Ministry of Public Health & Sanitation/
Ministry of Medical Services

Quality of Care for Prevention and Management of Common Maternal and Newborn Complications: Findings from a National Health Facility Survey in Kenya

Are Services Provided According to International Standards?

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ABBREVIATIONS AND ACRONYMS

AMTSL	Active management of the third stage of labor
ANC	Antenatal care
BSN	Bachelor of Science in Nursing
D5NS	Dextrose 5% in normal saline
EmONC	Emergency obstetric and newborn care
FIGO	International Federation of Gynecology and Obstetrics
ICM	International Confederation of Midwives
ICPD	International Conference on Population and Development
IM	Intramuscular
IU	International units
IV	Intravenous
JHSPH	Johns Hopkins Bloomberg School of Public Health
KEPH	Kenya Essential Package for Health
KSPA	Kenya Service Provision Assessment
L&D	Labor and delivery
MCHIP	Maternal and Child Health Integrated Program
MDGs	Millennium Development Goals
NCAPD	National Coordinating Agency for Population and Development
NS	Normal saline
NRHP	National Reproductive Health Program
NRHS	National Reproductive Health Strategy
PE/E	Pre-eclampsia/eclampsia
PMTCT	Prevention of mother-to-child transmission
PPH	Postpartum hemorrhage
QoC	Quality of care
SPA	Service Provision Assessment
STI	Sexually Transmitted Infection
USAID	United States Agency for International Development
WHO	World Health Organization

ACKNOWLEDGMENTS

This maternal and newborn quality of care (QoC) facility survey was designed and implemented by the Maternal and Child Health Integrated Program (MCHIP) in Kenya in collaboration with MCHIP colleagues in the United States. The authors would like to thank the following people and organizations for their contributions to this study: Vane Lumumba and Francis Kundu, both of National Coordinating Agency for Population and Development (NCAPD); and Hon. Beth Mugo, the Minister for Public Health and Sanitation, and Hon. Wycliffe Oparanya, the Minister for Planning Development and Vision 2030 in Kenya's Grand Coalition Government, for their support, through their line ministries and relevant departments, of the Kenya Service Provision Assessment (KSPA), of which this study was a part. We would also like to thank Alfredo Fort and Jeanne Cushing from ICF Macro, who made it possible to integrate new study tools into the KSPA. We further extend our gratitude to all facility in-charges and medical personnel for their participation in the study. Members of the core MCHIP Quality of Care (QoC) study team in the United States who made important contributions to this study include Patricia Gomez, Linda Bartlett, and David Cantor.

In addition, we thank the trainers and data collectors listed below:

Trainers for the MCHIP QoC survey data collector training:
Rosemary Kamunya (Jhpiego)
Patricia Gomez (Jhpiego/MCHIP)
Joygrace Muthoni (Jhpiego/MCHIP)
Mary Gathitu (Kenya Division of Reproductive Health)
Nancy Chelule (Nakuru Provincial General Hospital)
Jane Kanja (Nakuru Provincial General Hospital)
Lilian Sigei (Nakuru Provincial General Hospital)
Catherine Gakuo (Nakuru Provincial General Hospital)
Jim Ricca (Jhpiego/MCHIP)
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Faith Nyaura	Nairobi	Clinical Officer
Micheal Olombe	Nyanza	Kenya Registered Community Health Nurse
Grace Olongo	Nyanza	Senior Nursing Officer
Rehema Ondiege	Nairobi	Nursing Officer
Micheal Rotich	Nyanza	Kenya Enrolled Community Health Nurse
William Rutto	Rift Valley	District Republic Health Coordinator

We would further like to thank Nancy Koskei and John Alwar in the MCHIP/Kenya office for their support. Finally, we would like to thank our colleagues at the United States Agency for International Development in Washington, DC for their guidance, including Deborah Armbruster and Nahed Matta.

ABOUT MCHIP

The Maternal and Child Health Integrated Program (mchip) is the usaid bureau for global health flagship maternal, neonatal and child health (mnch) program. Mchip supports programming in maternal, newborn and child health, immunization, family planning, malaria and hiv/aids, and strongly encourages opportunities for integration. Cross-cutting technical areas include water, sanitation, hygiene, urban health and health systems strengthening.

This program and this study were made possible by the generous support of the American people through the United States Agency for International Development (USAID), under the terms of the Leader with Associates Cooperative Agreement GHS-A-00-08-00002-000. The contents are the responsibility of the Maternal and Child Health Integrated Program (MCHIP) and do not necessarily reflect the views of USAID or the United States government.

EXECUTIVE SUMMARY

International evidence suggests that improving the quality of obstetric care can directly reduce maternal and neonatal deaths. Most maternal deaths are caused by obstetric complications: postpartum hemorrhage (PPH), obstructed labor, pre-eclampsia/eclampsia (PE/E), puerperal sepsis, and complications of unsafe abortion. The majority of neonatal deaths are the result of infections, birth asphyxia, birth trauma, or complications of prematurity. In Kenya, 58% of all live births are not attended by a skilled heath provider and only 43% of all deliveries occur in heath facilities. Little is known about the quality of care provided to mothers and newborns in health facilities.

In the spirit of cooperation, the United States Agency for International Development's Maternal and Child Health Integrated Program (MCHIP) partnered with the Kenya Ministry of Health and ICF Macro to conduct a quality of care (QoC) survey during the first six months of 2010 to assess the care received by mothers and newborns during antenatal and delivery care. The main objective of the QoC survey was to determine the frequency and quality of interventions that address the direct causes of maternal and newborn deaths. The primary outcome measures were quality of antenatal care (ANC), quality of labor and delivery (L&D), infection control, client communication, management of complications of labor and delivery (PPH, severe PE/E, obstructed labor), essential newborn care, newborn resuscitation, harmful health practices, and health worker knowledge.

The QoC survey was fielded as part of ICF Macro's 2010 Kenya Service Provision Assessment (KSPA) in all eight provinces of the country. The study was conducted in a representative sample of 695 health facilities, of which 509 provided ANC services, 207 provided L&D services, and 129 were level 3 facilities expected to provide emergency obstetric and neonatal care (EmONC). Five tools were used to gather data and observations during health facility visits: a facility inventory, which reported on the condition of the health care infrastructure; three structured clinical observation checklists, which captured the behavior of health workers during ANC consults, labor and deliveries, and obstetric complications; and structured health worker interviews and knowledge tests on labor and delivery practices, management of complications such as PPH, PE/E, obstructed labor, and essential newborn care and resuscitation.

FINDINGS

We interviewed 234 selected health workers and observed 1,409 ANC consults and 626 deliveries. Areas of need and successes are summarized below.

SERVICE PROVIDED OR COMPLICATION MANAGED	FINDINGS
ANTENATAL CARE	
Routine ANC Services	1. Most ANC facilities were stocked with basic supplies (except iron) but lacked supplies that promote quality (counseling aids, infection control, etc.). 2. Discussion and counseling on birth preparation was inadequate.
Infection Control during ANC	The availability of supplies for infection control was average (57% of facilities); covered waste receptacles with plastic liners were the least often available (19% of facilities).
Postpartum Hemorrhage	In 62% of ANC visits, providers failed to ask about vaginal bleeding (in current or previous pregnancies) or to counsel clients to return if they experienced bleeding.
Pre-Eclampsia/Eclampsia	1. Nearly all mothers had their blood pressure checked during ANC (96%), and a blood pressure apparatus was present in most facilities (89%). 2. The administering of urine testing for proteins during ANC was average (59%). 3. Only a fourth of the ANC providers asked about signs of PE/E (in current or previous pregnancies) or counseled clients to return if they experienced signs of PE/E.

SERVICE PROVIDED OR COMPLICATION MANAGED	FINDINGS
LABOR & DELIVERY CARE	
Routine L&D Services	1. Fifty-seven percent of the facilities had all of the essential supplies for delivery, but only 20% had all elements to support a high quality of care during delivery (guidelines, standards, partograph, 24-hour staff or on-call). 2. Notably, only 3% of the facilities had all seven items needed for basic emergency obstetric and newborn care and only 3% had all nine items needed for comprehensive emergency obstetric and newborn care. 3. Overall score for provider-client communication was 61%, but during the knowledge tests, less than 30% of the providers selected "reassure client" as part of management of complications. 4. Although no harmful practices were observed in nearly 80% of the deliveries, the use of fundal pressure (a non-beneficial practice) was observed in almost 10% of births. 5. Providers scored 71% on knowledge of routine L&D practices.
Routine Newborn Care	1. Ninety-one percent of facilities had essential supplies for immediate newborn care. 2. The mean score for newborn care practices was 65%, with room for improvement in the areas of delayed cord clamping (51%) and skin-to-skin care (56%).
Postpartum Hemorrhage	1. Oxytocin was available in the delivery room at 79% of facilities. 2. During observations, oxytocin coverage was 90%, but only 50% of women received AMTSL provided according to standards; correct timing alone was observed in 77% of facilities (must be within one minute of delivery) and correct dosing/route was 64%. 3. Nearly all women with PPH were given oxytocin, and other appropriate treatments were also given (e.g., repair of lacerations, manual removal of placenta). 4. Provider knowledge of the signs of PPH was less than adequate at 43%, and less than 1% of the health workers knew all the correct steps in management of PPH.
Pre-Eclampsia/Eclampsia	1. Eighty percent of facilities had magnesium sulfate within the delivery area, only 24% had hydralazine. Only some of the mothers with severe PE/E received magnesium sulfate, and some received magnesium sulfate and diazepam. 2. Eighty-three percent of the providers knew how to diagnose severe PE/E, but only 1% knew all the correct steps in the management of severe PE/E.
Obstructed Labor	1. A partograph was used in 88% of cases, but in only 58% of cases it filled out correctly throughout labor and thus was not being used to its full potential. 2. Only 25% of level 3 facilities had the capability to perform cesarean sections, and only 22% reported conducting cesarean sections in the previous three months. 3. Provider knowledge of signs indicative of obstructed labor was at 44%, and few knew all of the correct actions to manage obstructed labor (4%).
Postpartum Sepsis	1. Overall, infection prevention practices were observed in 72% of the births. However, hand washing before and after examining the client was practiced by only 36% of providers. 2. Providers scored 41% for the signs of sepsis, tests to evaluate sepsis, and actions to manage sepsis.
Newborn Asphyxia	1. Most facilities had a suction apparatus (54%) and bag and mask (74%), but fewer had more specialized equipment such as a laryngoscope (14%). 2. The percentage of level 3 facilities reporting performance of newborn resuscitation was 56%. 3. Most of the 42 observed cases of asphyxia were treated with suction and/or bag and mask, with five cases ending in newborn death. 4. Only 12% of providers had knowledge of all actions to manage asphyxiated newborns, but knowledge of essential supplies was 54%.

CONCLUSIONS AND RECOMMENDATIONS

The quality of much of the maternal and newborn care observed during the study was below the internationally accepted standards for ANC and L&D practices and essential newborn care. The survey findings indicate a need to institute quality assurance processes and establish national standards for the provision of evidence-based practices in all levels of reproductive health care.

The quality assurance processes should include consistent standards-based reviews, clinical and quality audits with attendant feedback mechanisms, and provision of accredited protocols/guidelines from the national level and from the World Health Organization (WHO), the International Federation of Gynecology and Obstetrics (FIGO), the International Confederation of Midwives (ICM), and other international agencies dealing with quality of care in maternal and newborn health. Further, a concerted countrywide effort is needed to overhaul and strengthen the basic pre-service education programs for all cadres dealing with pregnancy and labor and delivery, and the in-service training programs offered for both medical and paramedical staff in clinical care and service management alongside supportive supervision. Such programs will strengthen health worker knowledge and skills, which are the foundation of quality in the provision of the maternal and newborn health care at all levels. In order to reduce maternal and newborn mortality in line with Millennium Development Goals (MDGs) 4 and 5, further improvements are needed in the capacity of all delivery facilities to conduct the signal functions for basic and emergency obstetric and newborn care, and active management of the third stage of labor (AMTSL) must become the norm in delivery by every skilled provider. Finally, logistics systems must be improved to ensure that there are no stockouts of essential life-saving drugs (such as oxytocin and magnesium sulfate) or supplies such as soap or hand disinfectant.

1. INTRODUCTION

1.1 BACKGROUND

The reduction of maternal and newborn mortality and morbidity continues to be a great challenge in Kenya. Each year more than half a million women die of complications during pregnancy and childbirth, and more than 3 million babies die during the first week of life (Lawn, Cousens, and Zupan 2005; Hill 2006). According to the World Health Organization (2008), postpartum hemorrhage is the most frequent cause of maternal deaths in developing countries, accounting for 27% of deaths, followed by hypertensive disorders of pregnancy (primarily pre-eclampsia and eclampsia) and sepsis, which each account for 12% of deaths, and obstructed labor (6% of deaths). In Kenya, pregnancy and childbirth complications are among the leading causes of mortality among women, with an estimated 488 maternal deaths per 100,000 live births and a neonatal mortality rate of 330 per 1,000 live births (KNSB/ICF Macro 2010). Although we have effective interventions for screening, prevention, and treatment of obstetric and newborn complications that can be readily provided in facilities by skilled providers, the quality of facility-based care must be improved in order to take advantage of these interventions and assist countries in meeting their targets for Millennium Development Goals 4 and 5.

Van den Broek and Graham (2009) recently noted that improving the quality of obstetric care in facilities is a neglected but essential approach to reducing maternal deaths. International evidence suggests that the most important factor in reducing maternal and early neonatal mortality is the attendance of a skilled birth provider. But not all "skilled birth attendants" are actually skilled. In fact, the quality of the care provided by skilled birth attendants is often unknown.

Three surveys—Columbia University's Averting Maternal Deaths and Disabilities program, the United Nations/University of North Carolina Emergency Obstetric and Newborn Care facility surveys, and ICF Macro's Service Provision Assessment (SPA) health facility survey—are the major, ongoing multi-country health facility surveys that assess the quality of maternal and newborn care. All three assess facility readiness for the provision of quality maternal care based on features such as the number and type of health providers at the facility, the services provided, and the availability of equipment and medical supplies. The SPA also includes direct observation of ANC client consultations.

MCHIP developed its maternal and newborn QoC survey to complement and build on these facility surveys. MCHIP and USAID first decided to develop a health facility survey toolkit with the idea of focusing on pre-eclampsia/eclampsia screening and treatment. We then expanded the toolkit concept to include key normal labor and delivery practices and treatment of major maternal and newborn complications at the time of birth. The survey draws on the survey model implemented in ten countries by the Prevention of Postpartum Hemorrhage Initiative (POPPHI) project (Stanton et al. 2009; *Active Management of the Third Stage of Labor*, n.d.). The POPPHI survey results successfully motivated policy and programmatic change efforts to increase the use of AMTSL and reduce PPH. The major added value of the QoC survey is that it includes knowledge tests and involves direct observation of client-provider interactions using structured, standardized clinical observation checklists in both ANC and L&D care. This survey is being conducted in multiple countries, both as a stand-alone instrument and as part of other survey efforts such as the SPA.

In Kenya, the QoC survey was combined with the KSPA to help inform efforts by the Division of Reproductive Health, MCHIP, and others to strengthen safe motherhood interventions in the country. In preparation for data collection, the providers who conducted the clinical observations participated in a five-day training session on essential maternal and newborn care

to ensure that their knowledge was updated and their skills were standardized. The clinical observers received technical updates in antenatal care; normal labor and birth, including infection prevention practices; woman-friendly care; use of the partograph; active management of third stage of labor; essential newborn care; newborn resuscitation; and identification and treatment of postpartum hemorrhage and pre-eclampsia/eclampsia. All of the updates were based on global evidence-based guidelines. The clinical observers were then able to practice the key interventions on anatomic models using the KSPA/QoC study data collection tools. This enabled them to refresh their knowledge and skills in the targeted areas while they were being introduced to the format and content of the tools.

The training was also intended to ensure that data collectors knew how to correctly obtain informed consent and could use the data collection tools with an inter-rater reliability of at least 80%. Once participants were familiar with the key interventions and the data collection tools, they were introduced to the concept of inter-rater reliability. Participants observed and scored trainers, who performed key interventions on anatomic models and made planned mistakes. Scores were then compared and discussed to help ensure at least 80% agreement in ratings across clinical observers. Participants compared their own ratings to those of a "gold standard" observer (a trainer). The team then visited a clinical site (Nakuru Provincial General Hospital) to observe providers of antenatal care, labor and delivery care, and newborn care. By the end of the classroom exercises and field practice, more than 90% of participants had ratings consistent with their colleagues more than 80% of the time.

The overall purpose of the QoC survey is to guide quality improvement activities in maternal and newborn health care at the facility, regional, and national levels through documentation of the appropriate use, quality of implementation, and barriers to performance of key preventive, screening, and treatment interventions during facility-based maternal and newborn care.

In our assessment, "quality" is defined as correct practice according to globally accepted, evidence-based guidelines that have been endorsed by the World Health Organization in its manual, *Managing Complications in Pregnancy and Childbirth: A Guide for Midwives and Doctors* (WHO 2000). The ultimate aim is to contribute to the reduction of frequent, preventable maternal and newborn deaths by increasing the use and quality of known life-saving interventions.

1.2 POLICY ENVIRONMENT

The 1994 International Conference on Population and Development (ICPD) made recommendations for maternal and newborn health care that were adopted internationally as minimum standards for care. The ICPD's woman-centered approach was reinforced in 2000 by the United Nations Millennium Declaration, which established the MDGs for maternal and child health (as well other development targets). The government of Kenya is committed to achieving Millennium Development Goals 4 (Reduce Child Mortality) and 5 (Improve Maternal Health) and has incorporated them into its maternal and newborn health framework for development and multisectoral cooperation. Kenya and other African Union states have adopted a "Road Map for Accelerating the Attainment of MDGs 4 and 5," a health-sector strategy to provide efficient and high-quality maternal and newborn health services based on the six pillars of maternal and newborn health. In Kenya, the ICPD recommendations were translated into the National Reproductive Health Policy (NRHP 2007) and operationalized by the National Reproductive Health Strategy (2009-2015) as a plan for reducing maternal, perinatal, and neonatal morbidity and mortality.

Vision 2030, Kenya's development plan covering the period 2008-2030, acknowledges that the health gains made in the 1980s and early 1990s have been reversed and that priority actions must be taken to gain ground again on reproductive health outcomes. Kenya's National Health

Sector Strategic Plan II sets forth a minimum package of services, called the Kenya Essential Package for Health (KEPH), which includes maternal and newborn health services. In addition, Kenya's Medium-Term Expenditure Framework highlights maternal, newborn, and child health as a central component of the annual health plan. The reproductive health policy environment in Kenya is now firmly grounded on the constitution promulgated in 2010, which in addition to bringing changes in the country's democratic structures, enshrines reproductive health as a right for all citizens. The QoC survey was developed against this background and as an outgrowth of the NRHP's identified need for a policy framework to support equitable, efficient, and effective delivery of high-quality reproductive health care services.

1.3 STUDY OBJECTIVES

This QoC survey, which was integrated into the national KSPA facility survey, is a part of a larger, multi-country QoC study being implemented by MCHIP. The primary objectives of the study are to determine how often and how well interventions that address the direct causes of maternal and newborn deaths (pre-eclampsia/eclampsia, postpartum hemorrhage, prolonged/obstructed labor, sepsis, and birth asphyxia) are performed. The study assesses the following obstetric and neonatal care interventions: screening, management of PE/E, use of AMTSL, use of the partograph, treatment of PPH and sepsis, and essential newborn care and resuscitation. The results of this assessment will be used to guide national programs and policies that address the quality of these key interventions in ANC and labor and delivery.

Secondary objectives of the study are to provide baseline estimates in Kenya and other countries on screening, prevention, and point estimates of treatment of severe PE/E and PPH; prevention of PPH through the use of AMTSL; prevention and management of prolonged/obstructed labor through the use of the partograph; prevention of puerperal sepsis through infection prevention practices; and prevention of newborn asphyxia through immediate essential newborn care and resuscitation practices. In addition, the study was designed to develop indicators and data collection tools for use in Kenya and other countries.

2. METHODOLOGY

2.1 STUDY DESIGN

The QoC survey was a cross-sectional, nationally representative health facility survey.

2.2 DATA COLLECTION METHODS AND TOOLS

A total of five tools were used to gather data and conduct observations. Three of the tools—the facility inventory, ANC observation checklist and health provider interview guide/knowledge test—were developed as part of the original SPA toolkit for Kenya, and MCHIP merely added data elements/questions to the tools. MCHIP developed an additional observation checklist for observing normal births as well as births with the following complications: PPH, PE/E, and newborn asphyxia, and a national policy and drugs interview guide. Each of the tools is described below.

Facility Inventory Tool

The facility inventory tool recorded infrastructure conditions and verified the availability and storage conditions of medications, supplies, and equipment. The facility inventory is conducted once at each facility and includes observation in the ANC service delivery area, the labor and delivery service delivery area, and the pharmacy.

Antenatal Care Observation Checklist

Clinical practice observations of ANC and vaginal deliveries in the selected facilities were conducted using checklists that were developed based on the WHO's international protocols for screening for and management of PE/E (as outlined in the WHO manual, *Managing Complications in Pregnancy and Childbirth*).

Labor and Delivery Observation Checklist

The labor and delivery observation checklist also was based on the WHO protocols (as outlined in *Managing Complications in Pregnancy and Childbirth*) for screening for PE/E in labor and delivery, management of PE/E and PPH in labor and delivery, routine and correct use of the partograph, and routine and correct essential newborn care and resuscitation. The background information collected included age, gravidity, and parity of the client, qualifications of the provider, and level of care provided by the health facility (tertiary care, hospital, health center, etc). The checklist was adapted from the instrument used by Stanton et al. in their international survey on AMTSL as part of the POPPHI project and Jhpiego's ACCESS Program Learning Resources Package on Best Practices in Essential and Basic Emergency Maternal and Newborn Care (Stanton et al. 2009; *Active Management of the Third Stage of Labor*, n.d.).

Health Care Worker Interview Guide/Knowledge Test

If available, those workers who were observed providing ANC or L&D services were asked to complete the health worker interview, although other providers of antenatal care and labor and delivery services were sometimes substituted. Information collected from health workers included medical qualifications, training and experience providing ANC, L&D, and newborn care services and supervision. The second half of the tool is a series of questions to test the workers knowledge of how to identify, manage and treat common maternal and newborn health complications. The tool also included clinical case studies, which were used to assess providers' knowledge and clinical decision-making pertaining to management of severe PE/E and newborn resuscitation.

National Policy and Drugs Interview Guide

The interview guide was used to collect information on the availability of essential newborn and maternal drugs and equipment. These drugs and equipment are issued by the Kenya Medical Supplies Agency according to national guidelines. There is countrywide strategy to supply essential drugs and equipment based on demand rather than allocating drugs based on the level of the facility.

2.3 SAMPLE

Data for the 2010 KSPA survey were collected from a representative sample of facilities throughout the country, a sample of health service providers at each sampled facility, a sample of sick children, and a sample of clients receiving services in family planning, ANC, sexually transmitted infections (STI), and labor and delivery. The QoC survey sample consisted of the subset of KSPA facilities offering ANC and delivery care services along with a sample of the ANC and delivery care health service providers and clients at these facilities.

Sample of Facilities

Facilities were randomly selected from a list of 6,387 functioning health facilities in Kenya at the time of the survey. The government classification of health facilities under the KEPH has six levels of care, starting with community-based facilities (level 1), dispensaries (level 2), and health centers (level 3). The higher-level facilities are larger in size and workforce: district

hospitals (level 4), provincial hospitals (level 5), and referral hospitals (level 6). A sample of 703 facilities was carefully designed to ensure that key indicators were present at the national and provincial levels, in each type of facility, and in the managing authorities. Hospitals and stand-alone HIV voluntary counseling and testing facilities were oversampled. All of the national referral hospitals (n=2) and provincial hospitals (n=8) in Kenya were included in the sample. The final KSPA sample included approximately 11% of all facilities in the country. The QoC facility sample included the subset of health facilities that offer ANC and/or maternity services.

Data were collected from 99% of the 703 facilities in the sample. Interviewers were not able to survey eight of the selected facilities for various reasons, including inaccessibility due to poor roads. Survey protocol required that facilities that could not be surveyed be replaced with the nearest facility of the same type, under the same managing authority, and in the same district. However, there were no facilities in the same districts that met the replacement criteria. Consequently, 695 facilities were assessed in the survey.

Sample of Health Service Providers

The sample of health service providers was selected from providers who were present in the facility on the day of the survey and who provided the services that were being assessed in the survey. The aim was to interview an average of eight providers in each facility and to represent all of the services being assessed. In facilities with fewer than eight health care providers, all of the providers present on the day of the visit were interviewed. In facilities with more than eight providers, an average of eight providers was interviewed, including all providers whose work was observed. If interviewers observed fewer than eight providers, they also interviewed a random selection of the remaining health care providers to obtain an average of eight interviews.

Sample for Observations

The goal for the observational component of the QoC survey was to observe at least 250 deliveries and 250 ANC consults. ANC clients were systematically selected for observation based on the number of clients attending the facility on the day of the survey. Where many clients were present and eligible for observation, the rule was to observe a maximum of five clients seeing each provider of the assessed service, with a maximum of 15 observations for each service in any given facility. However, at some facilities—primarily those in which multiple services were offered to clients at the same time in different locations within the facility—interviewers observed fewer clients than were eligible for observation.

Any family planning or ANC client who was also assessed for STI symptoms was observed both for indicators related to STI services and indicators related to family planning or ANC as part of the KSPA data collection.

2.4 TRAINING AND DATA COLLECTION

Twenty-eight skilled providers were trained as data collectors for the MCHIP QoC component of the KSPA in two sessions: a 13-day training session (November 30–December 12, 2009) and an eight-day training session (January 13–20, 2010), both in Nakuru, Kenya. The training covered data collection using structured questionnaires and direct observation of procedures, obtaining informed consent, and survey content. The providers' clinical observations skills were standardized during the study's data collector training workshop. Data collectors worked in teams of 16 and spent one day at each facility. Field work began on January 21, 2010, and ended on May 18, 2010.

2.5 DATA QUALITY CONTROL, ENTRY, AND ANALYSIS

Data Quality Control

After collecting data in each facility, the interviewers reviewed the questionnaires and cleaned the data. They then handed the questionnaires over to the team leader, who reviewed them a second time. The questionnaires were then passed on to the team coordinators, who sent them by courier to the NCAPD headquarters. The QoC study principal investigator and members of the KSPA study team also conducted supervisory visits to the field to oversee data collection in progress.

Once headquarters received the questionnaires from each facility, the questionnaires were reviewed to ensure that they were correctly completed and in the correct order. The office editor then edited the questionnaires to eliminate any mistakes that would prevent the computer from accepting information during data entry. In cases where there was a problem with the questionnaires from a specific facility, the data collection team was consulted so that the problem could be rectified. In extreme cases, the facility questionnaire was returned to the data collection team to check on the data.

Data Entry

Ten data operators entered the data under the supervision of one data entry supervisor and one NCAPD staff member. The data operators used a data entry screen developed by ICF Macro using CSPro software. All questionnaires were entered twice (100% verification) to ensure that the data had been keyed in accurately. Data entry took place from January through May 2010. Staff from the NCAPD, the Ministry of Medical Services, and the Ministry of Public Health and Sanitation reviewed all "other" responses and recoded them into categories relevant for data analysis.

Data Processing and Weighting

The design of the tabulation plan and the preparation of the programs for producing statistical tables were carried out from April through June 2010. Data analysis and clarification were conducted from July through October 2010. The data analysis plan was revised based on feedback from the KSPA management team.

Data from the facility inventory were weighted during analysis to account for differentials caused by oversampling and under-sampling, so that the data would accurately represent the actual distribution of facilities in the country. Data from the provider sample were weighted during analysis to account for the differentials caused by oversampling or under-sampling of providers with a particular qualification in a facility type or province. In a few cases the staff present on the day of the survey might not have been representative of the staff who normally provides the services being assessed.

Data from the observations were weighted using facility weights to adjust for overrepresentation of facilities and, thus, of observations in the sample. In a few cases the clients present on the day of the survey might not have been representative of the clients who normally receive the services being assessed.

2.6 ETHICAL REVIEW AND PROCEDURES

The study protocol was submitted to and approved in Kenya by the ethics board of the Kenya Ministry of Health and in the United States by the institutional review board of Johns Hopkins Bloomberg School of Public Health (JHSPH) and ICF Macro. The JHSPH institutional review board ruled the protocol exempt from review under U.S. federal code 45 CFR 46.101(b),

Category (5). Informed consent was obtained from all study participants, including facility directors (written consent), health workers (oral consent), and patients (oral consent). For minors, the child's guardian completed the consent form.

During pilot-testing, we realized that women presenting with obstetric complications might be either too ill, such that they would be mentally incapacitated, or unconscious and unable to give consent. Because these cases were very important in our assessment of quality of care, we received approval to obtain consent from the next of kin in these circumstances. All data collectors were trained in obtaining informed consent using the approved consent forms.

3. HEALTH FACILITY INFRASTRUCTURE

3.1 GENERAL INFRASTRUCTURE

Table 3.1: General Infrastructure of Facilities Offering Antenatal Care and Delivery Services

GENERAL INFRASTRUCTURE OF ANC FACILITIES	PERCENTAGE OF FACILITIES (%)	NUMBER OF FACILITIES (N=509)
Running water available in the facility	79	402
Patient auditory and visual privacy	94	478
General Infrastructure of Delivery Facilities	**Percentage of Facilities**	**Number of Facilities (N=207)**
Ability to conduct cesarean sections using general anesthesia	16	33
Transportation support for maternity emergencies*	49	101
Running water available in the facility	83	172
Patient auditory and visual privacy	87	180
Staff coverage 24 hours per day (schedule observed or staff live on-site)	46	95

*The facility has an ambulance or a system for providing support for emergency transportation to a referral site.

Among the 695 facilities in the sample, 509 provided ANC services and 207 provided delivery services. The majority of both ANC and delivery facilities had running water (79% and 83%, respectively) and provided auditory and visual privacy for patients (94% and 87%, respectively). Among the facilities offering delivery services, 16% reported that they could conduct cesarean sections using general anesthesia, 46% reported having staff coverage 24 hours per day, and 49% reported that they offered transportation support for maternity emergencies.

3.2 ANTENATAL CARE SERVICES, SUPPLIES, AND INFRASTRUCTURE

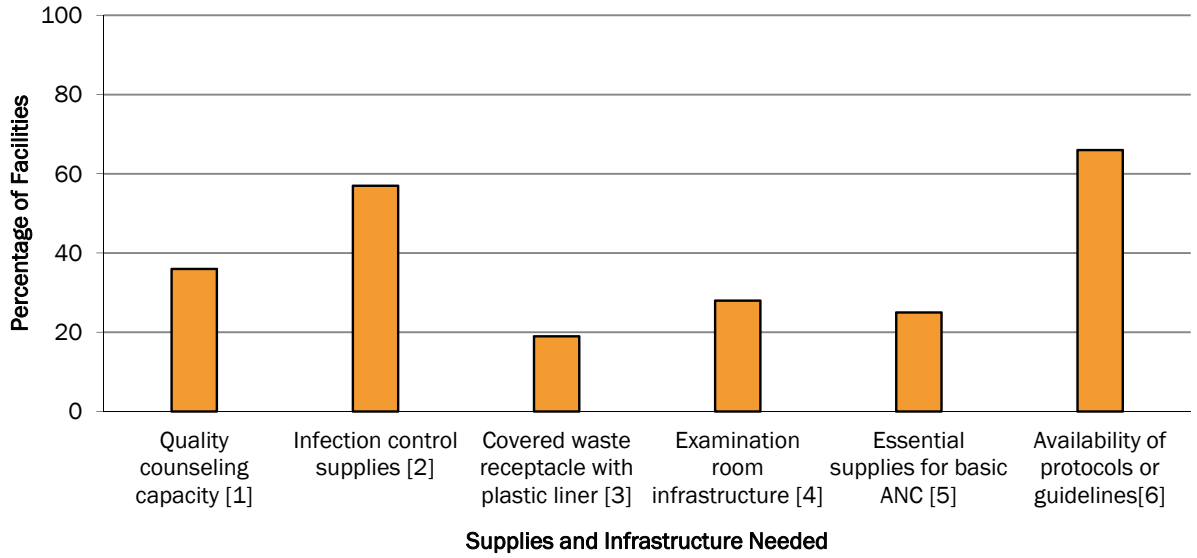
Table 3.2: Antenatal Care Services and Supplies

ROUTINELY OFFERED ANC SERVICES	PERCENTAGE OF FACILITIES (%)	NUMBER OF FACILITIES (N=509)
Intermittent preventive treatment with an antimalarial	96	489
Treatment for STIs	85	432
Counseling for family planning	88	448
Counseling for HIV/AIDS	94	478
Testing for HIV/AIDS	88	448
Counseling/testing for HIV/AIDS	95	484
Counseling on the recommended ANC visits	98	498

ESSENTIAL SUPPLIES FOR BASIC ANC	PERCENTAGE OF FACILITIES (%)	NUMBER OF FACILITIES (N=509)
Blood pressure apparatus	89	453
Fetoscope	85	432
Iron tablets	41	209
Folic tablets	74	377
Tetanus vaccine	81	412

Although the majority of the facilities (89%) had a functioning apparatus for taking blood pressure and 85% had a fetoscope, only 41% offered iron tablets. Preventive antimalarial medication was prescribed in 96% of the facilities, and at least 85% of the facilities offered routine counseling on family planning and HIV/AIDS and treatment for STIs.

Figure 3.1: Availability of Supplies and Infrastructure to Support Quality Antenatal Care Services (N=509)

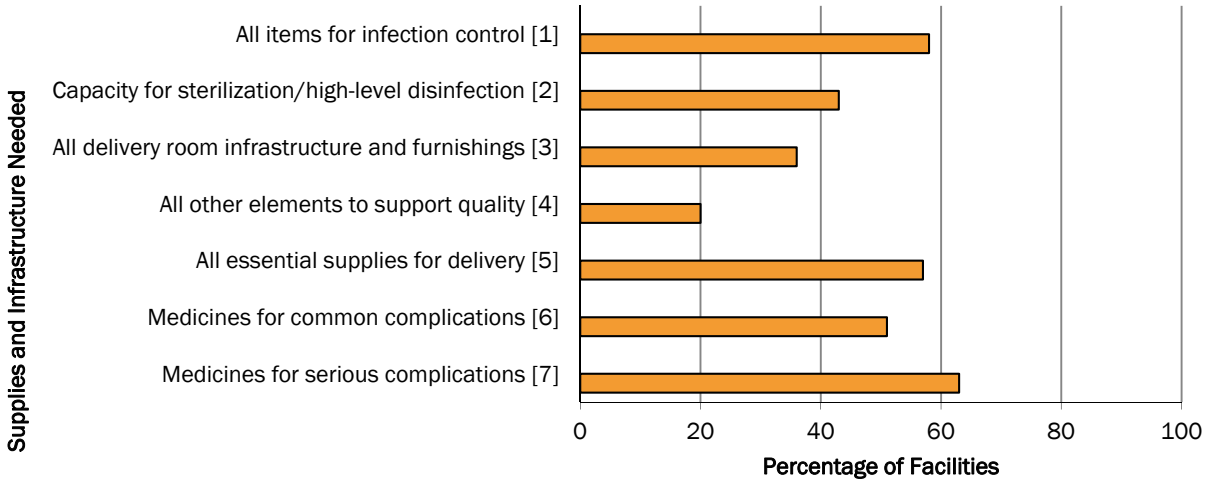


[1] Individual client health cards, written ANC guidelines, and visual aids for health education
[2] Soap and running water or hand disinfectant, gloves, disinfecting solution for decontaminating reusable items, and sharps box
[3] Although important for infection control, a waste receptacle with plastic liner was not included in the aggregate measure of infection control.
[4] May be any type of couch where a client can lie down flat
[5] Blood pressure apparatus, fetoscope, iron, folic acid, and tetanus toxoid vaccine
[6] Any antenatal care guidelines or protocols or any other maternal or neonatal health guidelines or protocols

More than half of the facilities had infection control supplies and infrastructure as well as the availability of ANC protocols. A waste receptacle with a plastic liner for infection control was the least common supply, with only 19% of facilities reporting that they had one.

3.3 SUPPLIES AND INFRASTRUCTURE FOR DELIVERY SERVICES

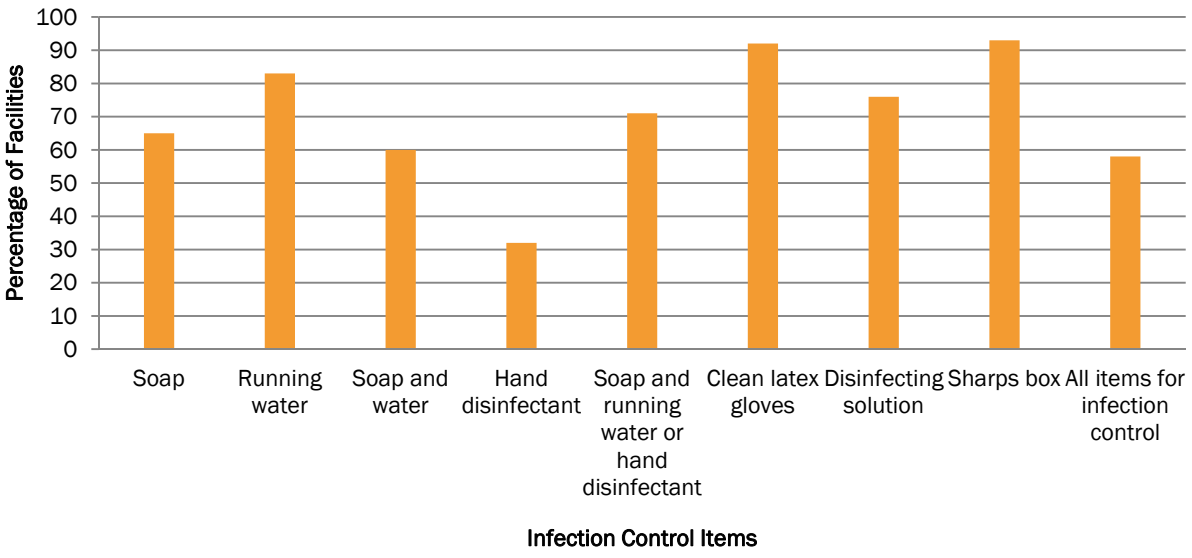
Figure 3.2: Availability of Supplies and Infrastructure to Support Quality Delivery Services (N=207)



[1] Soap and running water or hand disinfectant, gloves, disinfecting solution for decontaminating reusable items, and sharps box
[2] In location where delivery services equipment is processed; equipment and knowledge of minimum processing time for sterilization or high-level disinfecting and automatic timing device were available.
[3] Bed, examination light, and privacy (both visual and auditory)
[4] Guidelines, partographs, and provider on site or on call 24 hours a day, with duty schedule observed
[5] Scissors or blade, cord clamp, suction apparatus, antibiotic eye ointment for newborn, skin disinfectant
[6] Needle and syringe, IV solution with infusion set, injectable oxytocin, and suture material and needle holder located in delivery room; oral antibiotic located in the pharmacy or delivery room
[7] Injectable anticonvulsants (valium or magnesium sulfate) in delivery room, and antibiotic (ampicillin or gentamycin) in delivery room or pharmacy

More than half of the facilities (58%) had all of the items needed for infection control, 63% had medicines for serious obstetric complications, 51% had medicines for common obstetric complications, and 57% had all essential supplies for delivery. Few facilities (20%) had all of the elements needed to support quality during complicated deliveries, such as partographs, guidelines, and delivery providers on staff 24 hours per day.

Figure 3.3: Availability of Infection Control Items in the Labor and Delivery Service Area (N=207)



Most of the facilities had a sharps box (93%) and clean latex gloves (92%) for infection control. Both water and soap were available in 60% of the facilities, but hand disinfectant was available in only 32% of the facilities. A total of 58% of the facilities had all items needed for infection control. However, the availability of supplies varied by level of facility (as shown in the next section).

Table 3.3: Percentage of Facilities with Infection Control Items in the Labor and Delivery Service Area, by Level of Facility (N=207)

INFECTION CONTROL ITEMS	HOSPITALS (%)	HEALTH CENTERS (%)	MATERNITIES (%)
Soap	72	65	64
Running water	93	93	86
Soap and running water	68	64	53
Hand disinfectant	39	38	29
Soap and water or hand disinfectant	76	81	61
Clean latex gloves	93	93	91
Disinfecting solution	90	90	82
Sharps box	96	97	92
All items for infection control*	**69**	**67**	**54**

* Soap and running water or hand disinfectant, clean latex gloves, disinfecting solution, and sharps box (all items)

Hospitals and health centers were more likely than maternities to have infection control items. The sampled facilities included both public and private hospitals, health centers, and maternity facilities.

The survey asked facility staff whether or not the EmONC signal functions had been provided in the past three months. The seven *basic* EmONC signal functions are assisted delivery, removal of retained products of conception by manual vacuum aspiration, use of parenteral oxytocin drugs for PPH, use of parenteral anticonvulsants for PE/E, use of parenteral antibiotics for pregnancy-related infections, manual removal of placenta, newborn resuscitation. Two other signal functions are included in *comprehensive* EmONC: cesarean section and blood transfusion. The seven basic EmONC signal functions were expected to be performed in higher-level facilities (level 3 and above) that offered delivery services. There were 129 such facilities in the sample after dispensaries and clinics that also offer delivery services were excluded. Table 3.4 summarizes the findings.

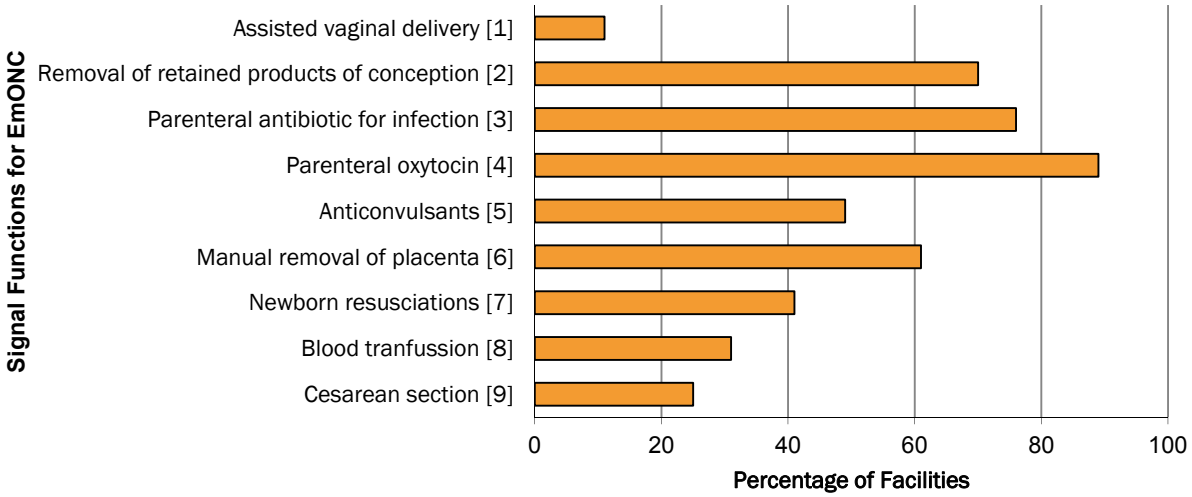
Table 3.4: Emergency Obstetric and Newborn Care Signal Functions Performed in the Past Three Months

ACTION	PERCENTAGE OF LEVEL 3 AND ABOVE FACILITIES (%)	NUMBER OF FACILITIES (N=129)*
Assisted delivery	5	7
Removal of retained products of conception	50	65
Use of parenteral oxytocin drugs	86	111
Use of parenteral anticonvulsants for PE/E	29	37
Parenteral antibiotic for pregnancy-related infections	65	84
Manual removal of placenta	46	59
Newborn resuscitation	56	72
Basic Emergency Obstetric and Newborn Care Functions (first 7 items)	**3**	**4**
Cesarean section	22	28
Blood transfusion	20	26
All Emergency Obstetric and Newborn Care Functions (9 items)	**35**	**4**

*Only level 3 facilities were expected to have capacity to perform signal functions for emergency obstetric and newborn care.

Use of parenteral oxytocin and parenteral antibiotic were the most commonly performed signal functions, found in 86% and 65% of the facilities, respectively. Assisted delivery was the least commonly performed signal function, found in only 5% of the facilities. Cesarean section and blood transfusion were performed at only 22% and 20% of the facilities, respectively. Notably, only 3% of the facilities had all seven of the basic EmONC functions. Similarly, only 3% of the facilities reported having all nine comprehensive EmONC functions (but some Level 3 facilities are health centers).

Figure 3.4: Availability of Medications, Supplies, and Staff Needed to Perform Emergency Obstetric and Newborn Care Signal Functions (N=129)



[1] Functioning forceps or ventouse
[2] Mean percentage for functioning kit for manual vacuum aspiration or dilation and curettage kit, oxytocin or ergometrine (at least one valid dose), syringes and needles, and Ringer's lactate, D5NS or NS infusion
[3] Mean percentage for ampicillin or gentamycin (at least one valid dose), syringes and needles, and Ringer's lactate, D5NS (dextrose 5% in normal saline) or normal saline (NS) infusion
[4] Mean percentage for oxytocin or ergometrine (at least one valid dose), syringes and needles, and Ringer's lactate, D5NS, or NS infusion
[5] Mean percentage for magnesium sulfate, diazepam, or phenytoin (at least one valid dose), syringes and needles, and Ringer's lactate, D5NS, or NS infusion
[6] Mean percentage for ampicillin and oxytocin or ergometrine (at least one valid dose), syringes and needles, and Ringer's lactate, D5NS, or NS infusion
[7]Mean percentage for nasogastric tubes, external health source, oxygen source, laryngoscope and endotracheal tubes, newborn-sized ambu bag or equivalent
[8] Operating table, operating light, anesthesia giving set (all functional), scrub area adjacent to or in operating room, tray/drum/package with sterilized instruments ready to use, halothane, ketamine, health worker who can perform cesarean section present or on call 24 hours per day (schedule observed), anesthetist present or on call 24 hours per day (schedule observed)

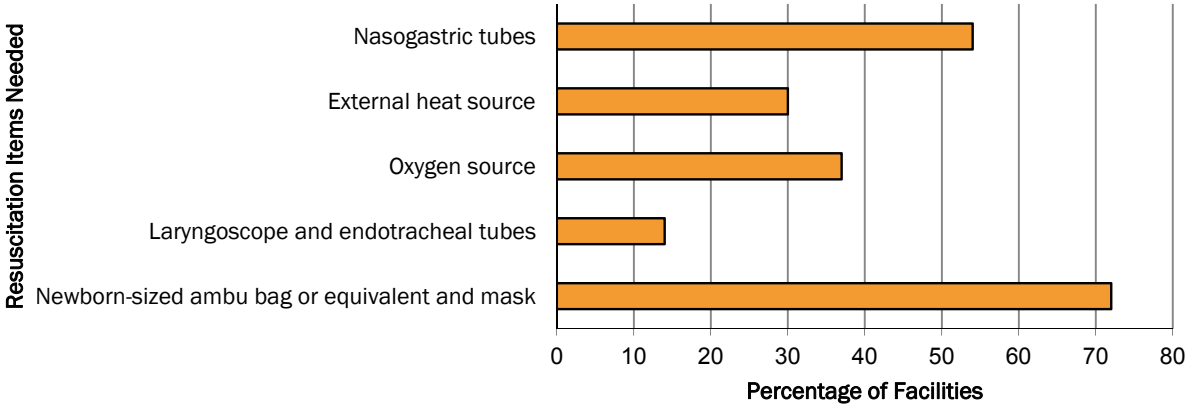
With respect to the availability of the medications and supplies required to perform the EmONC signal functions, the majority of facilities (89%) had parenteral oxytocin, but only 25% could provide cesarean sections and only 11% provided assisted vaginal deliveries. Less than half of the facilities were able to offer anticonvulsants and blood transfusions, yet the majority of the maternal deaths in the country are the result of PPH and severe PE/E.

Table 3.5: Availability of Supplies for Immediate Newborn Care

SUPPLIES FOR IMMEDIATE NEWBORN CARE	PERCENTAGE OF FACILITIES (%)	NUMBER OF FACILITIES (N=207)
Scissors or blade	97	201
Cord clamp or tie	95	197
Suction bulb	26	54
Suction machine	71	147
Suction apparatus (machine or bulb)	75	155
Drying and wrapping newborn	98	203
Antibiotic eye ointment (delivery room)	70	145
Antibiotic eye ointment (delivery room or pharmacy)	90	186
All Supplies for Immediate Newborn Care	**91**	**118**

The majority of the facilities offering delivery services (more than 90%) had scissors or blades, a cord clamp, and antibiotic eye ointment for newborns, either in the delivery room or in the pharmacy. However, a suction bulb was available in only 26% of the facilities.

Figure 3.5: Availability of Items Needed for Newborn Resuscitation (N=207)



Among the facilities offering delivery services, 72% had a newborn-sized ambu bag for performing newborn resuscitation. Although more than half of the facilities had nasogastric tubes, only about a third had an oxygen source and external heat source. Notably, only 14% had a laryngoscope and endotracheal tubes.

3.4: PHARMACEUTICAL INVENTORY

Table 3.6: Pharmaceutical Inventories among Delivery Facilities

KEY DRUGS	FACILITIES WITH DRUG AVAILABLE IN DELIVERY ROOM		FACILITIES WITH DRUG AVAILABLE IN THE PHARMACY	
	%	Number	%	Number
Ampicillin or Amoxicillin, injectable	4	8	13	27
Gentamycin, injectable	46	95	79	164
Magnesium sulfate	80	166	97	201
Oxytocin	79	164	71	147
Hydralazine or apresoline	23	48	—*	—*

* Data not collected

Key drugs for management of complications in pregnancy within the facilities were more often stocked in the pharmacy than in the delivery rooms. The majority of facilities (> 80%) had magnesium sulfate on hand in both the facility and the delivery room. The drug that was least often stocked was injectable ampicillin, with only 10% or fewer of the facilities having it in both the facility and the delivery room. Although PE/E is the second leading cause of maternal mortality in Kenya, less than a quarter of the facilities stocked antihypertensives (hydralazine or apresoline).

4. ANTENATAL CARE SERVICES

4.1. DESCRIPTION OF THE SAMPLE

Table 4.1: Antenatal Care Client Characteristics

CLIENT CHARACTERISTICS	PERCENTAGE OF CASES (%)	NUMBER OF CASES (N=1,409)
First visit	39	550
Follow-up visit	61	859
Gestational Age at Visit		
< five months	6	85
≥ five months	50	705
≥ eight months	44	620
Gravida		
Primagravida	32	451
Multigravida	68	958
Outcome of Visit		
Client goes home	78	1,099
Referred within the facility	19	268
Admitted at facility	0	0
Referred to other facility	1	14

A majority (61%) of the clients interviewed were at the facility for a follow-up ANC visit, and 50% having a gestational age of five months or more. Only 6% of the clients had pregnancies of less than 20 weeks. Following the ANC visit, the majority of the ANC clients observed went home, 19% were referred within the facility, none were admitted, and a few (1%) were referred to other facilities. Sixty-eight percent of the clients visiting the ANC clinics were multigravida, and 32% were visiting for their first pregnancy.

4.2 FIRST ANTENATAL CARE VISIT

Table 4.2: Content of First Antenatal Care Visit

INFORMATION ASKED FOR BY HEALTH WORKER OR MENTIONED BY CLIENT	PERCENTAGE OF CASES (%)	NUMBER OF CASES (N=556)
Client's Age	90	500
Medication Client was Taking	28	156
Last Menstrual Period	91	506
Number of Prior Pregnancies	95	528
Health Worker Gave or Prescribed		
Iron or Folic Acid Pills	60	337
Tetanus Toxoid Injection	79	439
Mean Score for First ANC Visit	74	411

During their first ANC visit, the majority of the clients (> 90%) were asked about their age, last menstrual period, and number of previous pregnancies. However, the client's medication history was discussed with only 28% of the clients. Overall, the mean percentage of all six assessment items (history and preventive treatments) occurring during the client's first ANC visit was 74%.

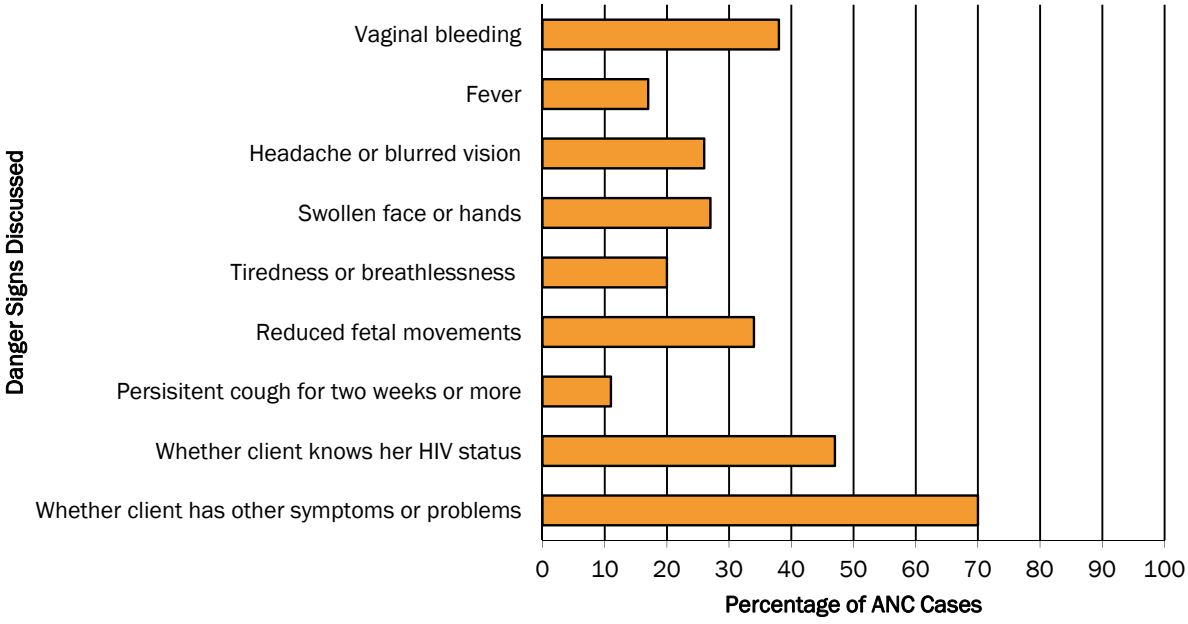
Table 4.3: Discussion of Complications during Previous Pregnancies

INFORMATION ASKED FOR BY HEALTH WORKER OR MENTIONED BY CLIENT	PERCENTAGE OF CASES (%)	NUMBER OF MULTIGRAVIDA FIRST ANC CASES (N=381)
Prior still birth	44	168
Heavy bleeding during/after delivery	32	122
Previous assisted delivery	56	213
Previous abortion	64	244
Previous prolonged labor	37	130
Previous pregnancy-induced hypertension	35	133
Previous pregnancy-related convulsions/eclampsia	14	53

The complications that health workers and clients discussed most often were abortion (discussed with 64% of the clients) and assisted delivery (discussed with 56% of the clients). However, complications that were life-threatening for the mother received less attention, with pregnancy-induced hypertension discussed by only a third of the clients and pregnancy-related convulsions/eclampsia discussed by less than one-fifth. PPH and PE/E are the leading causes of maternal death in Kenya, so improvement in this area is strongly needed.

4.3 PREVENTIVE SCREENING AND TREATMENTS

Figure 4.1: Discussion during Antenatal Care of Danger Signs in Current Pregnancy (N=1,409)



During ANC visits the most commonly discussed warning signs in pregnancy were HIV status (discussed with 47% of clients), vaginal bleeding (38%) and reduced fetal movements (34%). The least discussed signs (discussed with less than 20% of clients) were a cough persisting two

weeks or more and fever. Again, it is worrying that signs of PPH and PE/E received little attention during ANC visits.

Table 4.4: Screening for Pre-eclampsia/Eclampsia

COMPONENTS OF SCREENING PERFORMED BY HEALTH WORKER	PERCENTAGE OF ANC CASES (%)	NUMBER OF ANC CASES (N=1,409)
Asks about headache or blurred vision	23	319
Asks about swollen hands or face	24	344
Asks about a symptom of PE/E[1]	30	421
Takes client's blood pressure	96	1,352
Performs both PE/E screening elements[2]	29	409
Performs or refers for urine test	59	831

[1] Asks about headache or blurred vision or asks about swollen hands or face
[2] Asks about either symptom of PE/E and takes client's blood pressure

During ANC visits 96% of the clients had their blood pressure taken and 59% had a urine test performed. Examining clients' hands for edema was the least commonly performed component of screening for PE/E (27% of clients examined).

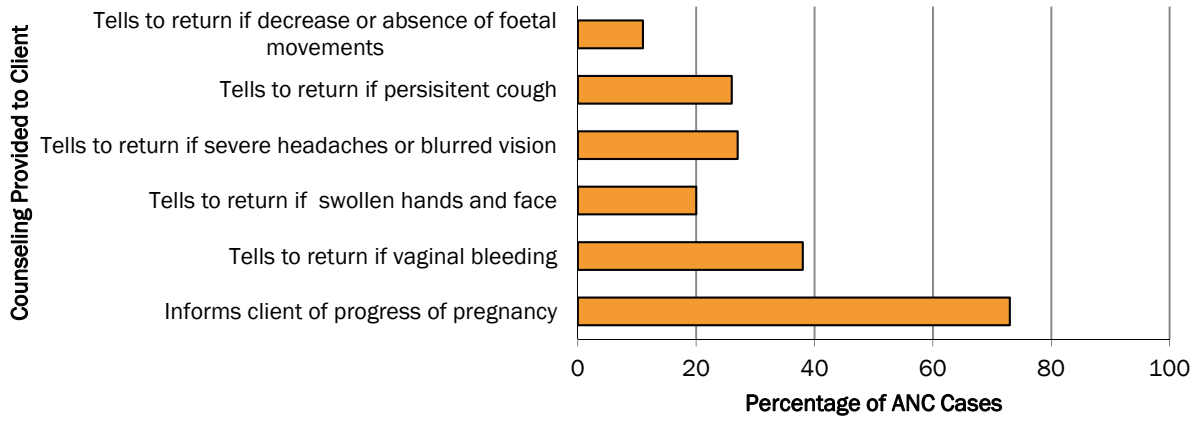
Table 4.5: Preventive Treatments

PREVENTIVE TREATMENTS PRESCRIBED OR GIVEN TO CLIENT DURING ANTENATAL CARE VISIT	PERCENTAGE OF CASES (%)	NUMBER OF CASES (N=1,409)
Iron or folic acid pills	50	705
Tetanus toxoid injection	50	705
Antimalarial prophylaxis	67	941
Insecticide-treated mosquito net (given/purchased)	32	463

Antimalarial prophylaxis was given to the majority (67%) of the ANC clients, and 50% of the clients received tetanus toxoid and iron/folic acid pills. Insecticide-treated mosquito nets were the preventive treatment least often provided to ANC clients (32% of clients were given or purchased them).

4.4 COUNSELING

Figure 4.2: Danger Sign Counseling during Antenatal Care Visits (N=1,409)



The majority of the interviewed ANC clients (73%) were informed of the progress of their pregnancy. Nearly 40% of the clients were advised to return if they had vaginal bleeding, and 20% were advised to return if they had a swollen face and hands. Reduced fetal movements or absence of movement was the danger sign that health workers discussed least often (11% of cases).

Table 4.6: Counseling on Preventive Treatments

HEALTH WORKER'S COUNSELING TASKS	PERCENTAGE OF ANC CASES (%)	NUMBER OF ANC CASES (N=1,409)
Counseling tasks for iron and folic acid		
• Explain the purpose of treatment	39	550
• Explain how to take	39	550
Counseling task for tetanus toxoid injection		
• Explain the purpose of treatment	29	409
Counseling tasks for antimalarial medication		
• Explain the purpose of treatment	47	663
• Explain how to take	54	765
• Explain the side effects	13	185
Counseling task for insecticide-treated nets		
• Explain the importance of the treatment	34	478

About half of the clients (54%) received an explanation of how to take an antimalarial drug as well as its purpose (47%). Less than 40% of clients who were given iron/folic acid, tetanus toxoid, and insecticide-treated nets received an explanation of the significance, the side effects, or the purpose of the treatment.

Table 4.7: Other Counseling Tasks during Antenatal Care Visits

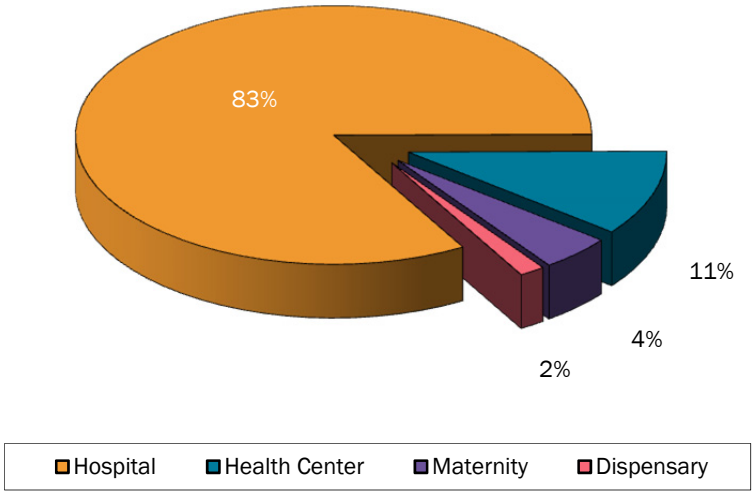
HEALTH WORKER'S COUNSELING TASKS	PERCENTAGE OF CASES (%)	ANC CASES (N=1,409)
Ask client where she will deliver	67	944
Advise the client to save money for delivery	56	789
Discuss postpartum family planning	22	310
Use visual aids	12	169
Look at client card (before or during consultation)	98	1381
Write on client card	100	1,409

During ANC visits, health workers counseled 67% of clients on their delivery place and advised 56% of clients to set aside money for delivery. Only 12% of clients received counseling from a health worker who used visual aids.

5. LABOR AND DELIVERY SERVICES

5.1 DESCRIPTION OF LABOR AND DELIVERY SAMPLE

Figure 5.1: Types of Facilities in the Labor and Delivery Sample (N=626)



A total of 626 deliveries were observed, and the majority of them were in hospitals. Eleven percent took place at health centers, 4% at maternities, and 2% at dispensaries.

Table 5.1: Health Worker Characteristics

QUALIFICATIONS OF HEALTH WORKERS PERFORMING DELIVERIES	PERCENTAGE OF L&D CASES* (%)
Specialist	1
Registered nurse	61
BSN nurse	3
Enrolled nurse	26
Nurse aide	2
Registered midwife	2
Enrolled midwife	6

* Percentages add up to more than 100% due to rounding.

Most deliveries (90%) were attended by nurses, but 8% were attended by midwives and 1% by doctors. About one-third of deliveries were attended by staff who were still in training (enrolled nurses/midwives). Two percent of deliveries were not attended by a skilled provider.

Table 5.2: Labor and Delivery Care and Outcomes

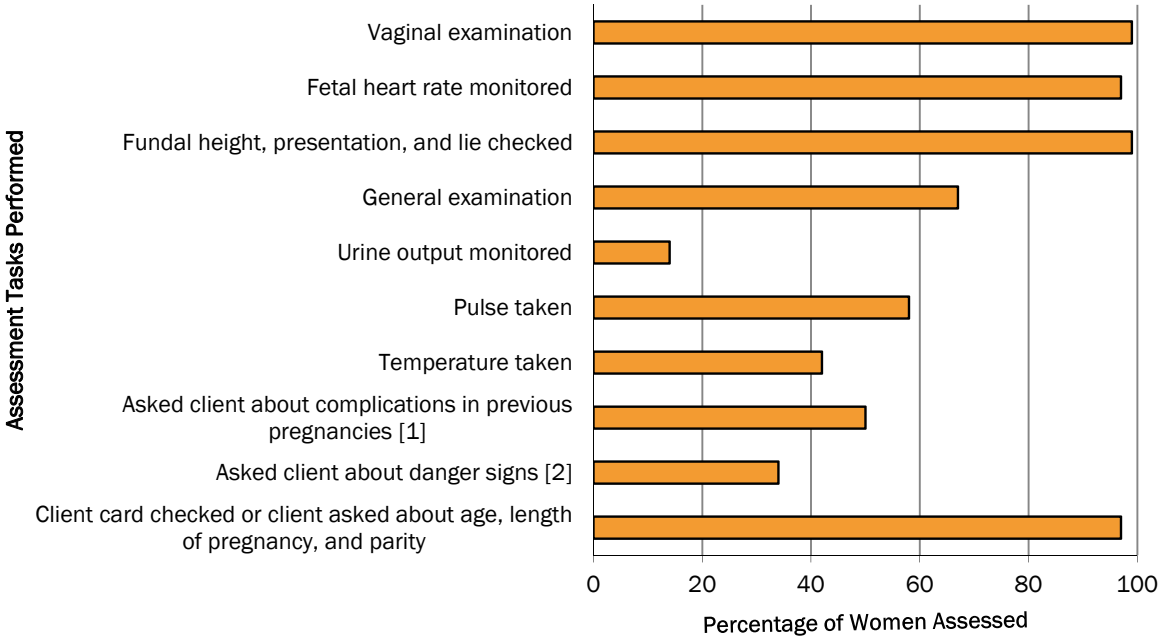
	PERCENTAGE OF L&D CASES (%)	NUMBER OF L&D CASES (N=626)
Components of L&D Received by Clients		
Initial client assessment	71	442
Management of first stage of labor	91	571
Management of second and third stages of labor	90	564
Immediate newborn and postpartum care	91	571
Management of PPH*	<1	32
Management of PE/E*	<1	10
Management of newborn resuscitation*	<1	42
Outcomes for the Mother and Newborn		
Goes to recuperation ward	90	561
Referred to other health worker within the facility	1	4
Goes to surgery in same facility	4	25
Referred to other facility	3	19
Cesarean Section	2	13
Maternal death	0	0
Newborn death	<1	2

* Data on management of complications is unweighted; results are descriptive rather than representative.

For a variety of reasons, not all components of labor and delivery care were observed for all cases. For example, some women were already in the second stage of labor when they arrived at the facility. In other cases, the observer may have been following another case when newborn care was provided. However, at least 90% of women in the sample were observed during the first, second, and third stage of labor and during immediate newborn care and postpartum care. Only 71% were observed for the initial assessment. Management of complications (PPH, PE/E, and newborn resuscitation) was observed in 84 cases, about half of which were newborn resuscitations. Ninety percent of the mothers went to recuperation after delivery, 3% were referred, and 4% went to surgery. The complication rate was 3%.

5.2 ROUTINE LABOR AND DELIVERY PRACTICES

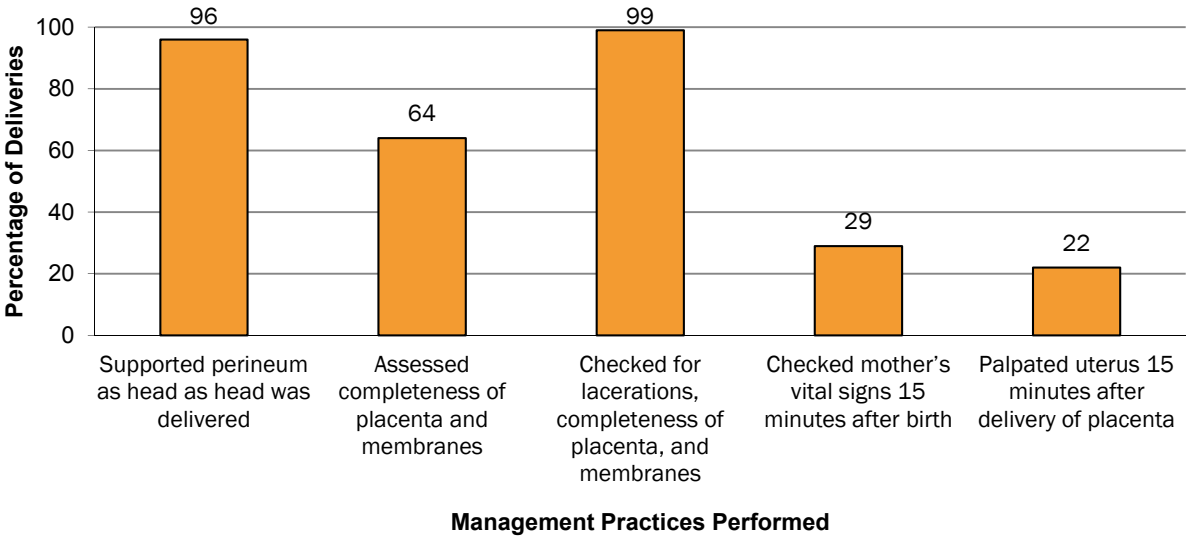
Figure 5.2: Tasks for Initial Assessment of Woman in Labor (N=442)



[1] Complications: high blood pressure, convulsions, postpartum hemorrhage, previous cesarean section, still birth, prolonged labor
[2] Danger signs: headaches, fever, discharge, swelling of hands and face, convulsions/loss of consciousness, vaginal bleeding

Figure 5.2 shows the essential obstetric practices that should occur during initial assessment of clients in labor. The health workers checked nearly all clients for age, parity, and length of pregnancy or checked the client's health card (97%), checked fundal height, presentation, and lie (99%), assessed fetal heart rate 97%), and performed a vaginal exam (99%). However, only about one-third (34%) of the clients were asked about danger signs in pregnancy, and only half were asked about complications in their previous pregnancies.

Figure 5.3: Tasks for Management of Second and Third Stages of Labor (N=564)



During the second and third stages of labor, the provider supported the perineum in 96% of cases. Ninety-nine percent of women had an assessment for perineal and vaginal lacerations. These actions are significant for the reduction of PPH because lacerations are the second most common cause of PPH globally. Unfortunately, other aspects of care related to detecting PPH were deficient. For example, providers took vital signs in only 29% of cases and palpated the uterus in just 22% of cases.

Table 5.3: Woman-Friendly Care during Initial Assessment and First Stage of Labor

Woman-Friendly Actions	Percentage of Cases (%)	Number of L&D Cases (N=442)
Initial Assessment		
Greets client	78	345
Encourages presence of support person	38	168
Asks for questions	36	155
Explains procedures before proceeding	77	339
Informs client of findings	76	337
First stage of labor		
Explains what happens in labor	62	334
Encourages client to consume fluids/food	62	322
Encourages/ assists client to ambulate	71	371
Supports client in a friendly way	87	472
Drapes client	24	132
Mean score for woman-friendly care	**61**	

During the initial client assessment in labor, 78% of clients were greeted by their health care providers, 77% had a provider who explained the procedure before proceeding, and 76% were informed of the provider's findings. However, few health workers asked clients if they had any questions, and only 24% of clients were draped during labor, indicating privacy was largely inadequate. The overall mean percentage score for woman-friendly care was fairly good, at 61%

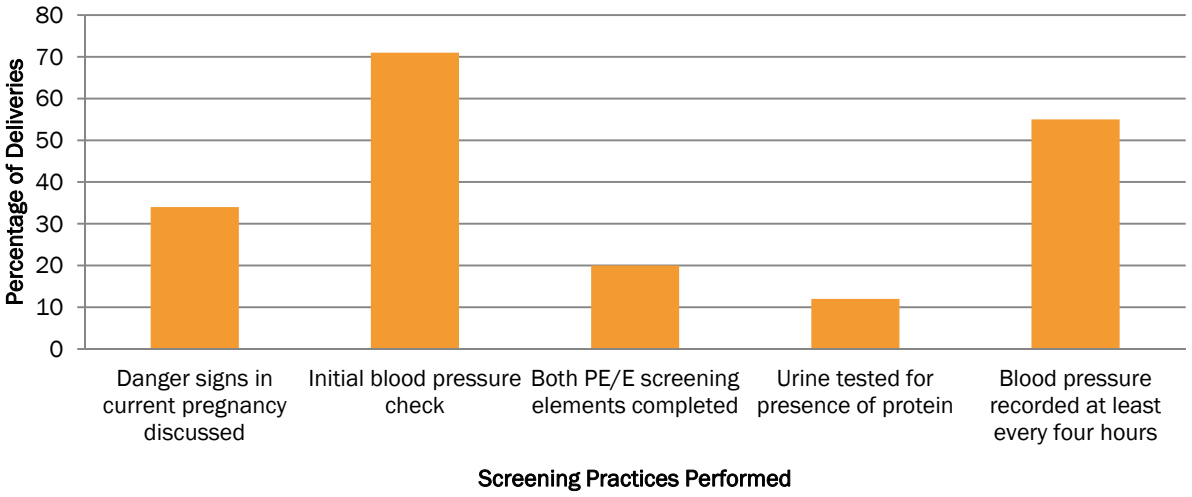
Table 5.4: Infection Prevention Measures

INFECTION PREVENTION TASKS PERFORMED BY THE PROVIDER	PERCENTAGE OF CASES (%)	NUMBER OF L&D CASES (N=621)
Washes hands before examination during initial client assessment	36	160
Washes hands before examination during labor	36	199
Wears disinfected or sterile gloves for vaginal examination and delivery	99	544
Wears clothing to protect face, hands and body	66	346
Safely disposes of all sharps	96	555
Decontaminates all reusable instruments	97	560
Safely disposes of all contaminated waste	98	579
Decontaminates apron	30	164
Washes hands after clean-up	83	489
Mean percentage score for infection prevention	**72**	

In nearly all deliveries, providers wore sterile/disinfected gloves for vaginal examination and delivery, and afterward safely disposed of all sharps, decontaminated all the reusable instruments, and safely disposed of all waste contaminates. Hand washing before examination

of patients, both at the initial client assessment and during labor, was the least practiced infection control practice (only 36% of cases). Overall, infection prevention measures were performed in 72% of deliveries.

Figure 5.4: Pre-Eclampsia/Eclampsia Screening Practices (N=626)



As shown in Figure 5.4, blood pressure measurement at initial assessment was carried out for the majority of deliveries (71%), but providers recorded blood pressure on the partograph (every four hours as per guidelines) in just over half of (55%) deliveries. The two key screening tasks (ask about danger signs and check blood pressure) were completed in only 20% of all deliveries, and only 12% of women had their urine tested for proteins during the initial assessment.

Table 5.5: Partograph Use

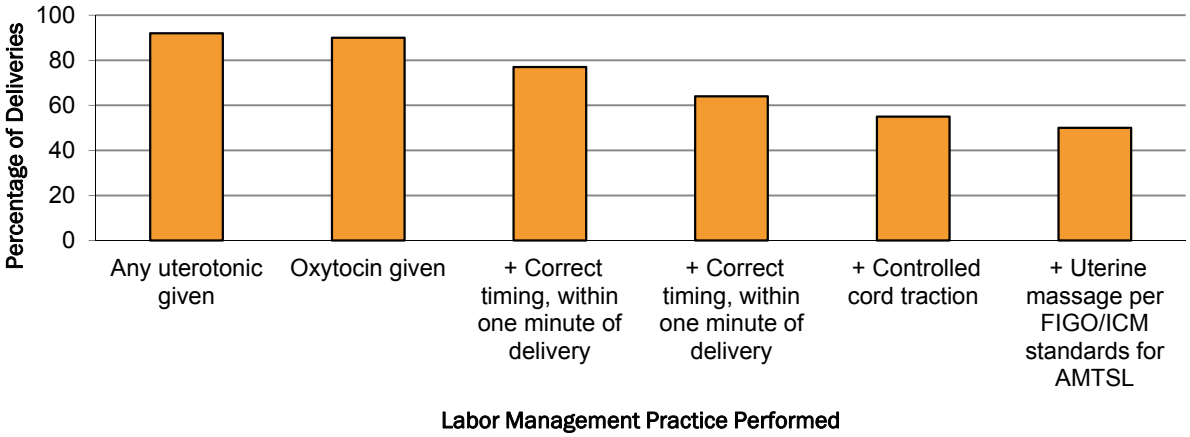
	PERCENTAGE OF L&D CASES (%)	NUMBER OF L&D CASES (N=626)
Partograph used in labor	88	433
Correct timing of partograph use, by type		
• 3 cm (old WHO)	93	348
• 4 cm (new WHO)	86	44
• Other partograph	84	3
• Correct timing (all types)	92	395
Partograph components[1]		
• Filled in with fetal heart tones, maternal pulse, and frequency/duration of contractions, at least every 30 minutes during labor	62	279
• Filled in with birth date, time, delivery method, and estimated blood loss after delivery	79	385
• All components filled in	58	258
Appropriate action taken at action line[2]		
• Consult a specialist	78	64

[1] From review of partograph after delivery, not direct observation

[2] Of cases where action line was reached, N=82; action line not reached in 81% of cases where partograph was observed during labor

The partograph was widely used during labor (88% of cases), and its use was initiated at the correct time in more than 90% of the cases in which it was used. Providers were less consistent in filling in details on the partograph during labor and delivery, with all components completed in only 58% of cases. The action line was not reached during observation in most cases (81%). However, when the action line was reached, the appropriate action was taken 78% of the time (cesarean sections were not observed).

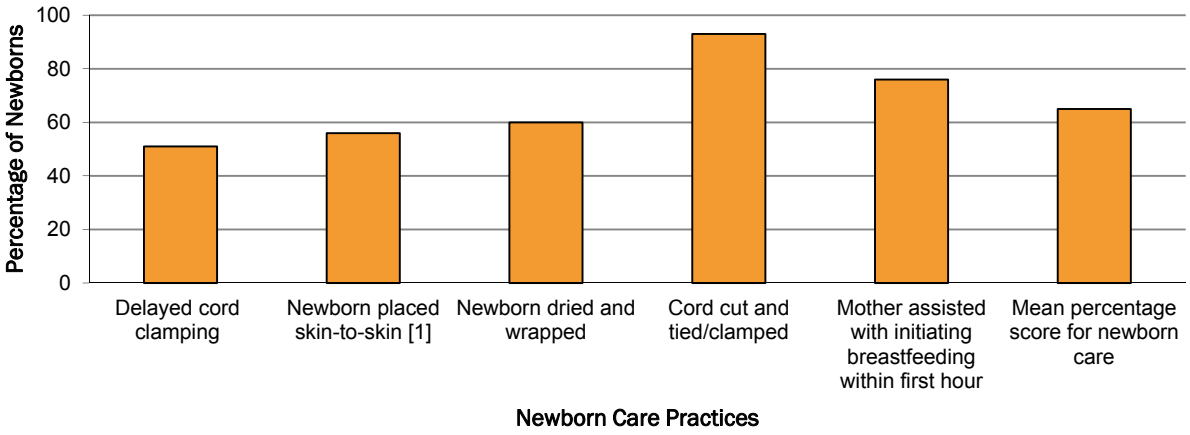
Figure 5.5: Use of Uterotonics and Active Management of the Third Stage of Labor during Deliveries (N=564)



Note: + indicates the practice was performed in addition to each of the previous practices listed.

The vast majority of women in the third stage of labor (92%) were given a uterotonic (predominantly oxytocin) after birth, but only 50% of women received all the elements of AMTSL recommended by FIGO/ICM (with 10 IU oxytocin given IM within one minute of delivery as the preferred uterotonic). Variations were observed in the route, dosing and units, and timing of the uterotonic and in use of controlled cord traction and uterine massage. The aspect of AMTSL with the poorest adherence to standards was the timing of the administration of oxytocin, with some providers waiting to administer the drug until after delivery of the placenta. Therefore, in order to improve all three elements of AMTSL, oxytocin use (correct dose, route, and timing) should be emphasized more in training.

Figure 5.6: Immediate Newborn Care Practices (N=548)



* Questionnaire reads: "Immediately assesses the newborn's respiratory efforts and, if breathing normally or crying, place on mother's abdomen skin-to-skin"; therefore some "no" responses may reflect breathing concerns rather than inattention to skin-to-skin contact with the mother.

The most commonly practiced element of essential newborn care was cutting and tying or clamping the cord (performed in 93% of cases), and the least common was delayed cord clamping of two minutes or more (performed in 51% of cases). Most women (76%) received assistance with initiating breastfeeding within the first hour after delivery. Overall, 65% of women received the five elements of immediate newborn care: delayed cord clamping, placing the newborn skin-to-skin with the mother, drying and wrapping the baby, cutting and tying the cord, and helping the mother initiate breastfeeding.

Table 5.6: Harmful and Unindicated Practices Observed

OBSERVED PRACTICES	PERCENTAGE OF DELIVERIES* (%)	NUMBER OF L&D CASES (N=626)
Harmful practices		
Use of enema	1	4
Pubic shaving	<1	2
Applying fundal pressure	9	52
Lavage of the uterus after delivery	1	7
Slapping the newborn	2	13
Holding the newborn upside down	7	44
Milking the newborn's chest	<1	1
No harmful practices observed	79	496
Unindicated practices		
Manual exploration of the uterus after delivery	1	6
Routine use of episiotomy	3	19
Routine aspiration of the newborn's mouth and nose at birth	1	6
Restricting food/fluids during labor	<1	1
No unindicated practices observed	91	569
No harmful or unindicated practices observed	**80**	**479**

* Multiple answers accepted; percents do not sum to 100%

Harmful practices are those that have no proven benefit and may cause harm to the client. Practices that are not indicated can be beneficial, but if they are routinely done in the absence of specific medical indications, they can be harmful. Table 5.6 shows that no harmful or unindicated practices were observed in 80% of the births observed. The most frequently observed harmful practices were application of fundal pressure (9% of deliveries) and holding the newborn upside down (7% of deliveries).

5.3 MANAGEMENT OF MATERNAL AND NEWBORN COMPLICATIONS

Table 5.7: Management of Pre-Eclampsia/Eclampsia Cases

CASE*	PROBABLE DIAGNOSIS	MEDICATIONS	FOLLOW-UP
1	Eclampsia	Magnesium sulfate IV, antihypertensive	Magnesium IM every four hours, ruptured membranes, and induced labor
2	Eclampsia	Magnesium sulfate IV, diazepam IV, antihypertensive	
3	Severe pre-eclampsia	Magnesium sulfate IV, diazepam IV, antihypertensive	
4	Severe pre-eclampsia	Magnesium sulfate IV, diazepam IV	Ruptured membranes and induced labor
5	Severe pre-eclampsia	Magnesium sulfate IV	Ruptured membranes and induced labor
6	Severe pre-eclampsia	None	None
7-10	Mild pre-eclampsia		

* Values from observations of complications are unweighted.

Among the ten observed cases of pre-eclampsia/eclampsia, two women were convulsing and unconscious (eclampsia), four had severe pre-eclampsia (diastolic blood pressure > 110mm Hg and proteinuria ≥ 2+), and four had mild pre-eclampsia. Both eclamptic women were give magnesium sulfate and an antihypertensive. One of the women with eclampsia was given magnesium IM four hours afterward and her labor was induced and membranes ruptured. The second was given diazepam IV in addition to magnesium sulfate. Three of the four women with severe pre-eclampsia cases were given magnesium sulfate. One of the three also received an antihypertensive and diazepam, one received only diazepam, and the third received only the magnesium sulfate. Two of the severe pre-eclampsia cases had membranes artificially ruptured and labor induced. One of the four women with severe pre-eclampsia received no medication, although both magnesium and diazepam were available in the delivery room (there may have been reasons for this that we cannot discern from the data). There were no maternal deaths associated with pre-eclampsia/eclampsia, but there was one stillbirth.

According to the World Health Organization, magnesium sulfate is the drug of choice for preventing and treating convulsions in PE/E. WHO's *Managing Complication in Pregnancy and Childbirth* recommends magnesium sulfate in a 20% solution 4g IV over five minutes, followed promptly with an additional 10g of magnesium sulfate in a 50% solution given 5g IM in each buttock (with lignocaine). However, the observed severe PE/E cases were provided only the initial treatment. In addition, three women were given diazepam together with magnesium sulfate, which is not recommended. The observation shows that there is confusion among providers about guidelines for treating severe PE/E and suggests they might not understand the mechanism of action of either medication. In addition, the combination of the drugs could lead to respiratory depression, which could endanger both the mother and the fetus/newborn. Although calcium gluconate can rapidly reverse respiratory depression caused by magnesium sulfate, it has no effect on diazepam, so a woman and her fetus/newborn who are treated with both drugs could be in a potentially harmful situation.

Table 5.8: Management of Postpartum Hemorrhage Cases

PROBABLE DIAGNOSIS	NUMBER OF CASES[1]	TREATMENT	COMPLICATIONS
Lacerations	14	11 repaired; 1 sent on to surgery 3 not repaired; 1 sent on to surgery (experienced shock and received blood)	3 with repair went into shock; 1 received blood and was sent on to surgery 1 without repair went into shock; she received blood and was sent on to surgery
Retained placenta	6	Manual removal for all	1 also had laceration (not repaired) 1 also received bimanual compression
Atony[2]	4	Bleeding stopped after uterotonic/massage for all	
Unexplained bleeding[3]	8	4 needed compressions, but it was not performed 4 needed no action	1 sent on to surgery; 1 went into shock

[1] Values from observations of complications are unweighted.
[2] Diagnosis of exclusion (placenta expelled, no lacerations)
[3] Given uterotonic/massage, placenta expelled, and no lacerations

Management of PPH was observed in 32 cases, and there were no associated maternal deaths. All PPH cases were given a uterotonic (one missing case), and 29 of 32 received uterine massage (one missing case). The most common cause of PPH was lacerations (14 cases), followed by retained placenta (6) and atony (4). It is important to note that a uterotonic would have no effect on bleeding from lacerations, unless uterine atony was also present.

Three women with PPH were sent for surgery. Seven women experienced shock due to heavy bleeding, and three of them were given blood. The provider repaired lacerations in 11 of 14 cases in which they was the primary cause of bleeding, although in one case in which a woman had lacerations and retained placenta, only manual removal of the placenta was performed. Compression was observed only rarely as a treatment for PPH (one out of 32 cases), but observers noted several times when compression was needed but not performed. Normally, bimanual compression would be needed only if external uterine massage and administration of oxytocin did not stop the bleeding. It would have no effect on bleeding caused by a laceration.

In eight cases, despite treatment with uterine massage and a uterotonic, bleeding continued and was without a clear cause (placenta expelled and no lacerations). In these cases and those in which no action was taken, it is possible that bleeding had diminished to the point that action was not needed, although we cannot tell from the data.

Table 5.9: Management of Newborn Asphyxia

NUMBER OF CASES[1]	TREATMENT	OUTCOME
42 not breathing at birth[2]	33 received stimulation	14 started breathing; 2 recovered without proper stimulation
26 not breathing after stimulation	20 received bag & mask ventilation 14 had adjustment to bag and mask	15 recovered normal breathing; 6 ventilated with oxygen and recovered; 5 newborn deaths

[1] Values from observations of complications are unweighted.
[2] Observation indicated 44 cases in which the baby was not breathing at birth; only 42 of those cases were observed during resuscitation.

Forty-two newborns with asphyxia were observed. Some form of stimulation (dry and wrap, position, suctioning of the mouth and/or nose) was performed in 33 of the cases, and 20 cases were treated with a bag and mask when suctioning alone did not lead to spontaneous breathing. A small number of newborns (six of 42) were ventilated with oxygen. In five cases, bag-and-mask resuscitation failed to recover breathing and the newborn died.

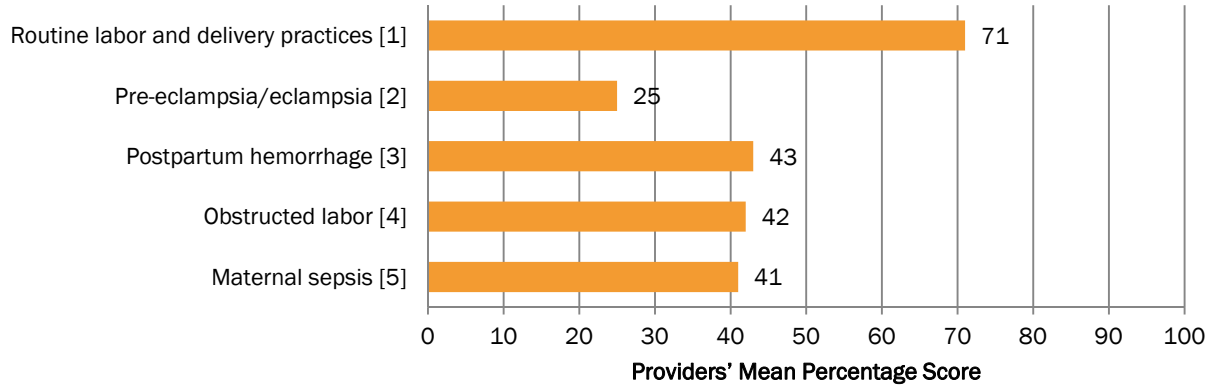
6. HEALTH WORKER KNOWLEDGE

6.1 DESCRIPTION OF THE HEALTH WORKER INTERVIEW AND KNOWLEDGE TEST SAMPLE

The most senior ANC/L&D health care provider at each facility (in terms of cadre and experience) was interviewed about L&D practices, complications of L&D, and essential newborn care and resuscitation.

6.2 MATERNAL HEALTH KNOWLEDGE

Figure 6.1: Knowledge of Maternal Care to Support Normal Deliveries and Detect and Manage Complicated Deliveries (N=234)



Mean percentage for (1) monitored fetal heart rate, assessed degree of moulding, assessed cervical dilation, assessed descent of head, monitored urine contractions, monitored maternal blood pressure, monitored maternal temperature, checked urine, and checked for amniotic fluid; (2) recorded information on partograph; (3) procedures that should not be routinely performed: artificial rupture of membrane, episiotomies, shaving, suctioning of newborn's nose and nasopharynx enema

[2] See Table 6.1; mean percentage for (1) examinations, (2) initial treatment, (3) treatment for convulsions, (4) equipment and supplies, (5) actions to take one hour later

[3] Mean percentage for (1) checking patient for signs of PPH: uncontracted/atonic uterus, rapid pulse, faint/weak pulse, external bleeding, retained products/placenta, genital tract injuries, pallor, full bladder; (2) taking actions for PPH: reassure the client, massage fundus, empty urinary bladder, give uterotonics IM or IV, perform bimanual compression of uterus, perform abdominal compression of aorta, start IV fluids, take blood for grouping, refer to a doctor/hospital, raise foot of bed; (3) taking actions for retained placenta: reassure the client, empty bladder, repeat uterotonic, manually remove placenta, give IV fluids, monitor vital signs for shock, check contractions of uterus, massage fundus after removal, give antibiotics, take blood for grouping, prepare theater, refer to doctor/hospital

[4] Mean percentage for (1) checking patient for signs of obstructed labor: no descent of presenting part, no change in cervical dilation, Bandl's ring, severe moulding, first stage > 12 hours, second stage > two hours; (2) taking actions for obstructed labor: reassure the client, start IV fluids, continuous bladder drainage, prepare for cesarean section, call the doctor, parenteral antibiotics, take blood for grouping, monitor vital signs

[5] Mean percentage for (1) checking patients for signs of maternal sepsis: vaginal bleeding, rapid/faint pulse, high fever, low blood pressure, lower abdominal pain and tenderness, foul-smelling vaginal discharge, anemia; (2) taking actions for maternal sepsis: start IV fluids, give parenteral antibiotic, give analgesics, take endometrial swabs, do ultrasound, start malaria treatment if rapid diagnostic test positive, perform manual vacuum aspiration, refer to doctor/hospital

Although providers exhibited relatively good knowledge of routine labor and delivery practices, their knowledge of signs, diagnostic tests, and interventions to manage complications was only fair. Providers scored lowest on knowledge of pre-eclampsia/eclampsia, with a mean score of only 25%.

Table 6.1: Knowledge of Diagnosis and Management of Pre-Eclampsia/Eclampsia

SIGNS AND MANAGEMENT OF PE/E	PERCENTAGE OF HEALTH WORKERS WITH ALL ANSWERS CORRECT (N=234) (%)	MEAN PERCENTAGE OF CORRECT ANSWERS (%)
Actions to take during examination[1]	10	28
Diagnosis of severe pre-eclampsia	83	83
Treatment for severe pre-eclampsia[2]	77	77
Treatment for convulsions[3]	2	37
Essential supplies and equipment[4]	5	48
Actions to take one hour later[5]	1	36
Mean score for PE/E case study	—	**25**
Health workers with all PE/E questions correct	**1**	—

[1] Three actions: check fundal height, fetal movement, any leaking of fluid from vagina
[2] Stabilize with magnesium sulfate and antihypertensives
[3] Five actions: administer oxygen at 4–6 L per minute, place in side-lying position, protect from injury, give magnesium sulfate, and provide antihypertensive
[4] Eight actions: give IV with normal saline or Ringer's lactate, urinary catheter and bag, patellar hammer, suction machine and catheter, oxygen and adult mask, injectable magnesium sulfate, calcium gluconate, and injectable antihypertensive
[5] Six actions: repeat magnesium sulfate four hours after last dose if reflexes and respiration normal, maintain diastolic blood pressure at 90–100 through antihypertensives, monitor labor and begin partograph, auscultate lungs hourly, record fluid intake and output hourly, examine and record respiration, reflexes, and patellar reflexes hourly

Although the majority of the providers indicated that they knew how to diagnose (83%) and treat (77 %) severe pre-eclampsia, their knowledge of treatment for convulsions and ongoing management was poor.

Table 6.2: Knowledge of Actions and Interventions for Management of Postpartum Hemorrhage

ACTION	PERCENTAGE OF HEALTH WORKERS WITH KNOWLEDGE (N=234) (%)
Reassure the woman	17
Massage the fundus	79
Empty urinary bladder	41
Give uterotonic (IM or by IV)	83
Perform bimanual compression of uterus	19
Perform compression of abdominal aorta	3
Start IV fluids	75
Take blood for grouping and matching	47
Refer to doctor	44
Raise foot of the bed	3
Mean score for management of PPH	**42**
Health workers with all PPH questions correct	**1**

The majority of the health care workers indicated that they would administer a uterotonic (83%), massage the fundus to promote contraction of the uterus (79%), and start IV fluids (75%). Knowledge of other actions was low, however, leading to an overall score of only 42%. Only 3% of the providers were knowledgeable about raising the foot of the bed and performing compression of the abdominal aorta.

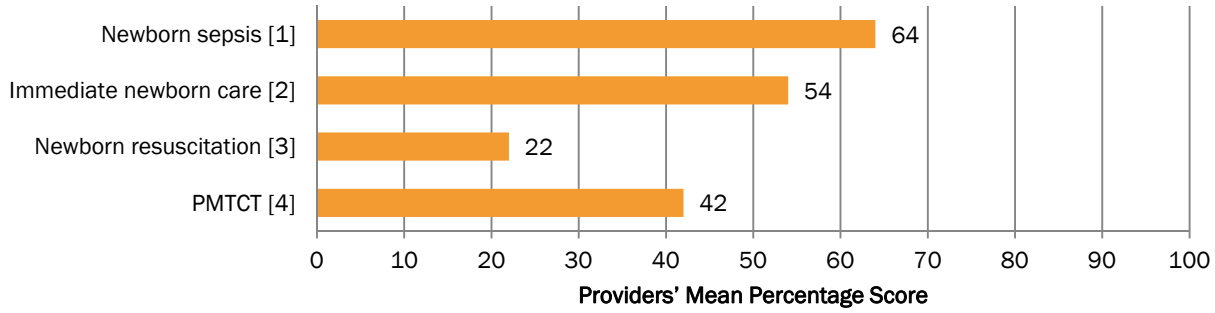
Table 6.3: Knowledge of Actions and Interventions for Obstructed Labor

ACTION	PERCENTAGE OF HEALTH WORKERS WITH KNOWLEDGE (N=234) (%)
Reassure woman	30
Start IV fluids	65
Drain bladder continuously by catheter	27
Prepare for cesarean section	63
Call doctor or refer	76
Administer parenteral antibiotics	5
Take blood for grouping and matching	37
Monitor vital signs	39
Mean score for management of obstructed labor	**43**
Health workers with all obstructed labor questions correct	**4**

Knowledge of actions and interventions for obstructed labor is shown in Table 6.3. The overall mean percentage score for correct actions was only 43%, and only 4% of health workers identified all of the actions needed for management of obstructed labor. The majority of providers knew to call a doctor or refer their cases (76%) and to prepare for cesarean section (63%), but only 5% knew to give parenteral antibiotics and only 27% knew to use a catheter.

6.3 NEWBORN HEALTH KNOWLEDGE

Figure 6.2: Knowledge of Newborn Care for Normal and Complicated Deliveries (N=210)



PMTCT = prevention of mother-to-child transmission (of HIV/AIDS)

[1] Mean percentage for poor/no breastfeeding, hypo/hyperthermia, restlessness/irritability, breathing difficulties

[2] Mean percentage for (1) equipment: two dry warm towels or cloths, self-inflating ventilation bag, newborn face mask size 1, mucus extractor/bulb syringe, sterile disinfected clamps, scissors and cord ties, flat surface with warm cloth, clock or watch with second hand, source of warmth; (2) actions: wipe face after birth of head, dry cord care, ensure baby is breathing, provide thermal protection, initiate breastfeeding within one hour, assess/examine newborn within one hour, provide eye prophylaxis, administer vitamin K

[3] See Table 6.4; mean percentage for (1) actions to take, (2) more actions to take (bag and mask), (3) actions to take when baby is breathing spontaneously

[4] Mean percentage for counsel for PMTCT, provide antiretroviral prophylaxis in early labor, wipe nose/mouth/eyes of newborn with gauze (avoiding suction), no routine episiotomy, minimize instrument delivery, hibitane vaginal cleansing, minimize vaginal exam, minimize artificial rupture of membranes, avoid milking cord/immediately clamp cord, appropriate use of partograph, AMTSL, provide antiretroviral prophylaxis to infant

Provider knowledge of newborn care and management of complications was fair. The providers scored highest on signs of newborn sepsis (64%) and lowest on resuscitation (22%).

Table 6.4: Knowledge of Management of Asphyxiated Newborns

ACTION	PERCENTAGE OF HEALTH WORKERS WITH ALL ANSWERS CORRECT (N=210) (%)	MEAN PERCENTAGE OF CORRECT ANSWERS (%)
Actions to take[1]	1	14
Actions to take when baby is still not breathing after using bulb syringe (bag and mask)[2]	13	34
Actions to take when baby is breathing spontaneously at 40 times per minute[3]	25	42
Mean score for newborn resuscitation case study **Health workers with all newborn resuscitation questions correct**	- **12**	**22** -

[1] Mean percentage for actions in order: dry baby by rubbing head-to-toe with dry cloth, throw away used wet cloth, wraps baby in second dry towel, observe baby not breathing after drying and wrapping, briefly tell mother that baby is not breathing and needs special assistance immediately, place baby on back on firm and flat surface, place small folded cloth under baby's shoulder so head is extended, suction first mouth, then nose using bulb syringe or mucus extractor, suctions only while pulling out bulb syringe or mucus extractor, observe that baby is still not breathing after suctioning

[2] Mean percentage for actions in order: cover baby's nose/mouth with face mask and make sure seal is formed, tests by squeezing two or three times to observe chest rise with each squeeze, ventilate about 30 times per minute, after one minute check if baby is breathing on own, discontinues ventilation when baby is breathing spontaneously at 30 times per minute

[3]Mean percentage for actions in order: place baby skin-to-skin with mother and initiate breastfeeding, document resuscitation information on mother's record, explain to mother what care was given, what signs to look for, and what action to take

The newborn resuscitation case study asked providers to identify the proper actions to take in each situation and to place the actions in the appropriate chronological order. The added level of difficulty of placing the actions in order may explain in part why the providers' scores are low, as some reported that they found the question confusing. Providers scored only 14% on average for the correct initial actions in the correct order of performance and only 34% for the correct actions in the correct order for using bag and mask for resuscitation.

7. DISCUSSION AND CONCLUSIONS

The quality of services provided to ANC and L&D clients in the areas of routine preventive interventions, communication/woman-friendly care, and prevention, screening, and treatment of maternal and neonatal complications was varied. Some of the reasons for this are related to a lack of facility readiness with respect to the necessary infrastructure, medicines, supplies, and equipment as well as gaps in health worker knowledge and skills. Other factors, such as facility management and supervision, may also have contributed to lack of compliance with quality standards, but this assessment did not explore those areas in detail.

FACILITY INFRASTRUCTURE

- Services, supplies, and infrastructure in the ANC service delivery areas were mostly up to standard. However, neither iron tablets nor counseling supplies were widely available (available in only 41% and 36% of facilities, respectively), and only about a third of facilities (28%) had an adequate examination room infrastructure.

- The medications and equipment needed to support normal and complicated deliveries were present in about half of the facilities with delivery services, but infrastructure and staffing were lacking (only 36% of facilities had the needed physical infrastructure components and 46% had 24-hour staff coverage). There was also room for improvement in the number of facilities with supplies for infection control (only 58% had supplies). Availability of oxytocin and magnesium sulfate was high but inadequate: oxytocin was available in the delivery room at 79% of facilities and magnesium sulfate at 80% of facilities.
- Only 3% of level 3 or higher facilities provided all nine EmONC signal functions; in fact, only 3% provided even the seven basic signal functions. Services for obstructed labor were particularly lacking (only 5% provided assisted deliveries and 22% provided cesarean sections), and only 29% used parenteral anticonvulsants for PE/E. Since most facilities had the capacity to perform signal functions, resource availability does not appear to be the limiting factor; it is more likely to be knowledge and training and/or support from supervisors.
- Supplies for immediate newborn care were present at most delivery facilities, as were the appropriate size of bag and mask needed for newborn resuscitation (72% had a bag and newborn-sized mask), but based on knowledge test scores and observed management of asphyxiated newborns, the capacity to perform advanced airway management for severely asphyxiated babies appeared to be limited.

ANTENATAL CARE SERVICES

- During ANC consultations, screening and education to identify and prevent complications was inadequate. At their first visit, 10% to 40% of multigravida clients were asked about previous conditions such as convulsions/pre-eclampsia and postpartum hemorrhage. Although most women had their blood pressure taken (96%) and were asked whether they had experienced any problems in their current pregnancy (70%), less than 40% were asked specifically about the life-threatening danger signs of PE/E and PPH. Few women were counseled to return to the health facility if these danger signs occurred.
- Half of the ANC clients received preventive interventions such as iron and folate tablets, tetanus toxoid injections, intermittent preventive treatment, and insecticide-treated nets. However, counseling on the importance, dosing, and side effects of these drugs/methods was low, indicating either a lack of information or a lack of emphasis during provider training.
- Although birth preparedness is an important activity in the reduction of maternal morbidity and mortality, only slightly more than half of the clients received counseling on how to prepare for the birth of their newborn.

LABOR AND DELIVERY SERVICES

- Most women received good care during the initial assessment at the time of admission to the facility, although as in the ANC consults, providers did not consistently ask about danger signs and previous pregnancy complications (34% of clients were checked for danger signs and 50% were asked about previous pregnancies). Women often had their blood pressure taken (71%), but few women (only 20%) received adequate screening for PE/E (checking for both blood pressure and danger signs). Urine testing for protein was infrequent (only 12% of women were tested).
- Communication between provider and client at the initial assessment and beginning of labor was mostly in keeping with guidelines for providing a woman-friendly environment. Privacy for the clients could be improved.

- Partograph use was high during labor (88% of cases) and its use was initiated at the correct time in 92% of cases. In cases where the action line on the partograph was reached, more than 75% of providers took appropriate action.
- The use of oxytocin during the third stage of labor was nearly universal, but many providers administered the drug too late and/or with an incorrect route or dose. Overall, half of all deliveries received AMTSL in line with the FIGO/ICM standard (10 IU oxytocin given IM within one minute of delivery with controlled cord traction and uterine massage).
- The quality of other efforts to prevent and detect PPH was mostly strong, with almost all providers supporting the perineum during delivery and checking for lacerations afterward. More than 60% of women were checked for vaginal bleeding and placenta completeness. However, although the majority of maternal deaths due to PPH occur during the immediate postpartum period, providers took the mother's vital signs 15 minutes after birth and palpated the uterus in only a third of the L&D cases.
- Infection control practices during labor and delivery met the required standard most of the time (mean percentage of 72%). Hand washing prior to examination of patients was poor (36% of deliveries), but all providers used gloves during deliveries and exams.
- Harmful or unindicated practices were observed infrequently (20% of deliveries). The most common such practice was application of fundal pressure during labor (9% of deliveries).

NEWBORN CARE

- The mean percentage score for practice of the five elements of immediate newborn care was 65%, and each of the individual practices was observed in at least 50% of the deliveries. However, drying and wrapping—a simple step that can help prevent the major causes of newborn death (hypothermia and sepsis)—was observed in only 60% of deliveries.

MANAGEMENT OF COMPLICATIONS DURING LABOR AND DELIVERY

- Of the ten observed cases of pre-eclampsia/eclampsia, six were clearly diagnosed with severe PE/E. Only five of these received any magnesium sulfate, three received magnesium sulfate and diazepam (which is contraindicated), two received antihypertensives, while one case received no medications. There were three labor inductions and no PE/E-associated deaths during the observations.
- Thirty-one of 32 women with postpartum hemorrhage were given oxytocin, in some cases unnecessarily as oxytocin would have no effect on bleeding from lacerations unless uterine atony was also present. Repair of lacerations was undertaken in 11 of the 14 PPH cases due to this cause, and manual removal of the placenta was performed for all six cases with retained placenta. Three women underwent surgery, and there were no maternal deaths.
- Providers managing the 42 cases of newborn asphyxia appeared to be well trained and able to take the correct actions. Almost all (38 of 42) resuscitated newborns were treated with suctioning of the mouth and/or nose as a first step. Twenty newborns received bag and mask ventilation and six of those received oxygen. In five cases, the providers failed to start or restart breathing and the newborns died.

HEALTH PROVIDER KNOWLEDGE

- Knowledge of routine labor and delivery practices was good (71% overall).
- Providers scored very poorly on the case study of pre-eclampsia/eclampsia (25% overall). Although most of the providers correctly diagnosed severe pre-eclampsia (83%) and knew the appropriate initial treatment (77%), only about one-third knew the correct treatment for convulsions and the ongoing management steps.

- The overall score for knowledge of signs of PPH, management of PPH (atony), and management of retained placenta was 43%. For management of PPH due to atonic uterus, most providers knew to administer a uterotonic (83%) and massage the uterus (79%), but knowledge of compression and other elements of care was much lower.
- The combined score for knowledge of signs and management of obstructed labor was 42%. Providers scored best on two interventions: calling a doctor (76%) and preparing for cesarean section (63%). Only about a third knew other specific steps.
- Knowledge of immediate newborn care practices and equipment was only fair (54%).
- Providers' knowledge of how to manage an asphyxiated newborn, as demonstrated in the newborn resuscitation case study, was very poor (mean percentage of 22%). Their knowledge of the initial steps to take, including stimulation and suctioning, was even worse (mean percentage of 14%).

8. RECOMMENDATIONS

Expectant women and their families anticipate a healthy pregnancy, a safe delivery, and a normal healthy baby who grows up well. Our survey findings suggest that the following changes are needed in Kenyan maternal and newborn health care in order to help curb morbidity and mortality within the course of pregnancy and childbirth.

1. Strengthen health systems by providing indicators to measure and compare the quality of maternal and newborn health care services provided at each level of health facility. Development of indicators and quality improvement activities should focus on the following recommendations:
    - The quality of maternal and newborn health care must be achieved and maintained by adhering to quality assurance standards.
    - Develop and distribute standard guidelines, procedure manuals, and job aids for maternal and newborn health care that are based on standard protocols (in line with ICPD, NRHS, WHO, and FIGO) and regularly updated.
    - Initiate and enhance regular clinical audits (in particular, maternal and perinatal death reviews) and build these into the performance management system. One measure that will ensure the quality of delivery services is to systematically review and adhere to international guidelines for audits.
    - Ensure consistent follow-up of corrective actions in the clinical and quality audits and feedback mechanisms on the reviews.
2. Make provider training and capacity building the pillar of maternal and newborn health care.
    - Increase recruitment of trained health workers to enhance coverage during the first 24 hours after delivery.
    - Strengthen basic pre-service education programs for all cadres of skilled health workers that provide care to pregnant women and in-service training programs for clinical care and service management.
    - Design mandatory in-service and routine staff development programs in order to improve skills and increase the use of preventive practices in both clinical care and service management (e.g., use of AMTSL to prevent PPH, correct use of the partograph to prevent prolonged labor by, and stringent infection prevention practices to prevent maternal and neonatal sepsis).

- Enhance supportive supervision and decentralization of reproductive health training, and further improve effectiveness of facilitative supervision as a functional unit of the performance management system.

3. Support a new policy direction in Kenya.
    - Increase budget allocation for the management and optimization of resources for maternal and newborn health in line with the national reproductive health policy to enhance the reproductive health status of all Kenyans by improving access.
    - Achieve resource mobilization by establishing linkages between reproductive health and all other sectors of development. This will enable a multisectoral approach to addressing the quality of care.
    - Integrate the provision and increase the availability of maternal and newborn health care at all levels to increase equitable access to reproductive health services.
    - Equip facilities appropriately to provide integrated maternal and newborn health care for normal and complicated deliveries.
4. Improvement of basic infrastructure for performance of EmONC signal functions.
    - Improve available infrastructure, supplies, and equipment to increase the quality of services. Specifically, increase the capacity of all delivery facilities to conduct the signal functions for basic emergency obstetric care to reduce maternal and newborn mortality in line with MDGs 4 and 5.
    - Ensure the availability of essential drugs for routine delivery care such as oxytocin and essential supplies such as soap and protective equipment for providers.

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