. Kitabi 2. Nyamagabe 3. Mushubi	Kigeme
	Muhanga	Muhanga	Kabgayi	1. Gitarama 2. Rutobwe 3. Gitega	Mushishiro
North	Burera	Burera	Butaro	1. Kivuye 2. Kirambo 3. Kinyababa	Bungwe
	Gicumbi	Gicumbi	Gicumbi	1. Giti 2. Mulindi 3. Muhondo	Mushara
Kigali City	Nyarugenge	Nyarugenge	Muhima	1. Mwendo 2. Kabusunzu 3. Rugarama	Cor Unum
	Kicukiro	Kicukiro	Masaka	1. Busanza 2. Gahanga 3. Nyarugunga	Kabuga
Totals		10	10	30	10

<sup>a</sup>*Agréées* are mission facilities that are approved by MoH and considered to be part of the network of public facilities.

## Tracers

The set of tracer medicines and supplies used in this assessment was determined by the MH Technical Working Group. This list included oxytocin, ergometrine, misoprostol, magnesium sulfate, diazepam, calcium gluconate, ampicillin IV, metronidazole IV, gentamicin, hydralazine, nifedipine, methyldopa, cefotaxime, aminophylline, Ambu® bags for neonates, ventouse, manual vacuum aspiration syringe, IV sets, IV catheters, syringes, protein urine testing sticks, oxygen (for hospitals only), Ringer's lactate solution, normal saline, and glucose solution 5 percent. These products and commodities were selected as medicines that are included in the STGs under SONU, that are important commodities and supplies required in the prevention and management of emergency obstetric and newborn conditions, and that are sometimes

overlooked. The only medicines for newborn selected by the MH Technical Working Group to be included in the tracer list for this assessment were antibiotics for neonatal sepsis.

## Data Collection

The group of data collectors, composed of 15 pharmacists and three MoH supervisors, was trained March 13–15, 2012, and as part of the training, participants validated and practiced the use of the instruments in a field test setting: Kibagabaga DH and Kimironko and Kinyinya HCs, before starting the survey. The data were collected March 19–30, 2012, by five teams of three data collectors (pharmacists), led by a data supervisor for each team). The five supervisors were three physicians from the MoH and two pharmacists from SIAPS. Five districts were visited in the first week with each team surveying the facilities in one district, and the remaining five districts were visited in the second week of data collection.

At all levels of the health system, interviews were conducted with health care providers, personnel responsible for managing medicines at the health facilities, the staff of the delivery unit, and managers of DPs. Structured data collection instruments were used at the health facilities and pharmacy stores to collect information on the availability and storage of medicines.

Seven questionnaires were used:

- 1: Questionnaire for the store manager or pharmacist
- 2: Questionnaire for the person in charge of the delivery suite (midwife)
- 3: Observation checklist for delivery suite
- 4: Observation checklist for pharmacy store
- 5: Questionnaire on availability
- 6A: Price comparison: sale price
- 6B: Price comparison: purchase price

These questionnaires were applied in the different facilities (as shown in table 2).

**Table 2. Questionnaires Used in the Survey**

Questionnaire	Type of Facility			
	HC	DH	DP	MPDD
1. Questionnaire for the storekeeper or pharmacist	x	x	x	
2. Questionnaire for the midwife	x	x		
3. Observation checklist for delivery suite	x	x		
4. Observation checklist for pharmacy store	x	x	x	x
5. Questionnaire on availability	x	x	x	x
6A. Price comparison: sale price	x	x		
6B. Price comparison: purchase price	x	x	x	x

The different tools and methodology used in the survey are described below. In addition to data collection in the facilities as described below, information was also collected at the central and district levels using topic guides and semi-structured interviews.

**Questionnaire 1. Interviews in District Pharmacies and Pharmacy Stores of Health Facilities**

This structured questionnaire was used to collect the information from the storekeepers of the DPs and facility stores on the following:

- Knowledge of STGs
- Quantification of medicine needs
- Order process and frequency
- Sources of MNH medicines
- Stock management (knowledge and practice)
- Communication and transport
- Reports and information system for pharmaceutical management
- Training of the personnel
- Supervision
- Resources

**Questionnaire 2. Interviews in the Health Facilities with the In-charge of the Delivery Suite**

This structured questionnaire was used to collect information from the person in charge of the delivery suite in the health facilities on the following:

- Knowledge of STGs
- Knowledge and implementation of good practices for management of pharmaceuticals and supplies for the prevention of PPH and the management of PE/E and newborn sepsis
- Ordering process
- Stock management
- Training and supervision for pharmaceutical management of maternal and newborn health conditions
- Resources

**Questionnaire 3. Observation Checklist for the Delivery Suite**

The observation was conducted in HCs and hospitals in the area of the delivery suite. The checklist contained various aspects to be evaluated, such as the following:

- Availability and quantity available in the delivery suite
- Storage conditions
- Record-keeping in the delivery suite

#### ***Questionnaire 4. Observation Checklist for the Pharmacy Store***

The data collectors observed each pharmacy store using a standard checklist to evaluate various aspects such as the following:

- Storage conditions
- Temperature
- Store management practices

#### ***Questionnaire 5. Availability of Medicines and Equipment***

This instrument was used in each pharmacy store of each facility and was completed by observing the stock cards and the actual stock with clarification from the facility storekeeper as needed. The information researched was the following:

- Availability in the store, amount of stock on hand, and periods of stock-out
- Monthly consumption of tracer pharmaceuticals
- Correspondence of stock records with physical counts for tracer pharmaceuticals
- Presence of expired stock

#### ***Questionnaires 6A and 6B. Comparison of Prices***

Two different forms were applied in all the DPs and health facilities to compare sales and purchase prices of the tracer medicines between facilities.

#### **Analysis**

At the end of each day, the supervisor of each team of data collectors checked the data for completeness and quality. At the end of the survey, the data analyst contracted for the purpose entered the data into Access® during April and May. Key indicators and question frequencies were generated during May and June, as well as any other information deemed necessary during the report writing phase.



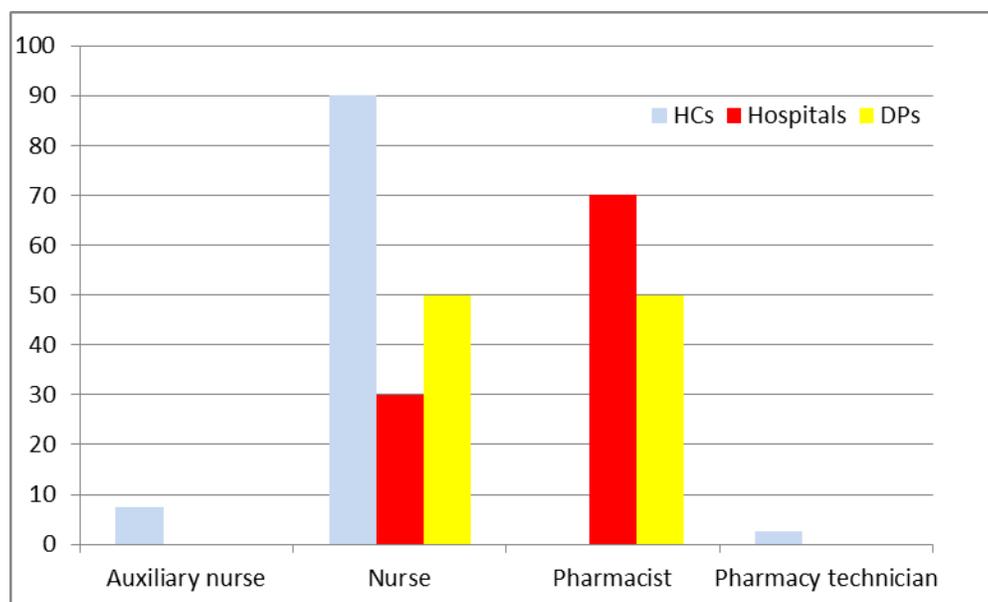
## RESULTS

This rapid assessment analyzed the management of medicines and other products for emergency obstetric and newborn conditions at DPs, hospitals, and HCs. The goals were to assess how the supply chain functions, to identify its strengths and weaknesses, and to make recommendations for further strengthening of the system. Various management aspects were assessed: qualification, training received, knowledge of treatment guidelines and storage conditions, actual storage conditions both in the pharmacy and in the delivery suite, store management, availability and stock levels, ordering process, supervision, reporting, and financing.

### Characteristics of Respondents

The respondents in the health facilities assessed were both pharmacy store managers and the clinical staff responsible for the delivery suite.

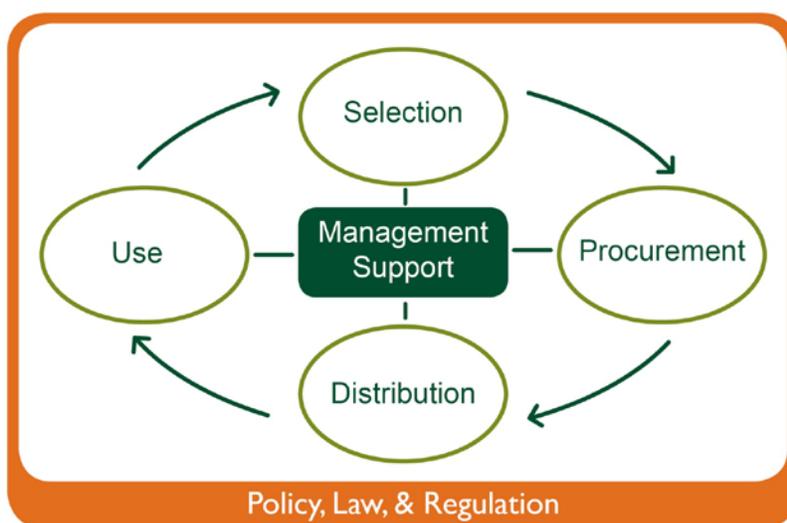
The storekeepers who responded to the interview were predominantly nurses in the HCs, pharmacists in the hospitals, and nurses and pharmacists in the DPs (as shown in figure 1). Of the storekeepers in HCs, 43 percent had served less than 1 year in the position, 45 percent had 1–5 years of experience in the same position, and 12 percent had over 5 years of experience in the same position, but 58 percent of the storekeepers had worked for 1–5 years in the same HC and 25 percent for over 5 years. In hospitals, the storekeepers had less time in the position, half of the storekeepers having worked as storekeeper in the hospital for less than 1 year (40 percent for under 6 months) and only 60 percent had more than 1 year in the hospital. In the DPs, the storekeepers had more time in their position, with (70 percent) in the position for over a year.



**Figure 1. Profile of storekeeper respondents**

The clinical staff interviewed who were responsible for the delivery suite were predominantly nurses in the HCs (95 percent) and midwives (60 percent) or nurses (40 percent) in the hospitals. Of the staff in charge of the delivery suite in HCs, 52 percent had less than 1 year in the position, but 78 percent of the respondents had more than 1 year of experience working in the HC. In the hospitals, 50 percent of the staff in charge of the delivery suite had less than 1 year in their position, but 80 percent had more than 1 year working in the hospital.

The results of the assessment are presented around the stages of the pharmaceutical management cycle (shown in figure 2) and include data from the central level interviews as well as data collection in the districts and facilities.



**Figure 2. Pharmaceutical management cycle**

## **Selection**

Oxytocin, misoprostol, ergometrine, calcium gluconate, and magnesium sulfate are all on the NEML, which is important because this list guides the procurement and distribution of medicines in the supply chain. A group of experts selects medicines for inclusion on the NEML based on the recommendations and guidelines of WHO and adapted to the Rwandan context by a consultant. The technical working group then validates the revised list, and the Minister of Health approves it. The list is updated every 2 years unless a major update is required before that. The most recent NEML is from July 2010 and predates the finalization of the current SONU treatment guidelines. The NEML specifies the therapeutic class and at what type of facility the medicines can be used, but the specific indication is not included. These are the levels included in the NEML 2010 for some of the medicines of interest:

- Oxytocin: uterotonic for use at district and referral hospitals (RH) only
- Ergometrine: uterotonic at HCs, DHs, and RHs
- Misoprostol: prostaglandin for use at DHs and RHs only for incomplete abortion
- Calcium gluconate: at DHs and RHs but for correction of electrolyte imbalance

- Magnesium sulfate: for use in RHs under anticonvulsives/antipileptics.

The above medicines are also all registered in the country for the indications specified in the NEML.

The medicines for the management of obstetric and newborn emergencies are outlined in the SONU module produced by the MCH desk of the MoH in 2012:

- Treatment of eclampsia is with hydralazine and magnesium sulfate or diazepam at RH and DH levels with calcium gluconate as an antidote for unwanted toxicity effects from magnesium sulfate.
- Pre-eclampsia is treated with hydralazine if it is severe, or if it is moderate with methyldopa or nifedipine at RH and DH.
- PPH is prevented with oxytocin or ergometrine or misoprostol tablets at community level (currently being implemented in only four pilot districts).
- Maternal sepsis is to be treated with a combination of ampicillin IV, gentamicin IV, and metronidazole IV in any health facility.
- Neonatal sepsis is to be treated with ampicillin IV and gentamicin IV in combination.

Table 3 shows the differences between the medicines on the NEML and in the SONU guidelines which are for use at facility level. Misoprostol is not recommended for prevention of PPH at facility level, rather just in the community as a pilot intervention as part of the home-based maternal and newborn health care strategy.

**Table 3. Selection of MNH Medicines**

Medicine	NEML 2010				SONU 2012 Health Facility	HBMNHC Community <sup>b</sup>
	RH	DH	HC	Community		
<i>Prevention of PPH</i>						
Oxytocin	x	x			x	
Ergometrine	x	x	x		x	
Misoprostol <sup>a</sup>	x	x				x
<i>Treatment of PE/E</i>						
Magnesium sulfate	x	x			x	
Diazepam	x	x	x		x	
Calcium gluconate	x	x			x	
Hydralazine	x	x			x	
Nifedipine	x	x			x	
Methyldopa	x	x			x	
<i>Sepsis</i>						
Maternal sepsis Ampicillin/gentamicin/metronidazole	x	x			x	
Neonatal sepsis Ampicillin/gentamicin	x	x			x	

<sup>a</sup>Included for a different indication

<sup>b</sup>Home-based maternal and newborn health care strategy

Of the districts surveyed, 70 percent of DH directors stated that they have disseminated the SONU guidelines in their district, 80 percent have done training on the guidelines, and 50 percent have conducted refresher training.

## **Procurement**

The procurement of essential medicines is conducted by MPDD once a year, and MCH commodities are usually included in that process of international tender. To facilitate the recent implementation of the SONU, the quantification of three products (oxytocin, ergometrine, and magnesium sulfate) required for SONU was conducted by the MCH department of the MoH based on morbidity using data from the health districts. The products were then purchased as seed stock with MCH department funds. This was a one-off process, and MCH commodities are now integrated into the quantification and procurement cycle of essential medicines.

The estimation of needs for the procurement of essential medicines is carried out at two levels. The DPs and hospitals estimate their needs at the end of the year and send them to the MPDD. No standard guidance document on how to estimate needs exists, so each district estimates in its own way. The MPDD also conducts its own needs estimate based on the past year's distributions and then compares that to the district needs estimate. When a difference is found, MPDD adjusts its needs estimate; if it has no data on distribution (e.g., if a product was out of stock), it uses the district estimate.

Government funds (from the national treasury) plus funds generated by the cost recovery of sales of medicines to DPs and throughout the supply chain are used for the procurement, which is conducted through an international tender process. The key products of interest in this study (i.e., oxytocin, ergometrine, misoprostol, and magnesium sulfate) are procured from international manufacturers. The oxytocin that was most recently procured generically from two different manufacturers came with storage temperature recommendations of under 30°C from both sources. Therefore, the central stores do not store or transport oxytocin injection under cold chain conditions. Ergometrine, however, is still subject to cold chain requirements, so it is stored in refrigerators in the central stores. MPDD respects the cold chain in the transport to DPs by using cold boxes and ice packs.

## **Distribution**

Distribution encompasses all the steps necessary to get medicines from the MPDD to the point of use including the order process at all levels (both external and internal within the facility), availability as a measure of the efficiency of the order process, storage, inventory management and record-keeping.

## **Order Process**

Data collectors examined the external order process of the facility as well as the internal order process to the delivery suite.

### Facility

All DPs used MPDD as their source of medicines, with 89 percent of them also using BUFMAR (*Bureau des Formations Médicales Agréées du Rwanda*), the wholesaler for approved mission health facilities in Rwanda. This practice is in accordance with the ministerial circular (20/1658/PTF/2001) of 2007, which states that each DP must send its orders to both MPDD and BUFMAR for quotes and then the DP can decide which to use to purchase the products based on price, availability, and other factors. If the DP cannot obtain the products from MPDD or BUFMAR (e.g., if they are out of stock), the DP must request PTF authorization to purchase at a private wholesaler. One DP noted, however, that a private wholesaler was its most frequent source of supply, which is not in accordance with the MoH instructions.

The same ministerial circular (20/1658/PTF/2001) of 2007 states that all HCs and hospitals must purchase their medicines and supplies only from the DP. All hospitals and HCs in the survey said they used the DP as their prime source of supply, but in addition, 31 percent of HCs and 60 percent of hospitals mentioned purchasing from private wholesalers, for example in cases of stock-outs at the DP. This practice goes against the MoH instruction, which states that in the case of stock-out at the DP, only the DP should procure products from the private sector, with the appropriate authorizations and other approvals in order to provide for the HC and hospitals in their charge. All storekeepers responded that they obtain the uterotonics and other medicines for obstetric and newborn emergencies from the same source as for the other essential medicines.

The order frequency was reported to be monthly by respondents at all levels, in 90 percent of cases, with four HCs mentioning that they used emergency orders. This finding reflects a recent change for the DP, which used to order every 3 months until the introduction of the LMIS system in March 2011 when all facilities were recommended to order monthly. The data collectors confirmed frequency of orders by examining the last order and they found that only four HCs (11 percent) and one hospital (11 percent) had ordered more than a month ago; the remainder had ordered within the last month.

Uterotonics and other medicines for obstetric and newborn emergencies are included in the order for all essential medicines, which is sent to the DP; only one storekeeper from an HC mentioned that sometimes that HC does a separate order. Almost all the storekeepers (95 percent) said they based their orders on previous consumption and that the order quantity was calculated in the same way for these medicines as for all other medicines. Ninety percent of storekeepers said there was a standard formula for calculating the order quantity. Of the 51 (85 percent) storekeepers who gave a formula, only 24 percent (20 percent of the total sample) correctly mentioned that the order quantity is based on the adjusted previous month's consumption multiplied by 2 minus the current stock. This formula is the recent one introduced with the LMIS in March 2011. Another 24 percent based the order quantity on the previous month's consumption but did not mention that it should be adjusted for stock-outs, and an additional 24 percent mentioned the previous formula used, based on average monthly consumption. Another 18 percent gave only the formula for adjusting the month's consumption for stock-outs but not the order quantity; the remainder either did not know, did not have the form to refer to, or said the consumption was multiplied by 3. The facilities are to respect a new system of stock management with maximum and minimum levels for all medicines in which at all levels of facilities the maximum stock is 2 months times the adjusted previous month's consumption and

the minimum stock is 1 month. It is assumed that the consumption referred to by the respondents is an overall consumption regardless of the source of the stock whether from private wholesaler or public supply system.

In general, the order is reportedly made on a preprinted order form (the LMIS reporting tool); only 10 percent of storekeepers in HCs and 30 percent of storekeepers in DPs did not know of such a preprinted form. Even though data collectors found a level of confusion on the calculation of the order quantity, the standard formula is included in the LMIS reporting form that serves as an order form, so the person ordering is guided on the form to calculate the order quantity according to the formula, and the calculation is not dependent on recall of the formula. Data collectors noted that the LMIS preprinted order forms do not include some tracer products of this survey (i.e., calcium gluconate injection, misoprostol for community use, hydralazine injection, methyldopa tablets, nifedipine tablets, or ampicillin injection), but these medicines can be included in the blank lines of the form. The electronic version currently under development will include all products.

All orders prepared by the storekeepers at HC level are reportedly authorized by the responsible of the HC. At the hospital level, the orders are primarily authorized by the hospital director, and at DP level the order is prepared by the storekeeper and authorized by the pharmacist director of the pharmacy.

The majority of storekeepers (76 percent) stated that their orders were not always satisfied (90 percent of DPs and hospitals and 70 percent of HCs). In 81 percent of the facilities responding ( $n=54$ ), the quantity of oxytocin ordered equaled what they received. The main reasons for the orders not being satisfied were cited as stock-outs at the central level (73 percent) or delays in delivery (reason not specified) (20 percent), and a few (three) mentioned lack of funds at the facility level. At MPDD level, the DP has a month to pay the bill for the purchase of medicines and supplies, and for the next purchase, the DP agent must present proof of payment of the previous purchase to be able to proceed with the order. At the DP level, the rules are not so clear, and not every DP operates the same level of strictness for payment. Some must pay upon ordering their medicines; others have a period within which to pay. This discrepancy could explain why lack of funds was a problem for some facilities who may be awaiting reimbursement from the *mutuelle*.

Medicines from MPDD to the DP are usually transported either by using MPDD vehicles (70 percent) or by the DP renting a vehicle (30 percent). At the time of the survey, MPDD had already started active distribution in which MPDD assumes all the responsibility to transport the products to the DP. The DP would have to find transport only for emergency orders to MPDD or other wholesalers. From DPs to the DH, medicines are usually transported by the hospital vehicle (33 percent), the district vehicle (22 percent), or a rented vehicle (50 percent); if the hospital and DP are close or in the same building, the medicines are carried by hand (22 percent). From the DPs to the HCs, 46 percent mentioned they borrowed a vehicle, 33 percent say they use the facility vehicle, 13 percent collect the medicines by motorbike, 13 percent mentioned using a taxi, 8 percent mentioned the district vehicle, and one HC even mentioned going by foot. Some facilities gave more than one option. Since the survey, the MoH has purchased small trucks for each DP, and these vehicles will allow the DPs to carry out active distribution to the health

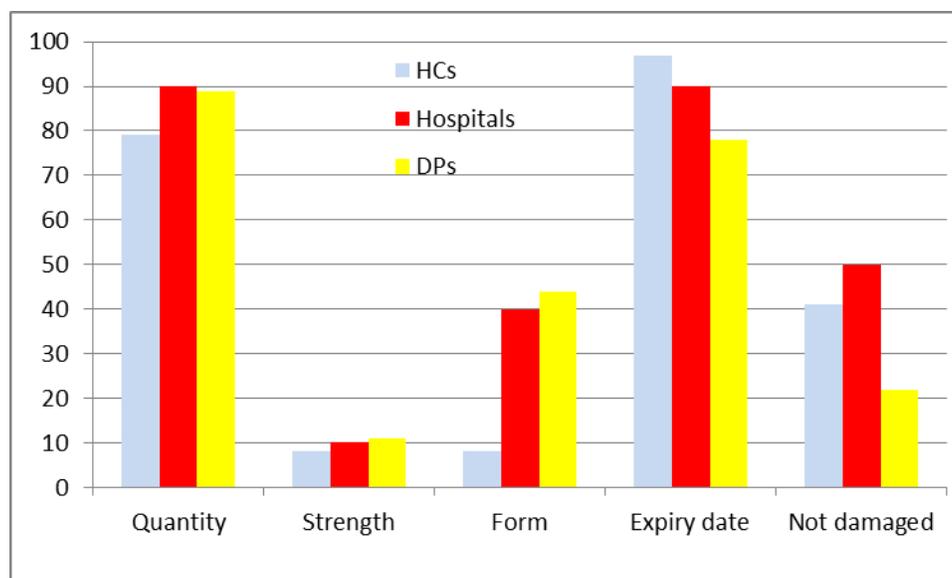
facilities. Some districts have actually started active distribution to their HCs at the time of this writing.

Of the storekeepers interviewed, 73 percent (90 percent DPs, 90 percent hospitals, and 65 percent HCs) stated that they took special precautions in transporting uterotonics, with many (60 percent of DPs, 50 percent of hospitals, and 40 percent of HCs) mentioning that they used cool boxes and ice packs, and 78 percent stating that they are kept cold during transport, although this is not required for the current brand of oxytocin that is in the system (it is required for ergometrine).

Overall, 40 percent of storekeeper respondents said they had experienced no problems with the order process. Those who did experience problems mentioned the following:

- Problems of stock-outs at superior levels (cited by 22 percent)
- The order process itself, for example in the authorization [12 percent of respondents, particularly hospitals (30 percent) and DPs (22 percent)]
- Delays (unspecified) (13 percent of HCs, 40 percent of hospitals and 22 percent of DPs)
- District not having transport for 15 percent of HCs and 22 percent of DPs
- Problems with the cold chain (22 percent of DPs)

When asked, as an open question, which aspects should be checked when receiving a medicines order, the majority of storekeepers did not know all the standard points to check when receiving an order, but focused on two main issues, quantity and expiry date, (as shown in figure 3). Although these aspects are important ones to check, it is also important to check the strength and form of the medicine to be sure that the product is the correct one and that the packaging is not damaged or the quality of the product affected in any way. Few of the storekeepers (30 percent) said there was a standard procedure for receiving medicines, which is not surprising because no standard operating procedures (SOPs) exist for medicines management; some facilities, however, may have developed their own or may be using one that was developed by MoH with the Rational Pharmaceutical Management Plus Program/USAID several years ago in the context of HIV.



**Figure 3. Receiving medicines**

### *Delivery Suite*

The data collectors asked the staff in charge of the delivery suite about how they requested medicines for use in the delivery suite. Once the medicines are in the pharmacy of the health facility, an internal process is in place for specific medicines to be requested or ordered from the pharmacy for use in the delivery suite or operating theater (where applicable). Most respondents reported using notebooks or registers because the majority stated no standard order form exists (72.5 percent HC staff, 60 percent hospital staff). This order is based on past consumption in the majority of cases (50 percent of HC respondents and 40 percent hospital respondents), general experience (20 percent HC staff), or when they need more (10 percent HC staff), or it based on a minimum/maximum system (20 percent of hospitals). The staff has no standard formula to calculate how much to order (85 percent HC staff, 90 percent hospital staff) for use in the delivery suite. The frequency depends on the facility; the HC delivery suite staff say they order from the HC pharmacy each week (47.5 percent), twice a week (15 percent), once a month (12.5 percent), or as needed (7.5 percent), and most hospital staff order either every week (37.5 percent), every day (37.5 percent), or as needed (25 percent).

Mostly the orders are fulfilled (78 percent HCs and 56 percent of hospitals), and if they are not, it is due to stock-outs at the facility pharmacy. In the last order for oxytocin, 82 percent of HCs and hospitals received the amount they ordered.

Similarly for the operating theater of hospitals, the medicines are generally ordered from the pharmacy (60 percent) rather than via the delivery suite (40 percent), usually weekly (60 percent) basing their order on previous consumption (83 percent).

Interestingly, internal order forms and consumption registers for the departments of health facilities have been developed by partners in collaboration with the MoH, at the central level, but these forms were not in use in the HCs visited as part of the survey.

### ***Knowledge of Storage Requirements***

For the effectiveness of medicines to be assured, they need to be stored in appropriate conditions; some uterotonic medicines have specific conditions:

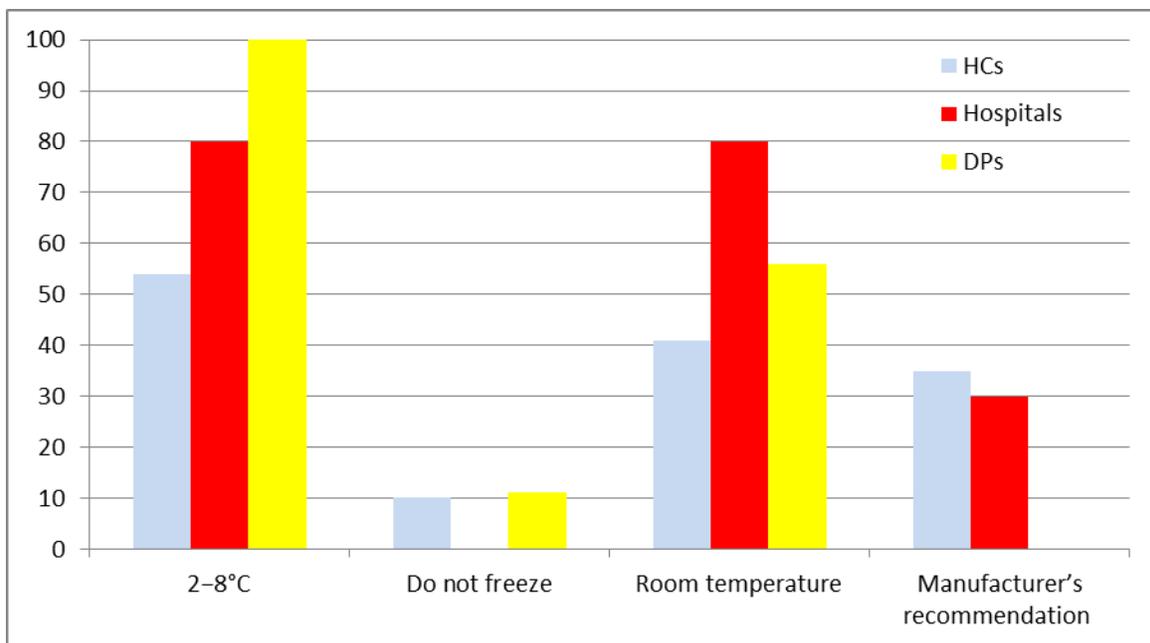
- The *US Pharmacopeia Monograph* on oxytocin no longer contains the recommendation to keep oxytocin injection cold; rather, it recommends storage according to the manufacturers' recommendations. For the current product available through the public system in Rwanda, produced by two different international manufacturers, recommendations state that the medicine should be stored at temperatures under 30°C but that it does not need refrigeration, and it should not be frozen.
- Ergometrine must be kept cold (2–8°C), in a box protected from light, according to US Pharmacopeia recommendations. Ergometrine may be stored out of the refrigerator for short periods [less than 4 weeks at 30°C ] without losing potency.
- Misoprostol does not need to be kept in the refrigerator nor protected from light, but it needs to be protected from moisture, primarily through correct packaging from the manufacturer.

Magnesium sulfate, diazepam, and calcium gluconate do not need to be kept in the refrigerator and may be stored at room temperature (15–30°C; ).

### ***Storekeepers***

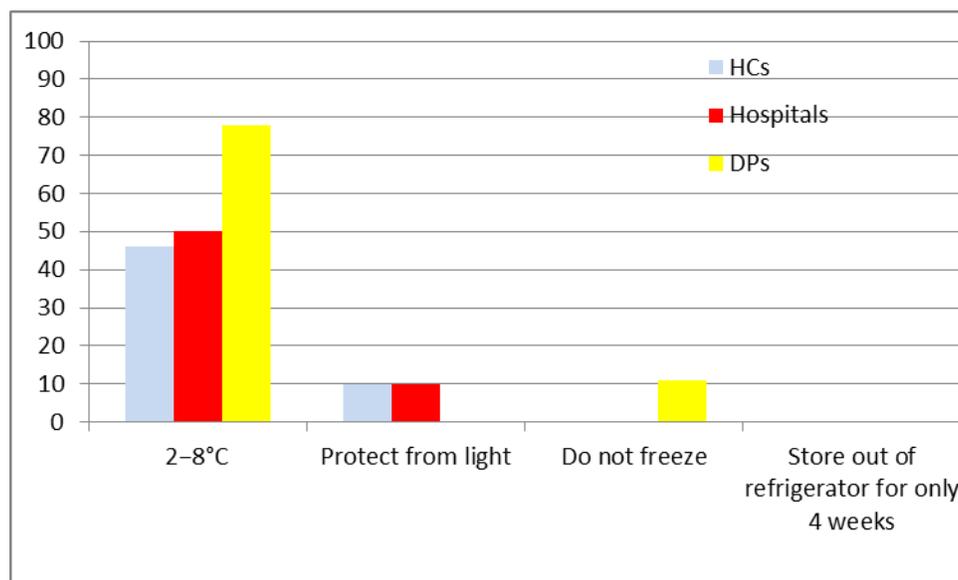
We assessed the knowledge of the storekeepers on the storage recommendations for the key obstetric emergency medicines: oxytocin, ergometrine, misoprostol, magnesium sulfate, calcium gluconate, and diazepam.

Because this question permitted multiple responses, many of the respondents said that the oxytocin should be stored in the refrigerator, and some also stated that it could be stored at room temperature (as shown in figure 4). Under half of the respondents in HCs and hospitals specified that it was according to the manufacturer's recommendations, so data collectors found a level of confusion. For ergometrine, fewer users knew the key storage requirements (figure 5).



Note: Multiple answers were permitted

**Figure 4. Knowledge of storage recommendations for oxytocin**



Note: Multiple answers were permitted.

**Figure 5. Knowledge of storage recommendations for ergometrine**

When asked about misoprostol, 60 percent of respondents (79 percent from HCWs, 10 percent from hospitals, and 33 percent from DPs) did not know the storage recommendations. Some mentioned correctly that it must be stored at room temperature (5 percent of HC respondents, 60 percent of hospital respondents, and 44 percent of DP respondents).

For magnesium sulfate, diazepam, and calcium gluconate, no storage requirements are specified, other than good practice for all medicines [i.e., do not refrigerate and store at room temperature (<30°C) protected from direct light.] Storekeepers exhibited some confusion, however, regarding the storage of these medicines, perhaps because of their association with others that do have specific storage requirements, because only 60 percent of all respondents (56 percent from HCs, 80 percent from hospitals, and 56 percent from DPs) stated that the medicines should be stored at room temperature.

*Staff in Charge of the Delivery Suites*

In addition to the storekeepers, we assessed the knowledge of the staff in charge of the delivery suite to see if they knew the storage recommendations for the key obstetric emergency medicines: oxytocin, ergometrine, misoprostol, and magnesium sulfate.

Despite the fact that the oxytocin in circulation in the national health system of Rwanda can be stored under 30°C, according to the two manufacturers, only 30 percent of respondents in the HCs and 20 percent in the hospitals knew that it could be stored at room temperature, and 50 percent of HC respondents and 80 percent of hospitals respondents said it had to be stored in the refrigerator. Only 5 percent of respondents in the HCs and none in the hospitals said it should not be frozen.

Table 4 shows the knowledge of the storage recommendations of ergometrine by the staff in charge of the delivery suites.

**Table 4. Knowledge of Storage Conditions for Ergometrine (percentages)**

Recommendations for Storage	Type of Facility	
	HCs (N=40)	Hospitals (N=10)
Keep in refrigerator between 2–8°C .	60	30
Keep protected from light.	2.5	0
Do not freeze.	2.5	0
May be stored at <30°C for up to 4 weeks.	0	0

The majority of respondents in delivery suites of HCs said they did not know how to store misoprostol (72.5 percent)—primarily because they do not use it—and 20 percent in hospitals did not know how to store it. Sixty percent of hospital staff stated correctly that misoprostol should be kept at room temperature.

Magnesium sulfate does not need to be kept in the refrigerator; all hospital delivery suite staff knew that, but only 45 percent of HCs delivery suite staff did, the remainder responding that it should be kept in the refrigerator (10 percent) or that they did not know (45 percent).

## **Storage Conditions**

To assess the storage conditions in both the pharmacy stores and the delivery suites, data collectors used an observation checklist at each facility visited.

### *Storage Conditions in Pharmacy Stores*

Data collectors found that the basic principles of store management are generally followed (as shown in table 5), although the temperature is not monitored regularly in the store even in DPs (20 percent), because they did not have thermometers. The temperature at the time of the visit was under 30°C in each facility, with most facilities (22 percent) at a temperature of 21°C, but that was the temperature at the time of the visit; the temperature was not monitored throughout the whole day. Some health facilities (25 percent) showed evidence of damaged cartons with the observed reasons being that the pharmacy was too small or that they had no or insufficient pallettes, also meaning that the products were not protected from damp (26 percent of HCs and 50 percent of hospitals visited). In one site, the data collectors even saw damp boxes. The area with more problems is that of the cold chain. In only just over half the facilities (62 percent of HCs, 70 percent of hospitals, and 40 percent of pharmacies), the refrigerator temperature was monitored daily, even though most facilities had refrigerator thermometers. The actual temperature of the refrigerator was 2–8°C in most facilities (85 percent), although some outlying temperatures of under 2°C and over 20°C were encountered in some facilities: 10 percent of HCs had refrigerator temperatures over 20°C; 64 percent of HCs and 10 percent of hospitals had refrigerator temperatures under 2°C.

Generally, oxytocin is not stored in the refrigerator because the manufacturer's recommendation states that it can be stored at room temperature; however, a few facilities still stored it in the refrigerator (table 5). Ergometrine was not always stored in the refrigerator; stock was found on the shelves in some peripheral facilities (25 percent of HCs and 40 percent of hospitals and DPs) and in the central stores. Ergometrine was found stored in boxes in less than half of the peripheral facilities (21 percent of HCs, 60 percent of hospitals, and 50 percent of pharmacies). Supplies required for the functioning of the cold chain were found lacking particularly at the DP level, with only 50 percent of DPs having cold packs and freezers.

**Table 5. Conditions of Store Management Observed in the Pharmacies of the Facilities Surveyed (percentages)**

Note: Cells shaded in orange (light gray in a black and white copy) show results at 50–74 percent for the target value; cells shaded in red (dark gray in a black and white copy) show results at under 50 percent of the target value.

Criteria of Good Store Management	Type of Facility			
	HCs (N=40)	Hospitals (N=10)	DPs (N=10)	MPDD (N=1)
The store is secure.	100	100	100	100
The storage area is clean and visually free from rodents and insects.	90	100	90	100
The products are well arranged on shelves or on palettes.	78	89	70	100
The medicines are arranged in a systematic way.	82	80	90	100
The products are arranged so that the labels and expiry or manufacturing dates are visible.	85	80	60	100
The products are stored and organized according to first expired/ first out.	85	70	80	100
The boxes and products are in good condition and not crushed or damaged.	75	100	90	100
The boxes and products are protected from dampness.	74	50	60	100
The products are protected from direct sunlight all the time.	87	70	80	100
The store has ceiling panels to protect it from the heat.	92	90	90	—
The temperature of the store is recorded and monitored regularly.	20	40	20	100
Average temperature and range for all facilities °C (at the time of the visit.	23.4 (18–28)	23.7 (21–26)	23.8 (21–30)	—
The store has a working refrigerator.	55	100	80	100
Temperature of the refrigerator is recorded and monitored every day.	62	70	40	100
Temperature of the refrigerator was 2–8°C at the time of the visit.	83	90	70	100
Average temperature (and range) of the refrigerator at the time of the visit /°C	7.9 (-3 – 44)	4.1 (1–7)	4.7 (2–8)	—
Refrigerator is in good condition.	92	100	80	100
Oxytocin is in the refrigerator at the time of the visit <sup>a</sup>	20	10	30	0
Oxytocin is on the shelves at the time of the visit.	83	90	100	100

Criteria of Good Store Management	Type of Facility			
	HCs (N=40)	Hospitals (N=10)	DPs (N=10)	MPDD (N=1)
Oxytocin is stored in boxes.	90	100	100	100
Ergometrine is in the refrigerator at the time of the visit.	19	20	30	0
Ergometrine is on the shelves at the time of the visit.	25	40	40	100
Ergometrine is stored in boxes.	21	60	50	100
Magnesium sulfate is in the refrigerator at the time of the visit. <sup>b</sup>	0	0	22	0
Magnesium sulfate is on the shelves at the time of the visit. <sup>c</sup>	23	100	44	100
Cool boxes with ice packs just for transporting medicines are available.	95	100	50	100
Freezer in which to store the ice packs is available.	90	90	50	100

<sup>a</sup>The manufacturer's recommendation for the current brand of oxytocin is to store at <30°C , so cold storage is not required.

<sup>b</sup>Magnesium sulfate does not need to be stored in the refrigerator and may be stored at room temperature.

<sup>c</sup>The low value was primarily due to the low availability of magnesium in HCs.

Most of the facilities (70 percent) reported that the electricity supply was regular, and many peripheral facilities have other means to provide power to the refrigerators without electricity (e.g., solar or kerosene power sources or a generator in the case of most hospitals), but only 40 percent of the DPs had access to a generator, and they had no other means of operating refrigerators.

### *Storage Conditions in Delivery Suites*

Because some medicines are kept in the delivery suite for emergency use, data collectors also observed specific aspects of store management in the delivery suites of the HCs and hospitals (as shown in table 6).

When interviewed, the majority of staff in HCs (61 percent) and 30 percent of hospital staff stated that they kept 10 ampoules of uterotonics in the delivery suite, the rest stating other amounts; no standard formula exists to calculate the amount that should be kept in the delivery suite. Very few (8 percent of HCs and 11 percent of hospitals) said they kept the uterotonics in the refrigerator presumably somewhere else in the facility but not in the delivery suite since no facilities had refrigerators in the delivery suite itself.

In some facilities, these medicines are also stored in the operating theater. In the hospitals surveyed, 25 percent of the delivery suite staff said they kept 10 ampoules in theater, 12.5 percent kept enough for a week, 25 percent said they used what was in the delivery suite, and the other 37.5 percent stored 12, 20, and 90 ampoules (12.5 percent each). The average number of deliveries in the HC per week was 12 (range 3–42), and the average number of deliveries in the hospital was 56 per week (range 7–180).

**Table 6. Storage Conditions in the Delivery Suite for Some Key Medicines (percentages)**

Product	Presence of Expired Medicine		Stored in a Refrigerator		Stored in the Box		Stored in Daylight		Stored in Direct Sun	
	HC (N=35) <sup>a</sup>	Hosp. (N=10)	HC (N=35)	Hosp. (N=10)	HC (N=35)	Hosp. (N=10)	HC (N=35)	Hosp. (N=10)	HC (N=35)	Hosp. (N=10)
Oxytocin 10 UI/ml, ampoule <sup>b</sup>	0	0	6	10	74	80	37	30	0	0
Ergometrine 0.2 mg/ml, ampoule	8 (n=12)	0 (n=4)	33 (n=12)	20 (n=5)	55 (n=11)	75 (n=4)	42 (n=20)	20 (n=9)	0 (n=12)	0 (n=5)
Misoprostol 0.2 mg, tablet <sup>c</sup>	—	0	—	0	—	67	—	33	—	0
Magnesium sulfate 1 g/2 ml, ampoule <sup>d</sup>	0	0	0	0	60	86	20	29	0	0

<sup>a</sup> The number for each medicine differs according to its availability in the delivery suite.

<sup>b</sup> Oxytocin was assessed in 35 HCs and 10 hospitals where oxytocin was available in the delivery suite.

<sup>c</sup> Misoprostol was assessed in three hospitals where misoprostol was available in the delivery suite.

<sup>d</sup> Magnesium sulfate was assessed in five HCs and seven hospitals where it was available in the delivery suite.

One HC had some expired medicine (ergometrine) in the delivery suite area. Ergometrine is the only uterotonic that needs to be stored in the refrigerator, and 33 percent of HC and 20 percent of hospitals had it stored in the refrigerator in the delivery suite. Although ergometrine can be stored out of the refrigerator (for a period not exceeding 4 weeks), no system is in place to monitor the time spent out of the refrigerator. A few facilities (6 percent of HCs and 10 percent of hospitals) even had oxytocin stored in the refrigerator in the delivery suite area, which is not necessary. Only 55 percent of HCs and 75 percent of hospitals were storing ergometrine in a manner that protected it from light in its box in the delivery suite area, and in 42 percent of HCs and 20 percent of hospitals, the ergometrine was exposed to daylight; however, no medicines were stored in direct sunlight in any of the delivery suites. Even though ergometrine comes in amber-colored glass ampoules, good practice dictates keeping them further protected from light by storing them in the box

### Availability

The rapid assessment evaluated the availability of tracer products at all the facilities surveyed including the MPDD (as shown in table 7). Data collectors considered a product to be available if a store had even one ampoule on the shelf at the time of their visit.

**Table 7. Availability of Tracer Products in the Facilities Surveyed (percentages)**

Note: Cells shaded in orange (light gray in a black and white copy) show results at 50–74 percent for the target value; cells shaded in red (dark gray in a black and white copy) show results at under 50 percent of the target value.

Product	HCs with the Product Available (N=40)	Hospitals with Product Available (N=10)	DPs with Product Available (N=10)	Product Available in MPDD (N=1)
Oxytocin 10 UI/ml, ampoule	95	100	100	100
Ergometrine 0.2 mg/ml, ampoule	40	60	70	100
Misoprostol 0.2 mg, tablet	5	90	60	100
Magnesium sulfate 1 g/2 ml, ampoule	15	80	40	100
Calcium gluconate 10 mg, ampoule	35	90	100	100
Diazepam 10 mg/2 ml, ampoule	93	100	100	100
Hydralazine 20 mg/ml, ampoule	0	70	60	0
Methyldopa, tablet	20	100	90	100
Nifedipine 10 mg, tablet	3	100	80	0
Gentamicin 80 mg/2 ml, ampoule	93	100	90	0
Ampicillin 500 mg, IV	80	90	100	0
Metronidazole 500 mg, IV	25	100	90	100
Cefotaxime 1g, IV	3	90	90	100
Aminophylline 250 mg/10 ml ampoule	93	100	100	100
Ringer's lactate IV solution	98	100	100	0
Sodium chloride 0.9% IV solution	53	100	90	0
Dextrose 5% IV solution	100	100	90	0
Urine dipsticks for protein	65	70	70	0
Syringes 2 ml	80	90	100	0
IV catheters	80	100	90	0
Infusion sets	88	90	100	0
Ambu bags	63	70	20	0
Ventouse	5	20	0	0
Syringe of manual vacuum aspiration (MVA)	13	10	0	0
Oxygen	5	80	0	0

Although oxytocin was available at all levels, ergometrine was less available especially at peripheral levels. Misoprostol was available at the central and district levels (70 percent of pharmacies) and in hospitals but was seldom available in HCs (5 percent); only one district surveyed is currently distributing misoprostol in the community as part of the home-based maternal and newborn health care strategy. In that one district, misoprostol was available at the DP and DH but in only two of the four HCs surveyed. The availability of products for eclampsia at peripheral levels was limited; magnesium sulfate was available in only 15 percent of HCs, but

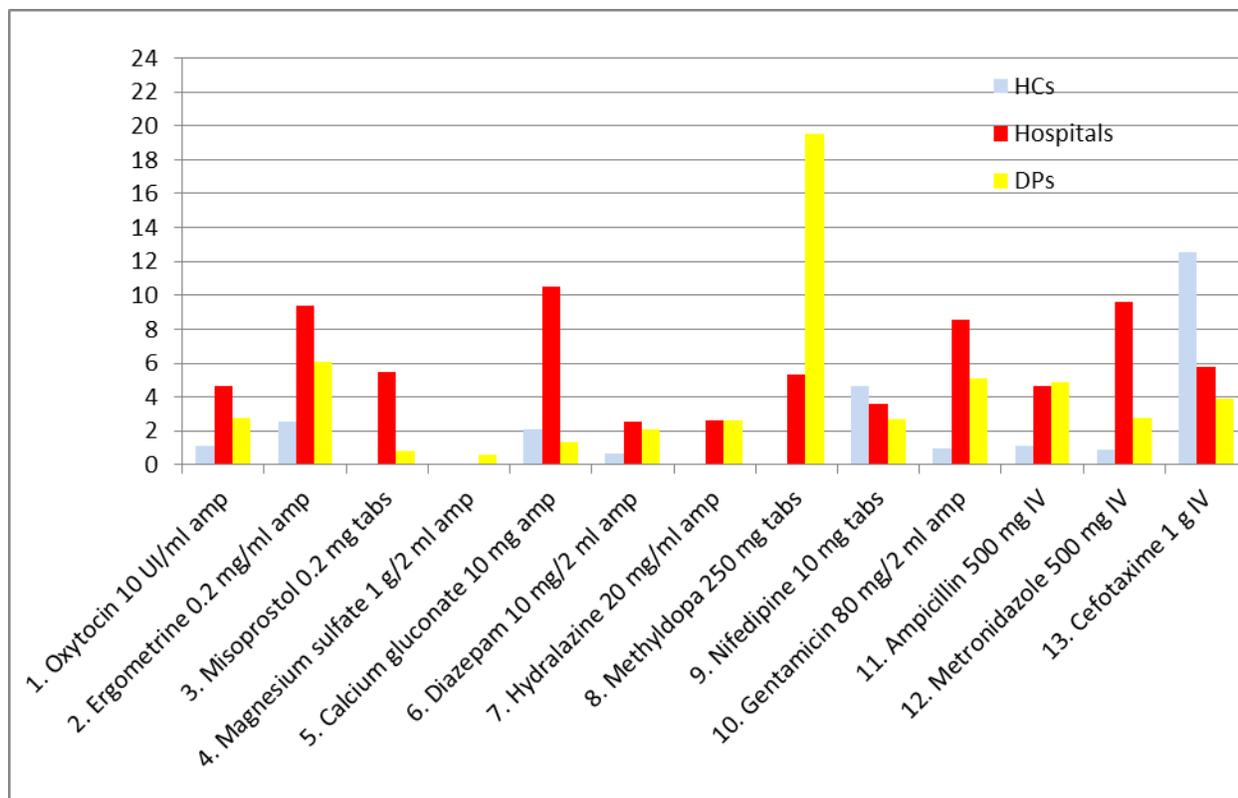
its antidote, calcium gluconate, was available in 35 percent. These products were more available in hospitals because, in general, patients are referred from the HC to the hospital level although not at all facilities (70 percent magnesium and 80 percent with calcium), and only half the DPs had magnesium sulfate available; it was available at the central level. Antihypertensive medicines were available in few HCs but were more widely available in hospitals, with the oral form being more available (90 percent with nifedipine and methyldopa) than the injectable hydralazine (60 percent).

Of the four antibiotics assessed, the availability of gentamicin and ampicillin was good at all levels, and metronidazole and cefotaxime were even available in HCs, although they are usually limited to hospitals since sepsis cases are usually referred from HCs. The intravenous solutions of dextrose and Ringer's lactate were widely available, but sodium chloride was available in only about half of the HCs visited (53 percent). Supplies for infusions and injections were widely available at all levels, but protein testing strips were available in just over half of the facilities (65 percent of HCs and 60 percent of hospitals) and were not in all DPs (80 percent).

The equipment required in obstetric and newborn emergencies was generally not widely available in the pharmacy store at any level, even in hospitals (see table 7), although the supply chain for these items should be the same as for essential medicines. Some items should not be used in HCs, for example MVA syringe and oxygen. The health facilities do not obtain oxygen through MPDD or DPs, but rather through private distributors although no quality control for the product is in place. These availability results do not reflect the availability of the items in the facility, merely spare items in the facility store.

As can be seen in table 7, key medicines were not all available at the central level in MPDD at the time of the survey. The MoH, however, was already aware of this deficit and is taking measures to alleviate the stock-outs.

The stock on hand of each product was calculated in terms of months according to the average monthly consumption, adjusted for stock-outs reviewed over the previous 6 months. As shown in figure 6, some products were available in large quantities (e.g., methyldopa in DPs; cefotaxime in one HC; and ergometrine, calcium gluconate, and metronidazole in hospitals) with quantities lasting 10 months or more.



**Figure 6. Stock levels in terms of months**

The guidance to health facilities since March 2011 states that for all medicines, facilities should have a maximum level of 2 months consumption and minimum level of 1 month consumption on hand. The results exceed the maximum of 2 months for most tracer medicines, especially in hospitals and DPs.

All HCs and hospitals visited stated they keep uterotonic medicines in the delivery suite so that they are on hand for emergencies. The availability of key medicines in the delivery suite was evaluated (as shown in table 8).

**Table 8. Availability of Tracer Products in the Delivery Suite (percentages)**

Note: Cells shaded in orange (light gray in a black and white copy) show results at 50–74 percent for the target value; cells shaded in red (dark gray in a black and white copy) show results at under 50 percent of the target value.

Medicine	Type of Facility		Total (N=45)
	HCs (N=35)	Hospitals (N=10)	
Oxytocin 10 UI/ml, ampoule	100	100	100
Ergometrine 0.2 mg/ml, ampoule	34	50	38
Misoprostol 0.2 mg, tablet	0	30	7
Magnesium sulfate 1 g/2 ml, ampoule	14	17	27
Calcium gluconate 10 mg, ampoule	6	20	9
Diazepam 10 mg/2 ml, ampoule	46	70	51
Hydralazine 20 mg/ml, ampoule	3	40	11
Methyldopa 250 mg tablet	3	0	2
Nifedipine 10 mg, tablet	0	20	4
Gentamicin 80 mg/2 ml, ampoule	57	90	64
Ampicillin 500 mg, IV	66	70	67
Metronidazole 500 mg, IV	23	20	22

The only medicine that was uniformly available in the delivery suite was oxytocin. Data collectors found that diazepam and the antibiotics gentamicin and ampicillin were available in the delivery suite in around half of all facilities. The other products considered necessary for management of emergency obstetric and newborn conditions were seldom available in the delivery suites of the facilities studied, which makes administering the medicines promptly in an emergency more difficult.

The amount of medicine stored in the delivery suite is usually small. A mean of 8 units was observed on 122 medicines in HCs (range 1–120), with 87 percent of the observations noting between 1 and 10 units, the most frequent amounts being 1 and 3 ampoules with 14 percent each, but 7 percent of observations noted more than 20 units kept in the delivery area in HCs, where the average number of deliveries is 12 per week (range 3–42). A mean of 16 units was observed for 58 medicines in hospitals (range 1–116) with 60 percent of the observations noting between 1 and 10 units, the most frequent numbers being 5 and 10 ampoules with 17 percent and 14 percent, respectively; however, 19 percent of observations noted more than 20 units kept in the delivery area in hospitals, where the average number of deliveries is 56 per week (range 7–180).

#### *Presence of Expired Products in Facility Stores*

Of all the facilities visited, only one hospital had an expired product (metronidazole IV) in stock. No other facilities had any expired products in their facility stores. One HC had some expired ergometrine in the delivery suite area.

#### *Stock-outs in Facility Stores*

When asked about stock-outs, 25 percent of storekeepers said they had experienced stock-outs in the last six months (20 percent of HCs, 30 percent of hospitals, and 40 percent of DPs). The amount of time a medicine was out of stock during the 6 previous months was evaluated by level of facility, and the results are shown in table 9.

**Table 9. Percentage of Number of Days Products Were out of Stock during the 6 Months Preceding the Survey**

*Note:* The denominator is the total number of days for which stock-out data were available over the 6 months.

Product	Type of Facility		
	HCs (N=40)	Hospitals (N=10)	DPs (N=10)
Oxytocin 10 UI/ml, ampoule	3.4	0.5	9.9
Ergometrine 0.2 mg/ml, ampoule	1.4	3.8	2.3
Misoprostol 0.2 mg, tablet	0	0.4	0
Magnesium sulfate 1 g/2 ml, ampoule	0	0	6.1
Calcium gluconate 10 mg, ampoule	5	0	13
Diazepam 10 mg/2 ml, ampoule	0	0	0.4
Hydralazine 20 mg/ml, ampoule	N/A	4.8	9
Methyldopa, 250 mg tablet	2.2	0	2.6
Nifedipine 10 mg, tablet	0	0.6	13.2
Gentamicin 80 mg/2 ml, ampoule	2.1	0.3	4.9
Ampicillin 500 mg, IV	0.7	0	9.2
Metronidazole 500 mg, IV	0	0	11.3
Cefotaxime 1g, IV	9.2	0.5	9.8
Aminophylline 250 mg/10 ml ampoule	2.3	0	0.7
Ringer's lactate IV solution	2.2	0	0.9
Sodium chloride 0.9% IV solution	0	0.2	3.7
Dextrose 5% IV solution	0.4	0	5.7
Urine dipsticks for protein	0.7	0	4.2
Syringes 2 ml	2.4	0	0.4
IV catheters	3.4	5.1	6.1

The range of stock-outs for HCs was from 0 to 9.2 percent (16 days) for cefotaxime and in hospitals from 0 to 5.1 percent (9 days) for IV catheters. Table 9 shows that the percentage of time with stock-outs for most products is slightly higher at DP level than the hospitals or HCs. This difference is probably due to the availability problems already mentioned at MPDD. The range of time out of stock in DPs was from 0 to 13 percent (23 days or over 3 weeks) for nifedipine tablets.

Storekeepers who had experienced stock-outs in their facilities cited stock-outs at the supplier (71 percent) and insufficient funds (28 percent) as the primary reasons.

### *Use of Stock Cards in Facility Stores*

Stock cards are critical tools for store management because they facilitate an analysis of distribution or consumption, an accurate estimation of needs, and a determination of when to order. All storekeepers stated they used stock cards, and when checked, all had stock cards for the medicines of interest in the survey. Ninety-five percent of the storekeepers mentioned that

they completed the stock cards at each stock movement, and the remainder said they entered the information daily. When asked about the advantages of using stock cards, 75 percent of storekeepers mentioned that they were to record stock movements, and 79 percent that they were used to monitor the available stock levels. Storekeepers also cited the following uses: to know the consumption (33 percent), to know where and when products were distributed (19 percent), to avoid stock-outs (17 percent), to monitor products' expiration dates (12 percent), and to know how much to order (7 percent).

To check whether the stock cards were indeed completed systematically at each stock movement, the rapid assessment evaluated each product to see if the physical stock corresponded to the amount recorded on the stock card in each facility surveyed (as shown in table 10). For equipment and supplies, the level of correspondence was lower in all facilities. In general, the correspondence in the hospitals and HCs was good, with only a few products showing some deviance. The correspondence at the DP level was in general lower than for hospitals and HCs. This finding is surprising given that all DPs have pharmacists, although in general, the work of inventory management would be carried out by the storekeeper. The finding highlights the important role of supervision.

An important practice in store management is performing regular inventories, which are important to check for any errors in the stock cards. Despite the discrepancies in the stock cards shown in table 10, the majority of storekeepers state that they do inventories every month (98 percent), with 91 percent stating they had done an inventory within the last month.

**Table 10. Percentage of Facilities with the Amount Recorded on the Stock Card Corresponding to the Physical Stock for Each Product Studied per Facility**

*Note:* Cells shaded in orange (light gray in a black and white copy) show results at 50–74 percent for the target value; cells shaded in red (dark gray in a black and white copy) show results at under 50 percent of the target value.

Product	Type of Facility		
	HCs (N=40) <sup>a</sup>	Hospitals (N=10)	DPs (N=10)
Oxytocin 10 UI/ml, ampoule	82	100	60
Ergometrine 0.2 mg/ml, ampoule	67	100	57
Misoprostol 0.2 mg, tablet	50	75	100
Magnesium sulfate 1 g/2ml, ampoule	83	100	75
Calcium gluconate 10 mg, ampoule	86	100	80
Diazepam 10 mg/2 ml, ampoule	87	100	80
Hydralazine 20 mg/ml, ampoule		100	67
Methyldopa, 250 mg tablet	75	100	56
Nifedipine, 10 mg tablet	100	100	62
Gentamicin, 80 mg/2ml ampoule	89	90	67
Ampicillin 500 mg, IV	90	89	60
Metronidazole 500 mg, IV	90	90	62
Cefotaxime 1 g, IV	100	89	67

Product	Type of Facility		
	HCs (N=40) <sup>a</sup>	Hospitals (N=10)	DPs (N=10)
Aminophylline 250 mg/10ml ampoule	89	90	70
Ringer's lactate IV solution	90	100	60
Sodium chloride 0.9% IV solution	91	100	67
Dextrose 5% IV solution	85	100	75
Urine dipsticks for protein	79	100	57
Syringes 2 ml	81	100	60
IV catheters	81	90	67
Infusion sets	81	86	75
Ambu bags	56	40	50
Ventouse	0	0	N/A
Syringe of MVA	60	N/A	N/A

Note: N/A= No data were recorded

<sup>a</sup>This number represents the number of facilities surveyed, but the number for each percentage was adjusted according to the number of facilities where the product was available.

### *Record-keeping in Delivery Suites*

Although all the facilities had registers to record details of the deliveries, few facilities used the register to record medicines given during the delivery (16 percent of HCs and 12 percent of hospitals). Similarly, few facilities had systems for recording movements of medicines into the delivery suite (20 percent of HCs and 30 percent of hospitals), and of those only some (77 percent of HCs and 33 percent of hospitals) were observed to be up to date when reviewed during the survey, and they are not standard. Similarly, for the few facilities that had an operating room, few (44 percent of hospitals) had a recording system for movement of medicines to the operating room, and of those only 22 percent were up to date. These systems are not standardized and do not follow the same format. The medicines given in many facilities are recorded only in the patient's notes.

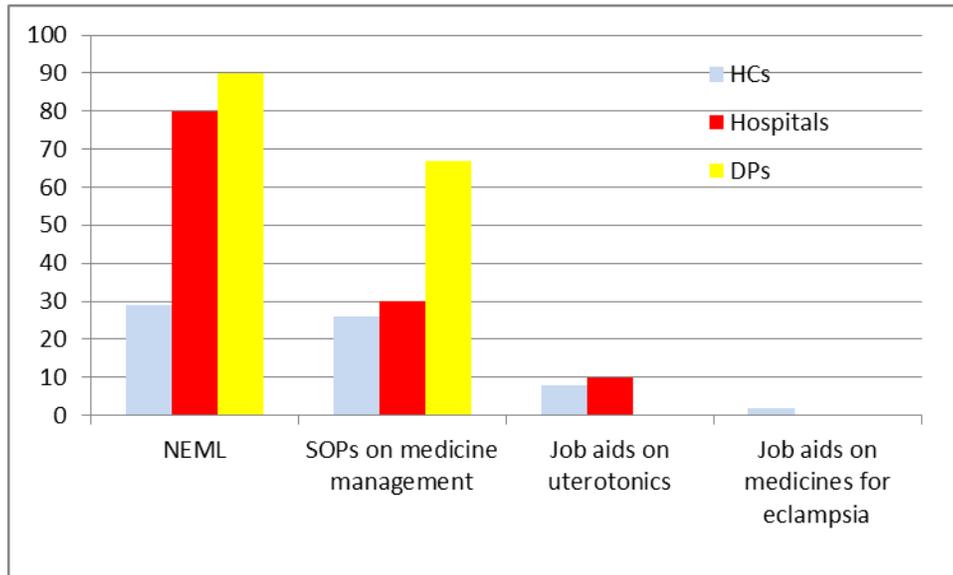
The majority of staff say they do not use any system to record stock in the delivery suite (57.5 percent of HCs and 60 percent of hospitals). A small proportion use an exercise book to record the stock movements (32.5 percent HCs and 30 percent of hospitals) or a stock card (10 percent of hospitals), but there is some variation in when they complete the record, most saying every time they use the medicine (41 percent of HCs and 33 percent of hospitals) or every day (29 percent HCs and 50 percent hospitals). In the operating theater, similarly some use an exercise book (40 percent of hospitals), some stock cards (20 percent of hospitals) completing them as they use the medicines (50 percent) or every day (33 percent) or even every week (17 percent), and many use no system at all (40 percent of hospitals).

### *Reference Material Available*

The respondents were asked about the reference tools and job aids available to promote the appropriate management of medicines of maternal and newborn conditions.

*Storekeepers*

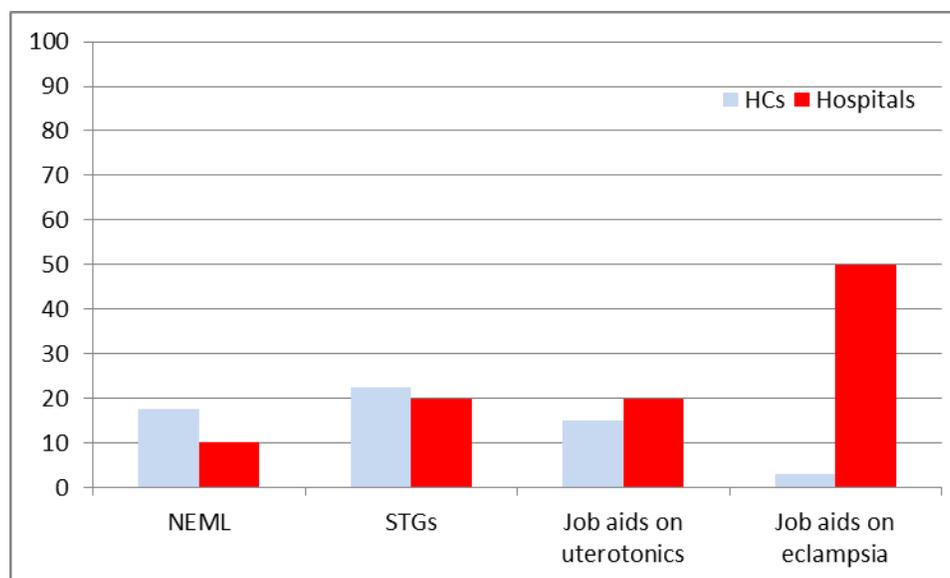
The NEML is important to provide guidance to the facility staff on which medicines they can use at each level of care; it thereby guides the order process. The list is distributed each time a new version is issued, and at least one if not two copies are sent to each facility. Storekeepers were asked if they have a copy of the NEML, SOPs for the management of medicines, job aids on management of uterotonics, and job aids on the management of medicines for eclampsia. The results show that, in general, storekeepers at peripheral levels did not have access to basic tools to promote the appropriate management of medicines in particular for maternal and newborn conditions (figure 7). Most respondents know that, as yet, no SOPs on management of medicines have been developed and approved at central level; however, those who state they have SOPs may have been referring to job aids on good storage practices recently circulated by MoH with the support of JSI, a locally developed SOP, or a version of an SOP that was developed by the Rational Pharmaceutical Management Plus Program/USAID for the management of antiretroviral medicines.



**Figure 7. Reference material available to storekeepers**

*Staff in Charge of the Delivery Suites*

Staff from the delivery suite were asked if they had a copy of the NEML, the STGs for maternal and newborn conditions, job aids on management or use of uterotonics, and job aids on the management or use of medicines for eclampsia. The results are shown in figure 8.



**Figure 8. Reference material available to the staff in charge of the delivery suite**

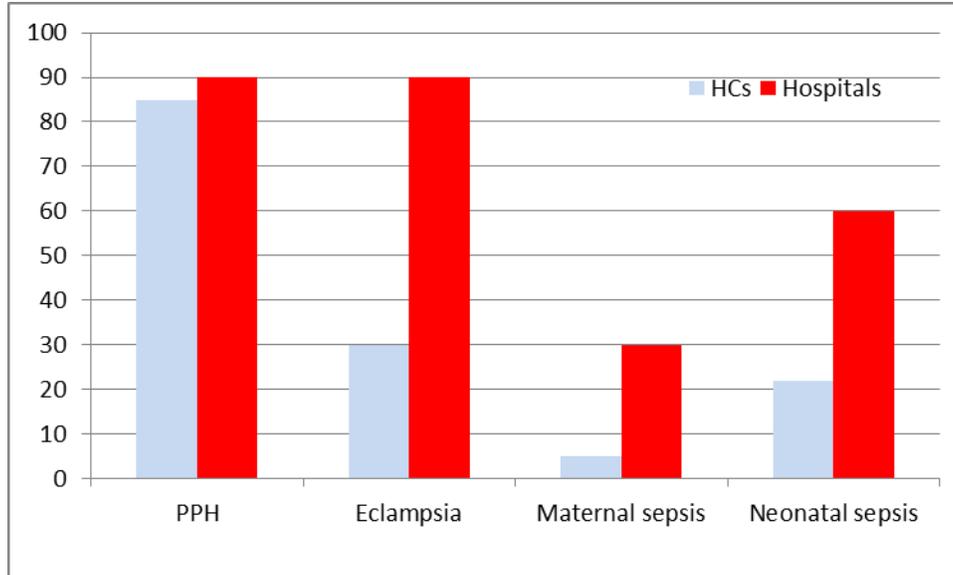
Few respondents had access to such documents. In the few facilities where respondents had access to job aids, only 16 percent of them said the documents included storage conditions. The job aids on uterotonics or eclampsia were primarily on the use of the medicines for management of the condition. The storage requirements of uterotonics, in particular, are complex, so simple job aids reminding staff, for example, that ergometrine should be kept in the refrigerator may help.

## Use

Use practices were not assessed as part of this survey because they are covered in the recent survey by the MoH with MCHIP.<sup>14</sup> We did, however, evaluate the knowledge of recommended treatments by both the delivery suite staff and the storekeepers.

The staff in charge of the delivery suite were asked if they knew the recommended medicines for preventing PPH and for treating eclampsia, maternal sepsis, and neonatal sepsis. In interviews with the district director, 70 percent said they had disseminated the STGs, 80 percent said they had conducted training in the STGs, and 50 percent said they had conducted refresher training on the STGs in their district. Although the medicines for prevention of PPH were, in general, correctly identified by delivery suite staff in both hospitals and HCs (as shown in figure 9), the percentage of those who gave the correct answer for treatment according the national STG for treatment of maternal and newborn sepsis is not optimal.

<sup>14</sup> MCHIP. 2011. *Quality of Care for Prevention and Management of Common Maternal and Newborn Complications. Rwanda.* Maryland, USA: JHIPEGO.



Note: Assuming oxytocin for PPH, magnesium sulfate for eclampsia, a gentamicin/ampicillin/metronidazole combination for maternal sepsis, and a gentamicin/ampicillin combination for newborn sepsis.

**Figure 9. Percentage of staff in charge of delivery suite stating correct treatment**

In HCs, 27.5 percent of respondents responded that the medicine used for the prevention and treatment of eclampsia was diazepam, which is also correct according to the STGs although magnesium sulfate is the preferred treatment; 28 percent did not know what the treatment should be.

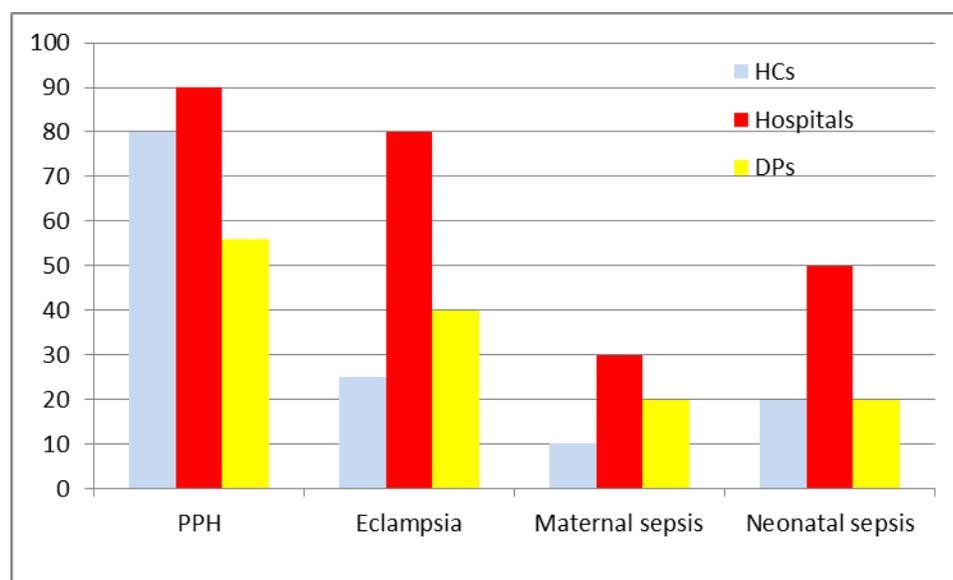
When asked what the recommended treatment for maternal sepsis was, few responded with the correct combination of the three antibiotics (as shown in figure 9). Table 11 shows the other responses, which include different combinations of the antibiotics as well as the antibiotics alone. Similarly for neonatal sepsis, few respondents at HC level knew the correct treatment, probably because these cases are managed only at the DH level, where only 60 percent of respondents knew the correct treatment combination.

**Table 11. Responses Provided by Delivery Suite Staff for Recommended Treatments (percentages)**

Use	Medicine or Combination of Medicines	Type of Facility	
		HC (N=40)	Hospitals (N=10)
Prevention and treatment of PE/E	Diazepam	30	0
	Magnesium sulfate <sup>a</sup>	28	80
	Magnesium sulfate and diazepam	2	10
	Don't know	28	0
Prevention of PPH	Ergometrine	12	10
	Misoprostol	2	0
	Oxytocin <sup>a</sup>	72	90
	Oxytocin or ergometrine	12	—
Treatment of maternal sepsis	Gentamicin/ampicillin/metronidazole <sup>a</sup>	5	50
	Ampicillin/metronidazole	2	0
	Ampicillin/other	20	0
	Gentamicin/ampicillin	28	40
Treatment of newborn sepsis	Don't know	2	—
	Ampicillin/gentamicin <sup>a</sup>	22	60
	Ampicillin	10	10
	Ampicillin/gentamicin/metronidazole/cefotaxime	0	10
	Don't know	5	0

<sup>a</sup> Indicates first-line treatment according to the SONU guidelines

Although the storekeepers do not treat patients, they need to know what the recommended treatments are to be able to assure availability of the necessary treatments. We found that the level of knowledge was similar to that of the staff of the delivery suite and that the same trend was repeated: more knew the treatment for prevention and management of PPH, fewer for PE/E, still fewer for maternal sepsis, and none for newborn sepsis (figure 10).

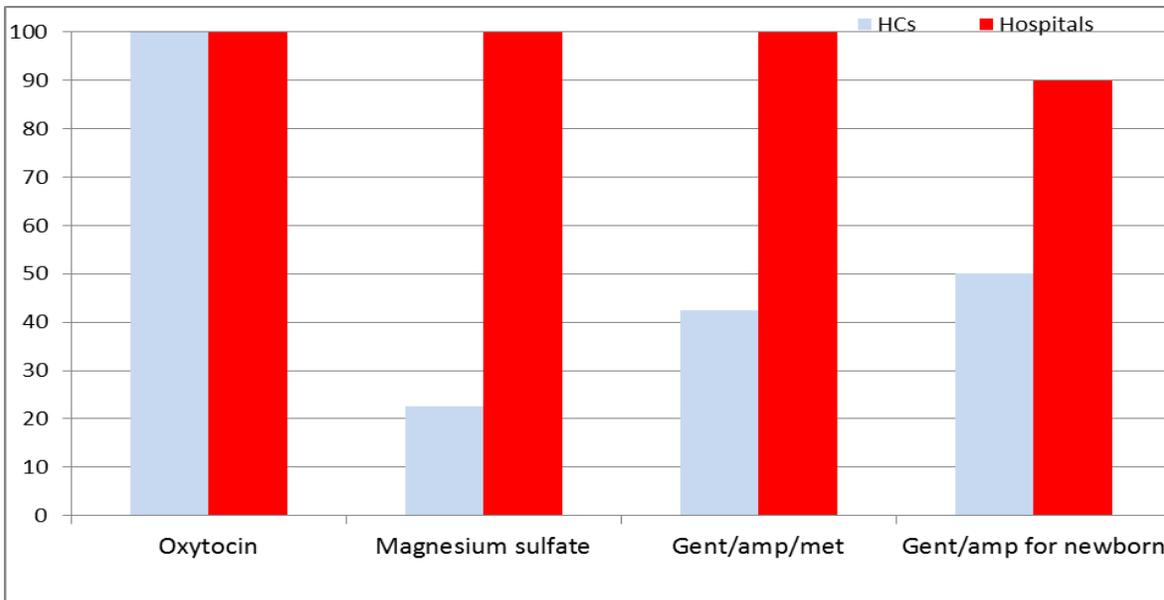


**Figure 10. Percentage of storekeepers for the delivery suite stating correct treatment**

The reported practices were evaluated by asking if they used the specific recommended medicines in the facility, without relating the medicines to a diagnosis; the responses are shown in figure 11. The reported use of the specific medicines is greater than the knowledge. The conditions for which they were used are not known, but the gap in use is marked in HCs, which is to be expected given the guidance in the SONU on the level for management of different conditions. When asked about the reasons why they did not use the specific medicines, the respondents made these comments (in italics), among others:

- *Magnesium sulfate is not permitted in HCs.*
- *In HCs, we only use ampicillin and gentamicin for maternal sepsis; metronidazole IV is never added. It is not permitted in HCs, only in hospitals. We refer the cases.*
- For newborn sepsis, comments from the HCs were—
  - *We usually refer.*
  - *We have never seen such a case.*
  - *We are not permitted to treat such a case.*

Although these opinions explain the data, they are not consistent with the objective of the SONU guidelines to assure correct care at all facility levels including HCs.



**Figure 11. Reported use of specific medicines in the facility (by delivery suite staff)**

(Gent/amp/met = Gentamicin/ampicillin/metronidazole; Gent/amp for newborn = Gentamicin/ampicillin for newborns.)

## **Management Support**

The rapid assessment examined three areas of management support: training, supervision, and reporting.

### ***Training***

Respondents were asked about their training in specific areas related to management of medicines and supplies.

#### ***Storekeepers***

Only 20 percent of the medical directors of the DHs were aware of any training conducted in the district on pharmaceutical management, and 30 percent said they had SOPs for pharmaceutical management that staff could consult when necessary.

All respondents in DPs have been trained in medicine management, but only 70 percent of the hospital storekeepers and 75 percent of the HC storekeepers have been trained. Of those trained, one third were trained a few years ago, one third in the last 12 months, and one third in the last 6 months. Only 8 percent had received specific training in the management of medicines for obstetric and newborn conditions. The majority of storekeepers (97 percent) felt that they needed further training in the management of medicines for obstetric emergencies, particularly in storage conditions (36 percent), store management (41 percent), and use (78 percent).

It is important to note that since 2009, the MoH has placed at least one pharmacist in addition to a storekeeper in each DP and at least one pharmacist in each DH in addition to a storekeeper. Often the storekeeper is responsible for the daily tasks of inventory management, however.

#### ***Staff in Charge of the Delivery Suite***

The staff in charge of delivery suites in HCs and hospitals was asked about whether they had received training in the management of cases of PPH, eclampsia, maternal sepsis, and newborn sepsis, as well as in the management of medicines for maternal and newborn conditions. As shown in figure 12, only around half or fewer had been trained in the different aspects, with the exception of PPH, for which over 70 percent of delivery suite staff had been trained. Of those who said they had received training in the HCs, about half had received it several years ago and the others in the last 12 months. In the hospital setting, the training was more recent: 75 percent for PPH and eclampsia, 100 percent for maternal sepsis, 67 percent for newborn sepsis reported that they had received training in the last year. Of the few from the HCs who said they had received training on the management of medicines for maternal and newborn conditions, most had received it a few years ago (71 percent). In the interview with the DH directors, 20 percent stated they had provided training in pharmaceutical management. When asked if they felt they needed more training in managing medicines for maternal and newborn conditions, all staff responded positively mentioning a number of different aspects that they considered necessary in a training, including stock management (40 percent of all respondents), storage conditions (4 percent of respondents), use (20 percent), and other aspects of ordering (16 percent).

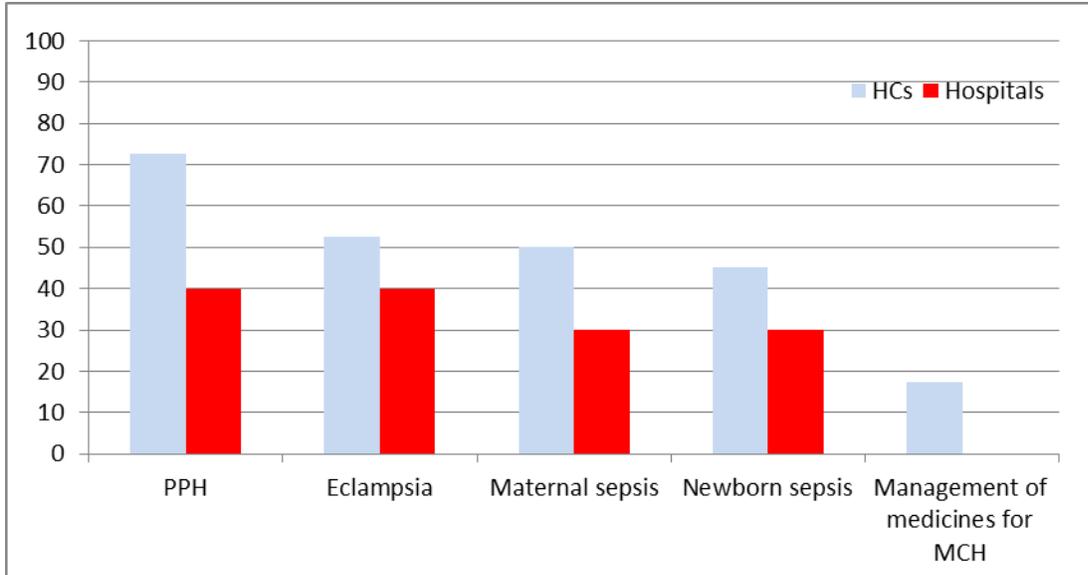


Figure 12. Training of staff in charge of delivery suite

**Supervision**

Most storekeepers (95 percent) at all levels stated they had a direct supervisor; one hospital storekeeper and two from DPs stated they were without a supervisor. The majority of HCs and hospital storekeepers (79 percent) stated that they were supervised by the district pharmacist and 5 percent of HCs and 22 percent of hospitals stated they were supervised by the director of the hospital. Of the district pharmacists stating they have a supervisor, 75 percent said they were supervised by MoH at the central level, mentioning the PTF or logistics staff.

The timing of the last supervision varied (as shown in table 12); one storekeeper from a DP said they were last supervised over 3 years ago.

Table 12. Timing of Last Supervision Visits (percentages)

Facility	Within the Last Month	Within the Last 3 Months	Up to a Year Ago	Over a Year Ago
HC	53	35	10	2% don't know
Hospital	22	33	22	11%, plus 11% don't know
DP	37	25		25%, plus 13% don't know

The aspects of pharmaceutical management that had been supervised in the last visit according to the respondents varies (as shown in table 13), despite the fact that all district pharmacists have developed a checklist for supervision, which includes all the aspects listed in table 13. The limitation is that the evaluation of supervision depends on what the respondent remembers of the visit; the limitations of their recall highlight the importance of leaving written feedback of the

supervision. The majority (81 percent) of supervisees receive oral comments from the supervision with only 39 percent saying that they receive a written report.

**Table 13. Aspects Assessed during the Last Supervision Visit in the Facilities Surveyed (percentages)**

Aspect	Type of Facility		
	HCs (N=39)	Hospitals (N=10)	DPs (N=9)
Stock cards	77	50	56
Consumption of medicines	38	30	11
Storage conditions	49	60	22
Physical stock level	26	20	11
Expired or damaged medicines	44	0	22

Most staff of the delivery suite stated they had a supervisor, although one HC respondent did not know and three HC respondents said they did not have a supervisor. In the HCs, the staff in charge of the delivery suite responded that they were supervised in general by the *titulaire* of the HC (67 percent), another 30 percent said they were supervised from the central level (including a nongovernmental organization), and one HC respondent said that they were supervised by the director of the hospital. In the hospital, the staff in charge of the delivery suite stated that they were supervised mainly by staff from the central level (62 percent), and 38 percent said by the hospital director. In the HCs, the majority of staff said that their last supervision was in the last month (61 percent) with some even saying they were supervised every day or every week (5 percent), and 22 percent in the last 3 months. In the hospitals, the staff stated they were supervised every day (30 percent), during the last month (37.5 percent) or in the last 3 months (12.5 percent). During these visits, the supervisor reportedly looked at storage of medicines in only one HC, and the materials in the unit in four HCs (11 percent) and one hospital (12.5 percent). In the main, they looked at registers (35 percent HCs, 25 percent hospitals) and partogrammes (17 percent HCs), and they observed practices (25 percent in HCs, 37.5 percent in hospitals). Although nearly all respondents say that they were given oral feedback (86 percent of HC staff and 100 percent of hospital staff), around half of the staff in charge of the delivery suite say they were left written feedback (57 percent of HCs and 37.5 percent of hospitals).

Additionally, 90 percent of the hospital directors mentioned that supervision of the HCs is conducted by the district team and that MNH issues are included.

### **Reporting**

Nearly all the storekeepers (93 percent) mentioned that they send a report of consumption and stock levels, which is delivered, usually by hand (88 percent) every month (98 percent) to the DP in the case of the hospitals and HCs and to the district health team or MPDD in the case of the DPs. Although the majority of respondents concurred on what was contained in the report (as shown in table 14), data collectors found no unanimous consensus about what is included in the

reports, which is surprising because it is expected that the report form used is the standard reporting format: the LMIS reporting tool. The respondents did not refer to the LMIS form, however, when responding to the question, so the responses depended on what they remembered of the information included in the LMIS. This finding, however, is limited because the reports are not completed from memory; the LMIS reporting form contains the elements that must be included in the report.

**Table 14. Elements Contained in the Monthly Report (percentages)**

Element	Type of Facility		
	HCs (N=40)	Hospitals (N=10)	DPs (N=10)
Quantity received	67	90	78
Quantity distributed/consumed	82	100	90
Quantity expired	44	50	67
Stock level	77	90	89
Days of stock-out	26	50	44

The importance of the stock cards was highlighted since 76 percent of storekeepers mentioned they use the stock cards to complete the reports. Although information on the medicines of interest in this survey is included in the monthly report of all medicines, some few HCs (12 percent) reported that they prepared additional reports on uterotonics and medicines for eclampsia.

The majority of staff from the delivery suites in HCs (57.5 percent) and in all hospitals say they prepare a report including information on obstetric emergency cases—the monthly epidemiological and productivity report. In the case of the HCs, these reports are sent to the district in a number of different ways: via the facility *titulaire* (19 percent), district health team (19 percent), data manager (33 percent), DH (9 percent), or a nongovernmental organization (5 percent). In the case of hospitals, the in-charge of the delivery suite says it is shared principally with the district health team (10 percent), the head of nursing (33 percent), and data manager (22 percent). These reports are generally sent by hand (81 percent HC or 80 percent hospitals) with every month (67 percent HCs; 40 percent hospitals) or every week (19 percent HCs; 20 percent hospitals) being the most frequent responses. The respondents state that the reports contain information on the number of cases (90 percent of HCs and 80 percent hospitals), but only one HC (5 percent of those saying they prepare a report) mentioned that the treatment was included.

### Price Analysis

To analyze the cost of these essential MNH commodities, the survey team reviewed the prices of medicines, both the purchase prices of the facilities and the sales prices to the patients.

## **Purchase Prices**

A variation was noted in the prices paid by facilities for the purchase of medicines (as shown in table 15). This variation could be attributable to the different suppliers used by the facilities. The purchase price paid by MPDD was available only through the accounting section of the MPDD, but at the time of the survey, not all the prices were available to the data collectors. Seventy-three percent of the medicines assessed in the survey in the DPs were purchased from MPDD, 9 percent from BUFMAR, but another 17 percent were purchased from private wholesalers. As expected, the majority of medicines (91 percent) in hospitals were purchased from the DP and the remaining 9 percent from private wholesalers. Again expectedly, the main source of medicines for the HCs was the DP (97 percent), with the remaining 3 percent of medicines purchased from private wholesalers.

Comparing the district purchase price with the purchase prices of the hospitals and HCs revealed that the mark-up applied by the facilities exceeded the 20 percent stipulated by the MoH in the majority of cases, in some cases up to 180 percent (as shown in table 15). This excessive mark-up was the case in 9 of 12 products when studying the purchase prices from HCs and 12 of 14 products when studying the purchase prices from hospitals.

In an analysis of the purchase prices from the MPDD (as compared to the median price of the international price guide<sup>15</sup>) of 10 medicines for which price data was available at MPDD, analysts found that only two were more expensive than the median price of the price guide: oxytocin at 2 times the price and magnesium sulfate at 1.3 times the price. Price is not the only criteria that is judged when adjudicating a tender; quality of a product is also important. Price, however, does give a general indication of the country's ability to purchase at competitive prices thus rendering the products as affordable as possible in the system.

## **Sales Prices**

The majority of the population is covered by *mutuelle* and, therefore, pays a single fee for the package of care at HC level and 10 percent of the total cost of services received at the hospital level. The few patients who are not covered by any insurance scheme, however, must purchase their medicines paying the full sales price. Furthermore, this sales price is the price applied in billing the *mutuelle* system for medicines dispensed to *mutuelle* patients.

Table 16 shows the sales prices of medicines; the data are shown separately for the mission and public HCs. For 43 percent of the 14 tracer medicines, the mean price was higher in the mission HCs than the public ones. Furthermore, the mean prices in the hospitals were higher for 43 percent of the tracer medicines. A great variation in the prices can be seen within a facility group, suggesting that the price margin guidelines are not being followed. The guidelines state that health facilities may mark-up their medicines for sale at no more than 20 percent on their purchase price from their respective suppliers. As can be seen from table 16, however, in public HCs, 6 of 12 products were being sold at a mark-up of over 20 percent on the HC purchase price and 2 of 14 products in hospitals were being sold at a mark-up greater than 20 percent on their purchase price.

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<sup>15</sup> Management Sciences for Health. 2010. *International Drug Price Indicator Guide*. Arlington, Virginia, USA: MSH.

**Table 15. Average Unit Purchase Price (in RwFr) by Type of Facility (RwFr)<sup>a</sup>**

Note: Cells in red (dark gray in a black and white copy) show an average mark-up of over 20 percent.

Product	HCs (N=40) (mean and range)	Percentage Mark-up on District Purchase Price	Hospitals (N=10) (mean and range)	Percentage Mark-up on District Purchase Price	DP (N=10) (mean and range)	MPDD Purchase Price
Oxytocin 10 UI/ml, ampoule	187 (29–338)	75	171 (29–268)	60	107 (24–240)	204
Ergometrine 0.2 mg/ml, ampoule	142 (52–317)	77	139 (60–220)	74	80 (17–230)	38
Misoprostol 0.2 mg, tablet		N/A	281 (94–403)	86	151 (78–335)	40
Magnesium sulfate 1 g/2 ml, ampoule	345 (0–545)	Lower than purchase price	410 (0–660)	17	350 (288–450)	78
Calcium gluconate 10 mg, ampoule	163 (43–363)	181	150 (43–363)	159	58 (27–261)	31
Diazepam 10 mg/2 ml, ampoule	112 (11–291)	33	121 (88–244)	44	84 (70–160)	64
Hydralazine 20 mg/ml, ampoule	N/A		676 (37–2100)	123	303 (293–305)	N/A
Methyldopa, 250 mg tablet	24 (18–35)	41	20 (17–35)	18	17 (14–25)	15
Nifedipine 10 mg, tablet	9 (3–20)	80	13 (3–25)	160	5 (3–18)	N/A
Gentamicin 80 mg/2 ml, ampoule	47 (19–107)	57	44 (23–107)	37	30 (17–77)	N/A
Ampicillin 500 mg, IV	98 (60–216)	27	106 (56–210)	38	77 (56–132)	N/A
Metronidazole 500 mg, IV	318 (216–400)	25	328 (246–400)	29	254 (245–257)	224
Cefotaxime 1 g, IV	434 (395–447)	18	452 (220–749)	22	369 (180–546)	155
Aminophylline, 250 mg/10 ml ampoule	99 (61–173)	16	132 (61–300)	55	85 (50–103)	89

<sup>a</sup>In August 2012, 1 US dollar = 599 RwFr.

**Table 16. Average Unit Sales Prices by Type of Facility (RwFr)<sup>a</sup>**

Note: Cells in red (dark gray in a black and white copy) show an average mark-up of over 20 percent.

Product	Mission HCs sales price (N = 10) (mean and range)	HC Purchase Price from Table 15	Public HCs sales price (N = 30) (mean and range)	Percentage Mark-up on Purchase Price	Hospitals sales price (N = 10) (mean and range)	Purchase Price from Table 15	Percentage Mark-up on Purchase Price
Oxytocin 10 UI/ml, ampoule	284 (206–500)	187	211 (34–500)	13	197 (34–276)	171	15
Ergometrine 0.2 mg/ml, ampoule	147 (52–300)	142	170 (38–381)	20	152 (52–305)	139	9
Misoprostol 0.2 mg, tablet	N/A		N/A		280 (0–483)	281	Less
Magnesium sulfate 1 g/2 ml, ampoule	489 (448–550)	345	460 (0–744)	33	459 (0–744)	410	12
Calcium gluconate 10 mg, ampoule	146 (52–240)	163	184 (2–432)	13	192 (52–432)	150	28
Diazepam 10 mg/2 ml, ampoule	148 (0–350)	112	140 (73–300)	23	134 (90–250)	121	11
Hydralazine 20 mg/ml, ampoule	N/A		N/A		675 (44–2520)	676	Less
Methyldopa, 250 mg tablet	59 (15–228)	24	28 (17–50)	17	44 (15–228)	20	12
Nifedipine 10 mg, tablet	13 (4–24)	9	13 (4–27)	44	14 (4–27)	13	8
Gentamicin 80 mg/2 ml, ampoule	60 (25–150)	47	57 (25–118)	21	54 (35–90)	44	23
Ampicillin 500 mg, IV	127 (79–350)	98	135 (68–508)	38	112 (68–179)	106	6
Metronidazole 500 mg, IV	402 (309–480)	318	374 (257–480)	18	372 (298–480)	328	13
Cefotaxime 1 g, IV	400 (264–536)	434	504 (178–786)	16	509 (264–786)	452	13
Aminophylline 250 mg/10 ml ampoule	120 (61–300)	99	128 (61–225)	29	122 (61–225)	132	Less

<sup>a</sup>In August 2012, 1 US dollar = 599 RwFr.

## SUMMARY OF KEY FINDINGS

The evaluation highlighted some strong points in the management of medicines for obstetric and newborn conditions but also some areas needing improvement as summarized below.

- ***Selection of medicines for MNH conditions***

Some disparity was found between the levels of use of certain medicines in the NEML of 2010 and those recommended in the recent SONU guidelines; for example, according to the NEML, oxytocin is for use only at the hospital level not at HCs, but ergometrine, a medicine that is less stable, is for use at all levels. Such disparities, however, are being addressed in the current revision of the NEML, which should be finalized in early 2013.

- ***Procurement***

Quantification for the procurement is based on needs estimate from the districts and from MPDD based on distribution figures. No standard procedure to estimate needs at district level exists.

Procurements of medicines for obstetric and newborn conditions are financed by the cost-recovery system of the Government of Rwanda as for all essential medicines. An initial purchase of oxytocin, ergometrine, and magnesium sulfate was funded by the MoH MCH department when the SONU was created.

Rwanda has procured oxytocin that is stable up to 30°C, which greatly enhances supply chain logistics.

- ***Order process***

Medicines for obstetric and newborn conditions are integrated into the essential medicines supply system. In general, the order process for health facilities is monthly, and most obtain their medicines from within the public system. A proportion of facilities (31 percent of HCs and 60 percent of hospitals) obtain medicines from private wholesalers to avoid stock-outs when their public sector suppliers have run out, a practice that goes against the ministerial guidelines.

The LMIS forms are used for ordering, which facilitates the order calculation process because all the necessary steps are indicated on the form. Almost all storekeepers knew that their order should be based on consumption, and although only 20 percent gave the correct formula, as stated above, the LMIS form contains the steps and formulas to estimate the order quantity in a standardized, correct manner. The process to order from the public sector seems to be fairly smooth in the majority of cases; few storekeepers presented problems with the authorization of orders, although some had transport problems.

Transport mechanisms varied. Transport is most problematic for the HCs, who the use of a number of different mechanisms to collect their medicine orders: district vehicle, borrowed vehicle, taxi, motorbike, bike, and by foot. Although an active distribution is in place for MPDD to DPs, it is currently planned to address only the distribution from DPs to HCs, awaiting the positioning of small trucks at the DP level.

Most storekeepers knew to check for the quantity and expiry dates of products upon reception of an order, but other issues, such as the condition of the packaging, presentation, in general were not mentioned as being important conditions to check for.

All health facilities stated that they kept key medicines for obstetric emergencies on hand in the delivery suite and operating theaters, but no standard system for that process seems to be in place (e.g., standard forms for tracking movement of medicines from pharmacy to the delivery suite or the operating theater or standard guidance on the amount to keep on hand).

- ***Storage conditions***

Storage conditions in all surveyed facilities were, in general, adequate. The temperature of the store was monitored in few medicines stores, even in DPs. Problems maintaining the cold chain were found, for example, poorly working refrigerators in some facilities and a lack of temperature monitoring refrigerators at all levels. The supplies for transport of cold chain commodities (e.g., ice packs and ability to refreeze them) were lacking, mainly at the DP level, where it is arguably less necessary because medicines are received transported by MPDD in cold chain conditions if needed, and the HCs come with their cold boxes to collect medicines needing cold chain. If the DPs start to carry out active distribution, however, they will require cold chain transport equipment.

Although the oxytocin in circulation in the public system in Rwanda does not require cold storage, which greatly facilitates distribution and storage, misunderstanding of storage conditions persists. Most respondents, both storekeepers and delivery suite staff, mentioned that oxytocin should be refrigerated, but many also said it should be stored at room temperature. In most stores, however, the oxytocin was found on the shelves. Around half of the facilities said they used cold chain for the transport of oxytocin. Not all respondents knew that ergometrine had to be kept cold and protected from light, and this deficit was reflected in practice; in some facilities, the ergometrine was not in the refrigerator (30 percent) or in its box (30 percent). In the delivery suite, ampoules were stored exposed to daylight and out of the refrigerator with no way of tracking for how long (i.e., if for less than 4 weeks or not) or for ensuring that stock is used on a first expired/first out basis. True, the delivery suites stock was small, but oxytocin is used in preference to ergometrine, so even if a facility has many deliveries per week, the ergometrine may sit on the shelf for some time before being used. Some respondents even got confused with the storage requirements of other medicines used in obstetric emergencies, such as magnesium sulfate and diazepam, thinking that they too needed to be stored in the refrigerator, or they did not know, and in two DPs, they were even found in the refrigerator.

- ***Availability***

Oxytocin was widely available at all levels, ergometrine less so. Misoprostol was available in DPs and hospitals, where it is used primarily for postabortion care. Misoprostol is used for PPH prevention in only one district, which is currently distributing it in the community; the community agents obtain the medicine from the HC who obtain it from the DP. In that district, however, only two of the four HCs had misoprostol in stock.

Similarly, magnesium, calcium, and hydralazine for PE/E emergency administration were not widely available at the HC level, neither were oral antihypertensives. Diazepam, however, is widely available at all levels. Injectable antibiotics of gentamicin and ampicillin were widely available at all levels, but metronidazole and cefotaxime were hardly available at the HC level because its use in practice is limited to DHs. In general, the availability of IV fluids and equipment needed to administer them was good, but urine dipsticks for protein were available in just over half of health facilities. Equipment for management of obstetric and newborn emergencies was not widely available at all levels. A stark finding of the evaluation was the inconsistent availability of products at central level in MPDD, the structure on which the whole distribution chain depends. Purchases by DPs from external wholesalers is not recommended because of the increased costs in products and logistics that are incurred and because quality is not guaranteed.

Although most products were available in quantities to last up to 4 months, some products were available in large quantities expected to last 10 months or more. These stock levels were seen mostly in hospitals and DPs, and the practice goes against the new system of keeping minimum and maximum stock levels at between 1 and 2 month's consumption, respectively.

The availability of medicines in the stores did not necessarily reflect the availability of medicine in the delivery suite. For example, gentamicin, ampicillin, and diazepam were widely available in facility stores, but in only about half of the delivery suites. Oxytocin was available in all delivery suites. The other medicines were not widely available in delivery suites in HCs because of their low availability in the HC stores; however, their low level of availability in delivery suites in hospitals was not related to the facility availability.

Only one hospital store and one HC delivery suite had expired medicines on hand. Stock-outs were, in general, more frequent and longer lasting at the DP level than in the peripheral facilities.

- ***Record-keeping***

All storekeepers said they use stock cards, and over 70 percent knew the use of stock cards was to monitor the available stock and record stock movements. In general, the stock cards were well kept in the health facilities, with the physical stock corresponding in general to the balance on the stock cards. More discrepancies were observed in DPs, which could be attributed to lack of supervision. At all levels, the rapid assessment found some differences between recorded and physical stock for equipment.

In delivery suites, staff report a variety of different internal systems for recording medicines administered in the suite or in the operating theater in some facilities, but the majority of facilities have no record-keeping system for the movement of medicines.

- ***Reference material on medicine management***

Although most DPs and hospitals had access to the NEML, the majority of HCs did not. The NEML guides which medicines are used at which levels and, thus, is an important tool for facilities to consult in the purchase of medicines whether from the DP or from private wholesalers. Other tools such as SOPs or job aids on the management of uterotonics or medicines for PE/E were scarce in health facilities, and only 67 percent of DPs had access to SOPs on medicine management, which is to be expected because no validated SOPs are available. In the delivery suites, even fewer staff had access to the same reference materials.

- ***Use***

The majority of staff in charge of delivery suite and storekeepers knew the recommended treatment for prevention and management of PPH in both HCs and hospitals. The majority of hospital delivery suite staff and storekeepers knew the recommended treatment for eclampsia, but less than half of the HCs staff knew it. Few staff from delivery suites or storekeepers knew the recommended treatments for maternal and neonatal sepsis.

Although according to the hospital directors, facilities from 80 percent of districts reportedly had been trained in the recent SONU guidelines, some confusion remains about which levels treat which conditions, and the assessment found some weaknesses in the preparedness of the facilities (e.g., products available) to prevent and treat emergency obstetric and newborn conditions.

- ***Training***

Although most storekeepers in facilities and DPs (over 70 percent) have been trained in general management of medicines, very few (7 percent) storekeepers and delivery suite staff have been trained specifically in the management of medicines for obstetric conditions, which have specific storage requirements. Additionally, under half of the delivery suite staff reported having been trained in the management of obstetric emergencies (with the exception of PPH) and newborn conditions, and only 18 percent had reportedly been trained in the management of medicines.

- ***Supervision***

Most storekeepers have a supervisor and have received supervisory visits, but the frequency and quality of supervisory visits varied. Key aspects related to medicine management such as stock cards, consumption, storage conditions, physical stock, or expired stock are not systematically assessed during the supervisory visits.

In general, the staff of the delivery suites is supervised fairly frequently by the in-charge or director of the same facility, and issues of management of medicines were reportedly supervised in only one facility.

- ***Reporting***

Nearly all HC and hospital storekeepers claim they send monthly reports to the DP, containing information primarily on stock level, quantity received, and consumption of all essential medicines, including the medicines of interest for this evaluation as part of the LMIS. About half of the delivery suite staff in HCs and all delivery suite staff in hospitals report on their activities, but these reports rarely contain information on the treatment provided at each delivery; this information is recorded only in the patient's notes.

- ***Price analysis***

The purchase and sales prices of medicines vary within a type of structure and between types of facilities, and the mark-ups applied exceed the MoH guidance for many MNH products.

The prices of medicines procured by MPDD were compared with the *International Price Guide*, and of 10 medicines analyzed, only two were found marginally more expensive than the international median price.



## DISCUSSION

### Policy and Case Management

At the policy level in Rwanda, the mismatch between key policy documents, the 2010 NEML and the SONU guidelines, has already been recognized. The NEML is currently being updated to reflect the SONU document. This update is crucial because the NEML is the document that both facility orders and national procurements are based on. The confusion is noted at the facility level in terms of, for example, the staff's knowledge of the treatment guidelines, the types of cases that can be managed at the HC level, and the types of medicines that should be available. Because the guidelines are new and contain different recommendations, the changes should be reinforced with refresher training, constant supervision, and job aids.

### Assuring Availability of a Quality Product

Essential products must be available at all levels of the supply chain (central and district levels) to assure their availability at hospitals and HCs and their appropriate administration when needed for obstetric and neonatal emergencies. Although appropriate inventory management and calculation of order quantities are aspects for which the facility level is responsible (and need to be supervised), if the supplies are not available at the next level, the facility is forced to run out of stock or purchase in the private sector, if that is even feasible. Quality information is essential to estimate needs accurately, and Rwanda is advanced in its implementation of an integrated LMIS. Supervision of the LMIS process, however, is necessary because the assessment showed that already facilities were not respecting the maximum and minimum levels of stock. It is always important to monitor the quality of the data and assure that the data are available in a timely manner to both central level for analysis and quantification, but also to the district and facility levels to serve as a supervisory tool to ensure stock levels are not excessive and to monitor rational use. For example, if oxytocin is to be given to every attended birth to prevent PPH, the quantity of oxytocin consumed should at least equal the number of attended births. These data can be monitored at the facility, district, or national level.

The assessment showed that a proportion of facilities obtain medicines from the private sector to avoid stock-outs when their public sector supplier has run out, and although this measure is stop gap to palliate stock-outs, it can have a negative effect on prices and products may even have different characteristics or storage requirements. Additionally, although quality assurance procedures are attached to the national procurement of medicines and commodities, it is important to ensure that all private wholesalers, of the mission sector as well as private for profit, are subject to the same quality assurance processes.

Rwanda is exemplary in choosing an oxytocin product that can be stored without refrigeration up to 30°C, but this practice still requires close attention to assure that all procurements continue with the same criteria for product selection. Different products with different storage requirements are circulating within the public sector and between the public sector and the private sector, and these differences will create confusion in both knowledge and practices for

both storekeepers and delivery suite staff, which is what was already seen in the assessment. It is essential that all facility staff are aware of the storage requirements for each of the medicines and do not unnecessarily use resources to keep the product cold when not needed, but also to check that the temperature of the storage facilities at all levels in the supply chain really are under 30°C at all times. Monitoring of maximum and minimum temperatures is recommended in all facilities but at least in all DPs and the MPDD.

Ergometrine, conversely, must be refrigerated, and it can be kept outside the refrigerator for no more than 1 month at 30°C. It rapidly loses potency when exposed to light, even indirect light, losing up to 21 percent with 1 month exposure to indirect light. For this reason, the ampoules should never be stored loose but always in boxes even in the delivery suite. Oxytocin is a much more stable product, with fewer side effects and so is recommended over ergometrine.

Uterotonics must be on hand in the delivery suite, and a system to track orders and appropriate storage conditions are crucial to avoid the medicines losing potency without the providers' knowledge. Thus, protection from extreme temperature and light (in the case of ergometrine) and a means of tracking how long the ampoules are stocked in the delivery suite are important. Because ergometrine was found out of the refrigerator in some facilities, disposal of this ergometrine should be considered since staff do not know how long it has been stored out of the refrigerator and whether it is still effective.

### **Availability of Equipment**

A recognized source of equipment (e.g., ventouse and Ambu bags) is needed to ensure that there is a stock of such items to replace damaged equipment in the facilities. Furthermore, a supply chain must be defined for these items. Is it the same as for medicines and commodities? Is the same documentation required? Without this information, facilities may find themselves without the needed pieces of equipment in the store (as seen in this assessment) and so not be able to attend an obstetric or newborn emergency appropriately if their current piece of equipment breaks or malfunctions.

### **Affordability of Medicines for MNH**

The *mutuelle* scheme in Rwanda reports an enrollment rate of 95 percent, which is a great success. Even though the majority of patients are not purchasing medicines at HC level, however, ensuring the prices are affordable for the few patients that do need to purchase and for the hospital patients that pay 10 percent of the final bill is important. Additionally, if prices are over-inflated, the *mutuelle* will gradually decapitalize. Within the supply chain, monitoring from the top is also important to ensure that the national level procurement has not purchased key MNH commodities at over-inflated prices and then monitoring down the system to ensure that the respective mark-ups are applied throughout the system so facilities can purchase the necessary medicines in the quantities they require and so the commodities are accessible.

## **Medicines for Emergency Newborn Conditions**

Although the assessment included as tracer medicines only antibiotics for newborn sepsis, analysts recognize that other medicines are necessary for emergency newborn conditions (e.g., caffeine, vitamin K, and phenobarbital). The recommendations resulting from the findings of the study will focus on improving access to and use of these medicines in addition to those studied. In fact, most recommendations are targeted at essential medicines in general and not just MNH medicines



## RECOMMENDATIONS

The following recommendations to improve pharmaceutical management of the commodities required for the management of obstetric and newborn conditions were generated from the findings of the survey in a workshop with different sections of the MoH and partners on September 5, 2012, and initial planning is under way within the MCH department.

- ***Selection***

- The MCH department should work with the PTF to ensure that the NEML in its current revision is aligned with the SONU and neonate guidelines.
- The MCH department should consider limiting the use of ergometrine over the long term for prevention of PPH because oxytocin is more stable and easier to manage. It will be important to monitor use of current stocks of ergometrine to limit expiry and to consider disposing of ergometrine that has been stored out of the refrigerator.

- ***Procurement***

- The MCH department should work with the MPDD, the PTF, and the LMO to ensure that quantification is correctly conducted and quantities are adhered to in the tender process to avoid stock-outs at the central level. Additionally, standard procedures should be disseminated for the annual needs estimation at the district level.
- The MCH department should establish and share with MPDD and the central maintenance workshop (*Atelier Central de Maintenance*) responsible for maintenance of health facility equipment and defining their technical specifications the technical specifications for oxytocin (i.e., that it can be stored at ambient temperatures <30°C) and other products such as neonatal masks for Ambu bags and oxygen.
- The PTF should ensure that quality assurance practices are in place for commodities procured in private sector.

- ***Distribution***

- The PTF should develop and implement SOPs and job aids for the management of essential medicines, including specific storage conditions of ergometrine.
- The PTF should ensure that the internal processes in a facility for ordering and monitoring stock levels in departments are included in the SOPs.

- ***Use***

- The MCH department should ensure that the SONU and neonate guidelines have been disseminated and that orientation is provided in all health facilities. Reviews of practice and supervision should be conducted to assess adherence to the guidelines.

- *Supervision*
  - The PTF should include the monitoring of price mark-ups of commodities in the supervisions conducted at DPs and in the guidelines for district pharmacists to conduct supervision at facility level.
  - The PTF should validate and disseminate the supervision guides.
  - The MoH should expand performance-based financing to the DP level.
  - The LMO should ensure that information on availability and consumption of key commodities is available promptly for analysis and feedback to facilities to allow monitoring of current stock levels per current consumption patterns, as well as for estimation of needs as part of the quantification and procurement process.