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Situation Analysis of Inpatient Care of Newborns and Young Infants

Rwanda

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The Maternal and Child Survival Program (MCSP) is a global, $560 million, 5-year cooperative agreement funded by the United States Agency for International Development (USAID) to introduce and support scale-up of high-impact health interventions among USAID's 25 maternal and child health priority countries,* as well as other countries. The program is focused on ensuring that all women, newborns and children most in need have equitable access to quality health care services to save lives. MCSP supports programming in maternal, newborn and child health, immunization, family planning and reproductive health, nutrition, health systems strengthening, water/sanitation/hygiene, malaria, prevention of mother-to-child transmission of HIV, and pediatric HIV care and treatment.

* USAID's 25 high-priority countries are Afghanistan, Bangladesh, Burma, Democratic Republic of the Congo, Ethiopia, Ghana, Haiti, India, Indonesia, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Nigeria, Pakistan, Rwanda, Senegal, South Sudan, Tanzania, Uganda, Yemen and Zambia.

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Abbreviations

BFHI	Baby-Friendly Hospital Initiative
CPAP	continuous positive airway pressure
ENC	essential newborn care
KII	key informant interview
KMC	kangaroo mother care
LBW	low-birthweight
MCSP	Maternal and Child Survival Program
MOH	Ministry of Health
NICU	newborn intensive care unit
NYI	newborn and young infant
SNCU	special newborn care unit
USAID	US Agency for International Development
WHO	World Health Organization

Background

Newborn lives can be saved and morbidity prevented by implementing an integrated health systems approach along the continuum of care that identifies high-risk newborns and provides timely, quality inpatient care.[1]

It is a global priority to increase the effective coverage and quality of key routine practices (known as essential newborn care [ENC]) in the care of the newborn, particularly at the time of birth and over the first hours of life, whether in the health facility or at home, and to build and strengthen care for small and sick newborns, which is much less developed.

It has been estimated that optimal supportive care in a hospital's Special Newborn Care Unit (SNCU) could avert 70% of newborn deaths due to preterm birth complications, and 90% could be averted with availability of hospital newborn intensive care units (NICUs).[2] A first step in the process of improving inpatient care of the newborn and young infant (NYI) is to understand the landscape of care through a situation analysis.

Rwanda's Ministry of Health (MOH), with support from the US Agency for International Development (USAID)'s flagship Maternal and Child Survival Program (MCSP), conducted a situation analysis of inpatient care of NYIs to identify gaps within the continuum of care and to establish the link between the needs of small and sick newborns and the capacity of the health system to respond accordingly. The situation analysis adapted protocol and tools developed jointly by USAID, Every Preemie–Scale, MCSP, UNICEF, the World Health Organization (WHO), University Research Co./Applying Science to Strengthen and Improve Systems Project, Saving Newborn Lives, the London School of Hygiene and Tropical Medicine, and the Global Health Supply Chain Program. The landscape analysis includes components of policy, implementation strategy, service readiness, and systems to support quality services and clinical practices.

Rwanda Country Profile

In Rwanda, child mortality rates fell from 196/1,000 in 2000 to 50/1,000 in 2015, but the reduction in newborn mortality[3] was slower, falling from 44/1,000 to 20/1,000 births during the same period.[4] Most recently, the institutional infant mortality rate[5] was 11/1,000 live births,[6] the perinatal mortality rate[7] was 29/1,000,[8] and the newborn institutional mortality rate was 10.03/1,000.[9]

The Demographic and Health Survey is expected to show decreases by 2020 that will highlight Rwanda's decreasing trend in mortality, which puts it on track to meet the newborn Sustainable Development Goal of a reduced newborn mortality rate of less than 12 deaths per

Box 1: Rwanda Birth Statistics

- Annual births: 370,000
- 91% facility birth rate
- 91% of births take place in the presence of a skilled birth attendant
- Preterm birth rate (babies born < 37 weeks): 12%
- Low-birthweight rate (babies born < 2,500 g): 7%

Source: Every Preemie–SCALE. Rwanda: Profile of Preterm and Low Birth Weight Prevention and Care. May 2019.

[1] Bhutta ZA, Das JK, Bahl R, et al. 2014. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? *Lancet*. 384(9940):347–70. doi: 10.1016/S0140-6736(14)60792-3.
[2] Moxon SG, Lawn JE, Dickson KE, et. al. 2015. Inpatient care of small and sick newborns: a multi-country analysis of health system bottlenecks and potential solutions. *BMC Pregnancy Childbirth*. 15 Suppl 2:S7. doi: 10.1186/1471-2393-15-S2-S7.
[3] Newborn mortality rate: number of deaths per 1,000 live births during the first 28 days of life.
[4] UNICEF, World Health Organization (WHO), World Bank, United Nations Population Division. 2012. *Levels and Trends in Child Mortality 2012*. Geneva: WHO.
[5] Infant mortality rate: the number of deaths per 1,000 live births of children under 1 year old.
[6] Health Management Information System (HMIS) 2017.
[7] Perinatal mortality rate: number of stillbirths and deaths in the first week of life per 1,000 total births.
[8] National Institute of Statistics of Rwanda, Ministry of Finance and Economic Planning, Ministry of Health (MOH), ICF International. 2015. *Rwanda Demographic and Health Survey 2014-15*. Kigali: National Institute of Statistics of Rwanda, Ministry of Finance and Economic Planning, MOH, and ICF International.
[9] HMIS 2017.

1,000 live births by 2030. Despite this success, newborn mortality still accounts for 62.7% of infant mortality and contributes 40% of Rwanda's under-5 mortality.[10] The top causes of newborn death in Rwanda are prematurity (36%), birth asphyxia (35%), and newborn infection (10%).[11]

As seen in Box 1, Rwanda has approximately 370,000 live births per year. However, nationally, it has just four NICUs, one neonatologist,[12] 18 newborn nurse specialists, and no pediatric ophthalmologists.[13] The MOH reports staffing needs for select staff types (doctors, nurses, midwives) in district hospitals only, and these estimates reveal a deficit of over 13,000 clinical staff.

Rwanda's National Strategic Plan for NYIs, included within the National Plan/Strategy for Reproductive, Maternal, Newborn, Child, and Adolescent Health, includes expanding/improving care for NYIs in general and specifically for inpatient services, filling gaps in services for inpatient care of NYIs that should be available, and addressing staffing and capacity development plans for NYI inpatient care. Specific, documented strategies for improving inpatient NYI care include service planning by facility type/level of newborn care services and a quality improvement strategy for NYI inpatient care.

Relevant national guidelines/protocols on prenatal interventions, ENC, newborn assessment, and routine monitoring of NYI patients include most key topics, but some were missing, including minimal mother/child separation and maintaining a low stimulation environment (low light/noise), both of which have key implications for nurturing care and are important for the neurodevelopmental outcomes of small and sick newborns.

The MOH is working with national and international partners to build a strong foundation for successful newborn programming with national policies, guidelines, drugs, and equipment lists and specifications that promote appropriate NYI services. Routine monitoring of newborn indicators and efforts to use the data to address identified issues, such as training gaps, contribute to an informed and responsive platform for NYI service promotion.

[10] Rwanda MOH. 2018. *Fourth Health Sector Strategic Plan, 2018-2024*. Kigali: MOH.
[11] Rwanda Biomedical Center (RBC). 2016. *Annual Maternal, Newborn and Under Five Death Audit Report 2016*. Kigali: RBC.
[12] At the time of publication (September 2019), Rwanda was reported to have two neonatologists.
[13] Situation Analysis of Inpatient Care of Newborns and Young Infants in Rwanda 2019; Results Tables. Tool 1, National Profile, Table 1.7: National staff need and availability.

Methodology

This assessment uses a framework based on six building blocks defined by WHO for well-functioning health systems[14] to assess the health system as it relates to care for the small and sick newborn at national and subnational levels. The framework for assessing information at the facility level is based on the WHO *Standards for Improving Quality of Maternal and Newborn Care in Health Facilities*,[15] including evidence-based interventions.

Tools and methods for the assessment build on international experiences in collecting information on availability and readiness to provide services, systems to support quality services, and quality of services provided. These include the Service Provision Assessment, the Service Availability and Readiness Assessment, Comprehensive Emergency Obstetric Care survey tools, and the Every Mother Every Newborn facility assessment (UNICEF). In addition, the content of the tools and the analysis plan are informed by multiple stakeholders, particularly recent assessments and lessons learned by Every Preemie–SCALE, MCSP, the London School of Hygiene and Tropical Medicine, and the Applying Science to Strengthen and Improve Systems Project.

Objective

To assess policies, implementation strategies, services readiness, and health systems related to inpatient care of NYIs (0–59 days old) in Rwanda.

Study Design

The health facility-based situation analysis employed qualitative and quantitative data collection methods, including:

1. Document review
2. Key informant interviews (KIIs) at the national, regional, and facility levels
3. Facility assessments

The purposeful sample of 15 public and private facilities offering inpatient care for NYIs (0–59 days old) was selected by the MOH with approval from the Rwanda National Ethics Committee. Public facilities were prioritized for inclusion, with an attempt to sample at least one hospital at each service level along the referral continuum. The sample included one national referral hospital, two provincial referral hospitals, and 10 district hospitals from Rwanda's five provinces, and two private clinics from Kigali.

In early 2018, a team of Rwandan newborn specialists, including the study principal investigator and technical advisors supporting the assessment, reviewed and adapted the tools designed for multicountry use to fit the Rwandan context. This involved editing the tools to include the Rwandan terminology for various cadres of health workers involved in the provision of NYI services, the names of NYI equipment used in Rwanda, and to correctly represent the structure of the Rwanda health service in presenting the health system. For example, the health system in Rwanda is decentralized, and though the health system consists of national, provincial, and district levels, the districts manage their own health services. As such, the Tool 4: Interview with Regional-Level Management Personnel was adapted to target district-level directors of health as respondents, rather than those at the regional level.

[14] (1) Health services; (2) health workforce; (3) health information system; (4) medical products, vaccines, and technologies; (5) health financing; (6) leadership and governance; and (7) community engagement.

[15] (1) Evidence-based management of complications; (2) actionable information systems; (3) functional referral systems; (4) effective communication with women and families; (5) patients/caretakers treated with respect; (6) emotional support for parents/caretakers of newborn (7) competent, motivated staff; and (8) infrastructure, environment, and resources to provide care.

Data collection, using the adapted tools (Health Facility Assessment, Interview with Health Care Providers, Interview with Parents/Caregivers, and Interview with Regional-Level Personnel) took place from June 18–July 10, 2018. During this time, one co-investigator conducted KIIs at national and district levels with individuals informed in national-level policies and programs related to inpatient care for NYIs, and a team of four data collectors and two data managers conducted the 15 facility assessments to ensure consistency and comparability of data.

Box 2: List of Tools 1–9

1. National Profile
2. National Guidelines
3. Interview with National-Level Personnel
4. Interview with District-Level Personnel
5. Health Facility Assessment
6. Patient Record Review
7. Health Information Reports
8. Interview with Health Care Providers
9. Interview with Parents/Caregivers

Table 1: Numbers of parents and providers interviewed by province and facility type

		Number of parents interviewed	Number of providers interviewed
#	**KIGALI**		
1.	Private Clinic	0	2
2.	District Hospital	3	2
3.	Private Clinic	3	2
4.	District Hospital	3	2
	NORTH		
5.	Provincial Referral Hospital	3	2
6.	District Hospital	3	2
	SOUTH		
7.	National Referral Hospital	3	2
8.	District Hospital	3	2
9.	District Hospital	3	2
	EAST		
10.	District Hospital	3	2
11.	District Hospital	3	2
12.	District Hospital	3	2
13.	Provincial Hospital	3	2
	WEST		
14.	District Hospital	2	2
15.	District Hospital	3	2
	TOTAL	**41**	**30**

Data Analysis

Data were collected using paper tools and electronic devices. Electronic data collection was conducted with the SurveyCTO app on Android tablets (Tools 4, 6–9). Data for the remaining tools were collected on paper and manually entered into Epi-Info (Tool 5) or Excel (Tools 1–3). SPSS 24 (IBM Corporation) was used for all quantitative data cleaning and analysis.

Descriptive analysis (frequencies, means, and cross-tabulations) was conducted for all variables by tool. When appropriate, scores or indices were created and are described in table footnotes.

All data were aggregated but stratified by site, type of facility, and province. A cumulative logit model was used to estimate whether the ratio of patients to nurses was a predictor of caregiver perceptions of care.

For open-ended responses recorded in interviews with caregivers and providers, qualitative analysis was used to identify patterns and trends. All responses were read and summarized according to emergent subthemes.

Challenges and Limitations

- As the facilities were not randomly selected, the results are not generalizable to all facilities providing care for small and sick newborns in Rwanda. They do, however, provide evidence on the range of facility-level service development for NYI care. This information is expected to be useful for program planning.
- It may have been more effective to only interview caregivers who are about to be discharged or who had recently been discharged to ensure that positive reports of care were not offered out of fear of retaliation for poor feedback while NYIs were still inpatients.
- Facility 7 had no inpatient NYIs on the day of data collection, which prohibited completion of significant portions of the tools, such as the parent/caregiver interviews.
- The Tool 4 interviews with the district-level directors of health were compromised by the limited time the interviewees had to spare.

Results

The report presents a concise analysis of key results from Rwanda's situation assessment of inpatient care of NYIs and presented according to the assessed themes listed in Box 3.

Detailed data tables for each tool, listed in Box 2, are available as an addendum to this analytical report.

Box 3: Assessed Themes

1. Newborn and young infant (NYI) units infrastructure
2. NYI services
3. Provision of care: human resources
4. Commodities for newborn services
5. Management services
6. Monitoring and evaluation
7. Quality of care
8. Infection prevention
9. Referrals
10. Discharge planning
11. Parental support
12. Experience of care

NYI Units Infrastructure

In Rwanda, NYI inpatient care services are provided through NICUs,[16] SNCUs,[17] basic care units,[18] and kangaroo mother care (KMC) units[19] at national and subnational levels. Table 2 presents the total number of government and private facilities offering each level of service.

Table 2: Number of Facilities Offering Each Level of Service

Level of Service	# Government Facilities	# Private Facilities
NICU	3	1
SNCU	47	2
Basic Care Unit	47	5
KMC Unit	47	2

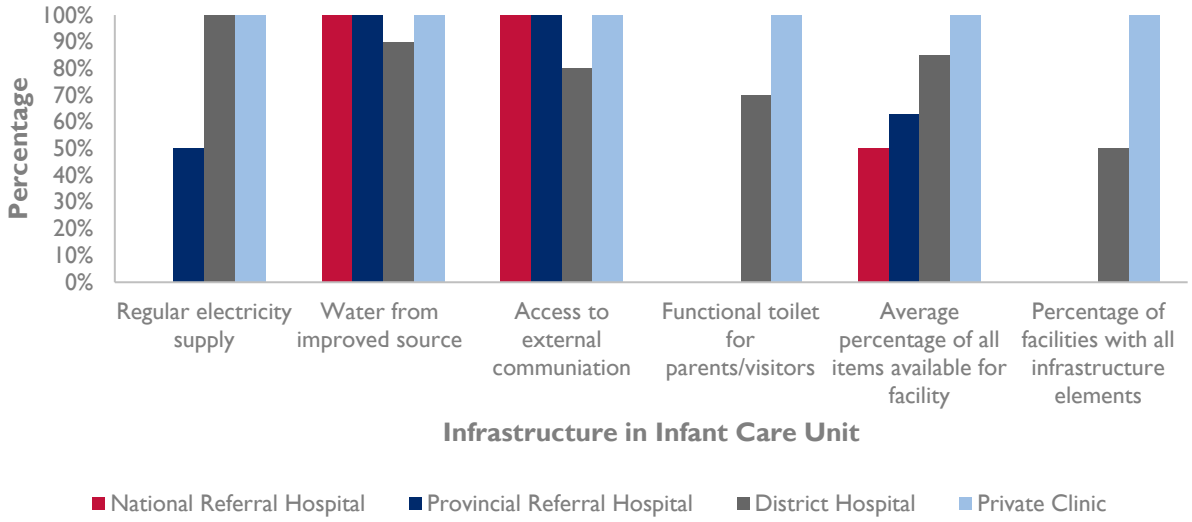
For this situation assessment, the highest level of infant care unit in the 15-facility sample was the SNCU. None of the assessed facilities included a NICU, but all facilities, except Facility 7, had KMC units, as defined by the facility respondent.

Only two (15%) of the 15 facilities had units to receive NYI inreferrals: one district hospital and one private clinic. Both had emergency rooms, but neither had outpatient clinics. Only the district hospital was open 24 hours, during which time a doctor was always on site. Neither clinic had a 24-hour on-call doctor for the unit.

As described in Figure 1, most infant care units (87%) had regular electricity except the national referral hospital, which has the highest patient burden. Water from an improved source was confirmed in 93% of the facilities. Functional toilets for parents/visitors were available in 60% of facilities. Family-centered care relies upon the involvement of the caregiver in the treatment of the NYI and therefore requires infrastructure at the facility level that allows affordable, comfortable accommodation for accompanying family members.

[16] NICU: provides higher level of service with continuous monitoring of sick infants who are considered in critical condition. A neonatologist is ideally available 24 hours.
[17] SNCU: provides various services for moderately sick infants with less intensive monitoring than in a NICU. In many facilities, this will be the highest-level unit available for NYIs.
[18] Basic Care Unit: provides care for NYIs who are not critically ill or often those who were critical but have improved and are almost ready for discharge.
[19] KMC Unit: provides beds for the mother or another person and for small and stable infants to practice KMC (skin-to-skin care, breastmilk feeding, early discharge, and follow-up).

Figure 1: Infant care unit infrastructure by facility type (N = 15)



All of the sampled facilities had a backup source of electricity available (generator or solar power) that met all unit needs, including general lighting and equipment. There were some chairs available in which mothers could breastfeed or provide skin-to-skin care (47%), but none of the facilities had enough chairs for each mother. No chairs were provided for mothers in the national referral or provincial hospitals. Generally, the chairs that were available could not be easily positioned for privacy (0%).

NYI Services

In this section, high-impact, evidence-based interventions proven to improve outcomes for small and sick newborns are discussed. Table 3 provides the summary information on the percentage of the intrapartum services that are available in the sampled facilities. By facility type, the private clinics scored the lowest on providing the listed services.

Table 3: Average percentage of services and interventions reported in facilities (N = 15) for indicated areas

Background characteristic	Intrapartum interventions for fetus[1] (5 Items)	Conditions diagnosed and treated[2] (9 Items)	Routine newborn screening for congenital conditions[3] (5 items)	Practices for infant safety[4] (4 Items)	Interventions for sick newborn[5] (4 items)
Percentage	71	84	9	92	75

[1] Antenatal corticosteroids, magnesium sulfate for premature labor, magnesium sulfate for fetal neuroprotection, antibiotics to prevent fetal infections, ultrasound to determine gestational age.
[2] Diagnose/treat severe newborn infections, provide antibiotics, diagnose/treat newborn respiratory distress/disorders, detect/manage hypothermia, detect/management hyperbilirubinemia, diagnose/treat seizures.
[3] Birth defects, surgical repair blood tests (e.g., hypothyroid, phenylketonuria, cystic fibrosis, hypoglycemia), assess hearing, screen for retinopathy.
[4] Thermal management, feeding, and lactation support; wash hands between infants, one infant per cot.
[5] Oxygen administration, fluid management, alternative feeding, exchange transfusion.

Table 4 presents the specific services for NYIs available at the sampled facilities by facility type.

Table 4: Percentage of facilities (N = 15) with practices for providing specific services for newborns and young infants (NYIs)

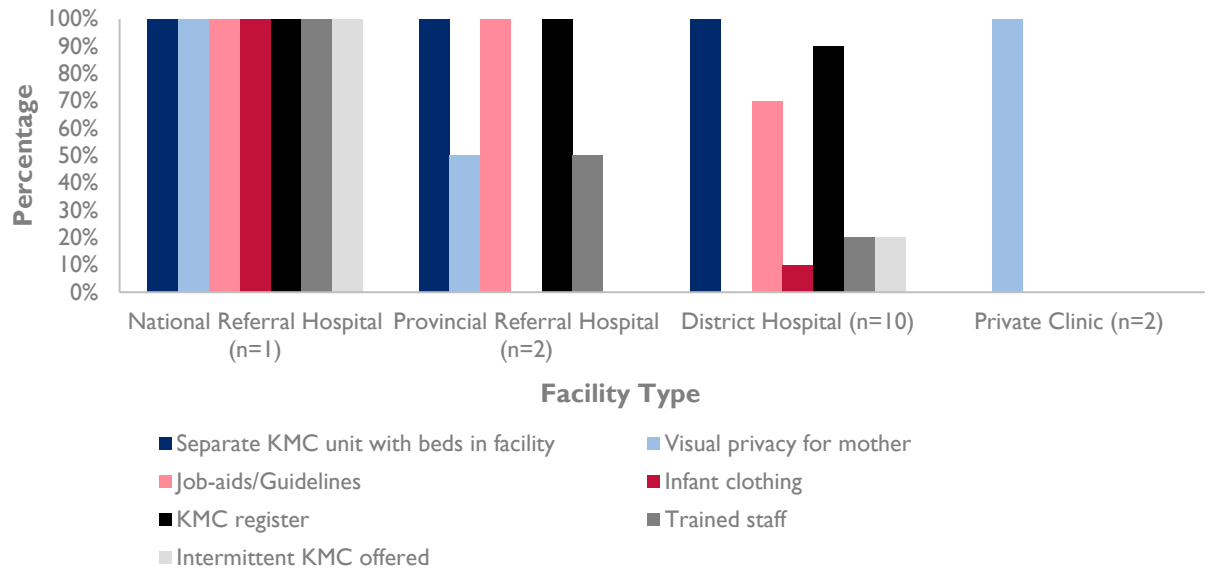
NYI Service Available	National Hospital	Provincial Hospital	District Hospital	Private Clinic
Diagnosis and treatment for specific conditions				
Diagnose sepsis/severe bacterial infection.	100	100	80	100
Provide antibiotics for newborn infections.	100	100	100	100
Diagnose newborn respiratory distress/disorders.	100	100	100	50
Treat newborn respiratory distress.	100	100	90	50
Detect and manage hypothermia.	100	100	100	100
Detect hyperbilirubinemia.	100	100	90	50
Manage hyperbilirubinemia.	100	100	100	50
Diagnose/investigate cause of seizures.	100	0	0	0
Treat seizures.	100	100	80	100
Assess newborn hearing.	0	0	0	0
Screen for retinopathy of prematurity.	0	0	0	0
Basic interventions for NYIs				
Thermal management	100	100	100	50
Feeding and lactation support	100	100	100	50
Handwashing between infants	100	100	100	50
Advanced interventions for NYIs				
Administer oxygen.	100	100	100	100
Provide IV fluids.	100	100	100	100
Provide alternatives to breastfeeding.	100	100	100	100
Exchange transfusion.	0	0	0	0

KMC: KMC is an evidence-based approach to reducing mortality and morbidity in preterm infants, defined by WHO as prolonged skin-to-skin contact between mother and infant, exclusive breastfeeding, early discharge with follow-up, and support. KMC is routine in all facilities but one (93%). The observed conditions for KMC (Figure 2) were far better established in the government facilities (particularly the national referral hospital) than the private facilities, which lacked all aspects of KMC resources, and service conditions bar privacy for the mother.

The private clinics' failure to promote KMC reinforces the damaging misconception of KMC as a lower-quality option than incubator care for preterm and low-birthweight (LBW) babies, or "poor man's medicine." Despite research evidencing the benefits of KMC in rich and poor settings, uptake has been slow due to multiple barriers, including misperceptions among health communities that KMC is substandard care. A joint statement[20] released in 2017 by six major health professional associations, including the American Academy of Pediatrics, endorsed KMC for all settings in an attempt to dispel this belief. Of 140 small/premature babies identified in the 15 facilities on the day of assessment, only 42% (59) were receiving skin-to-skin treatment through KMC.

[20] 2016. Kangaroo Mother Care Joint Statement. https://www.healthynewbornnetwork.org/resource/kmcjointstatement/.

Figure 2: Kangaroo mother care (KMC) resources and service conditions (N = 15)



Breast milk feeding: Only five facilities (33%) had policies in place to encourage the exclusive use of breast milk, but all 15 offered alternative feeding opportunities for infants unable to breastfeed, and 60% had guidelines/job aids available on alternative feeding. No facilities offered milk banking/donor breast milk.

Each of the sampled facilities offered alternative feeding opportunities for infants who cannot breastfeed. Infant weight scales were observed in each facility. Paladai cups were not observed, but the cup and spoon were means for providing alternative feeding in 67% of facilities. Nasogastric tubes were mostly available in the following tube sizes: 4 or 5 (73%); 6, 7, or 8 (100%); and 9 or 10 (47%).

Functional manual breast pumps were available in 67% of the facilities, and 40% had functional electronic breast pumps. Each facility had a refrigerator for storing breast milk, but only 50% had the means for labeling containers for storing breast milk, and only 7% had containers for storing breast milk.

Eighty-five percent of NYI mothers were currently breastfeeding without problems, and 89% reported having sufficient privacy and a comfortable location to do so. Five mothers (12%) had not been offered support for breastfeeding by facility staff. One of these five mothers reported supplementing breast milk with breast milk substitute. Though the vast majority (98%) of NYIs were being fed breast milk (breastfed or expressed milk), 85% of all mothers surveyed reported out-of-pocket costs for breast milk substitute. Given the lack of evidence of breast milk substitute feeding at such a level, it is unclear whether the purchased breast milk substitute was used or whether the purchase was repeated. This is an anomaly in the context of other results and requires additional investigation.

Of 140 small/premature babies identified in the 15 facilities on the day of assessment, just 24% were receiving feeding support to improve the effectiveness of breastfeeding/alternatives to breastfeeding.
Severe bacterial infection: Though less accurate, diagnosis of severe infection is most commonly made by clinical assessment (80%) rather than by blood cultures. The 20% of facilities (the national referral hospital, one of the two private clinics, and one of the 10 district hospitals) that did report use of blood culture also used antibiotic sensitivity testing. Facilities would "always/sometimes" provide a one-dose injectable antibiotic and then refer NYIs with symptoms of severe infection. It is unclear why referral was provided as an option since all of these facilities had inpatient care. The assumption is it is due to lack of confirmatory diagnostic abilities in the facilities surveyed.

Respiratory distress: Each facility had infant bags and masks for preterms and newborns, but only eight of the 15 facilities (53%) reported seeing infants with symptoms of respiratory distress. Of these eight, 50% report immediately referring the patient to a higher level of care (NICU) without further assessment; 63% resuscitate if needed, then refer without other assessment; 100% provide oxygen if needed; 88% administer continuous positive airway pressure (CPAP) if needed; but none intubate and use ventilator, which indicates that the facilities cannot support longer ventilation (usually found in a NICU) if needed. All facilities had functional pulse oximeters, but only one facility used oxygen saturation to diagnose respiratory distress. The rest rely upon clinical assessment using signs and symptoms (e.g., grunting or chest inspiration).

Seizures: Only 20% of facilities report seeing infants with seizures; of these, 33% immediately refer the patient without further assessment or treatment. Sixty-seven percent provide one dose of injectable drugs for seizure control, then refer. The only reported diagnostic method was clinical assessment.

Hyperbilirubinemia: Ninety-three percent of the facilities provide services for hyperbilirubinemia. Of these, all have available and functional phototherapy lights (100%), and 93% can conduct ABO compatibility tests, but only 21% have masks for infants' eyes. Methods available for bilirubin assessment included quantitative serum bilirubin (93%) and transcutaneous bilirubin (71%).

Provision of Care: Human Resources

Rwanda's lack of skilled NYI service providers is problematic. Both national and district key informants reported insufficient numbers of skilled workers, medical and nursing/midwifery staff, and staff who are unwilling to be posted where needed, in addition to high staff turnover and low motivation. There is a widespread lack of specialized staff, such as neonatologists. Such need is currently not accurately captured by the MOH's human resource for health structure, under which neonatologists, newborn surgeons, and pediatric ophthalmologists are counted together under the term "specialists" or "other medical doctors."

The units caring for the sickest infants in the 15 visited facilities reflected the national and subnational KIIs' understanding of the human resource situation. The facilities had, in total, one newborn nurse specialist and 56 nurses/midwives scheduled to work a 24-hour shift (an average of 3.7 staff per facility). The ratio of patients to 24-hour nurse/midwife staffing was an average of 4.6, ranging from 1.0 at the national referral hospital to 8.5 at a district hospital. None of the sampled facilities had a neonatologist/newborn surgeon. The most common specialist on staff was a pediatrician, seen at 67% of the facilities, followed by a newborn nurse specialist (33%).

Fourteen facilities had experienced unexpected staff shortages more than four times in the past month and would fill such unexpected gaps by pulling staff from other units (64%), calling in off-duty staff (21%), "making do" with those present (93%), or not allowing working staff to take breaks (7%).

When staff are newly hired or rotated to work in the sick NYI unit, routine practice (defined as at least half of the time) includes assigning new staff to work with experienced staff (93%), not assigning new staff to the sickest patients (87%), providing trainings (60%) before starting (the topic of the training was not confirmed), or training while working in the unit (87%).

Most of the reported in-service training took place within the previous 12 months and included capacity-building on nationally approved modules of ENC; newborn protocol; and the Emergency Triage Assessment and Treatment protocol that includes newborn resuscitation and the feeding of preterm babies.

All NYI service providers should receive periodic refresher training in newborn resuscitation, including practice on a manikin. In the past year, 47% of staff had received training on newborn resuscitation, of which 85% reported practice on a manikin. Only 13% of respondents confirmed that all facility staff had received training on advanced care for small and sick newborns. No staff had received training in the past year on how to counsel parents on infant death.

Commodities for Newborn Services

The procurement of essential commodities is decentralized, and orders are handled at the hospital and district pharmacy levels. As such, the MOH is not alerted to stock-outs of essential commodities until they are reported. Three district stakeholders reported district-level shortages of essential NYI commodities in the past 12 months. The shortages were not due to forecasting error or delays but, given the decentralized nature of procurement, were attributed to insufficient local funds to fill the gaps. There is no central department that reviews facilities' drugs and equipment orders in the context of the essential list of drugs or protocols and standards, and it was reported that there is no coordination among the facilities, the district pharmacies, and the MOH's center of procurement.

Drug procurement: The observed national drug procurement policy includes NYI drugs. Essential newborn commodities are included on the essential drugs list, to which government facilities are required to adhere. Drug quality standards are required for procurement and apply to both government and private facilities. A monitoring system exists to validate the quality of procured drugs, and bidding guidelines are in operation. In practice, however, it was mentioned that essential drugs for newborns are often sidelined by procurement departments.

Equipment procurement: The national equipment procurement policy includes equipment for NYI care. Bidding guidelines are in place, and equipment specifications exist for major pieces of NYI equipment, such as incubators and radiation heaters, as well as newborn resuscitation bags. The MOH recently rolled out the Medical Equipment Management Maintenance System, which standardizes hospitals' inventories of equipment and collates reports of equipment functionality.

Maintenance and repair: Each facility was considered responsible for managing and arranging routine maintenance or repair for its equipment, and most were able to pay for the work with petty cash. None of the facilities included funding for equipment parts in their purchase plans, but some districts budgeted for parts at the facility/district level. The district in the south was the most effective in terms of budgeting for and facilitating NYI equipment maintenance for incubators, radiant warmers, and CPAP equipment, but more significantly, it was the only district to have a capable maintenance person. No personnel exist at the district and regional levels who are qualified to maintain and repair radiant warmers, incubators, and CPAP equipment. The upkeep of NYI equipment is reliant on coordination at the national level, which poses a significant challenge to the facility teams trying to regularly maintain and repair equipment. This reveals a crucial gap, which should be addressed at the national level if the districts are to continue to bear the responsibility for the maintenance and repair of their facilities' equipment.

All 15 facilities possessed incubators, radiant warmers, and infant weighing scales for NYI services. Only 14 had phototherapy equipment, 12 had micro-infusion pumps and CPAP equipment, and seven had oxygen concentrators. Over 90% of the facilities had a functional incubator; of these, 40% had temperature probes, 93% had phototherapy lamps, 67% had multisign physiologic monitors, and 13% had respiration monitors. All 15 facilities provided oxygen, which is crucial for the correct use of a CPAP machine (a form of ventilator): 47% had centrally piped oxygen, and 80% had oxygen tanks stored on site. Oxygen was consistently available in all facilities over the past 3 months and was available on the day of assessment. Though Rwanda has a national oxygen policy, the responsibility for procurement and supply rests at the facility level. There is an insufficient number of oxygen producers, concentrators, and tanks, and it is recommended that oxygen plants be established in each province. Each of the respondents believed that the primary level of responsibility for procurement and supply of oxygen lay with the facilities. Two regional key informants said that the availability of oxygen concentrators and tanks is problematic. Another felt that the oxygen is too expensive compared with what the patients pay for it.

Management Systems

Management activities within the previous 3 months included external supervision of newborn care (80%), management team meetings (20%), interdisciplinary team meetings (20%), and budget management (e.g., budgeting, approving procurements, or reporting on accountability of funds) (80%).

External supervision helps to ensure that standards are followed across facilities. They are often in a position to ensure that systemic issues can be brought to the attention of higher-level decision-makers. Each facility confirmed that it had received external supervision relevant to NYI care within the past 6 months: 27% reported supervision the month of the assessment, 53% within the past 2–3 months, and 20% in the past 3–6 months.

The provider interviews confirmed that 24 (80%) had been personally supervised during the previous 3 months. In all cases, supervision was external, coordinated by the MOH or the Rwanda Biomedical Center, which has a directorate in charge of maternal and child care, and monitors all health facilities on a regular basis. Supervisions include observation of work (100%), use of a checklist (96%), discussion of: communication with the parent of the NYI (58%), recordkeeping (100%), equipment maintenance/adequate supplies (58%), patient care (100%), and staff motivational issues (75%).

Eighty percent of the facilities reported having no management team in place responsible for addressing NYI services. Only three NYI management teams were identified: one (7%) at the facility level, and two (13%) at the specific unit or department. Each had met most recently within 1 month, and the discussions had included cases resulting in deaths (67%), clinical care (100%), nursing care (100%), staffing numbers or skills (67%), consumable resources, (67%), equipment/diagnostics (100%), and finances (67%).

Interdisciplinary team meetings are expected to improve coordination and identification of needs, and result in better planning and smoother teamwork for any particular patient. In addition to clinical and nursing care, other disciplines may be helpful in coordinating immediate service needs and follow-up services after discharge. Interdisciplinary management teams were in place at 47% of the facilities; 86% had met in the past 3 months. Participants included clinical staff: medical (86%), nurses/midwives (100%), nutritional (43%), and other technical staff (e.g., laboratory; 71%). Nonclinical participants included social services (71%) and managers (100%). No community-based workers or parent/family representatives took part in the team meetings.

Of the 15 facilities, 80% (government facilities, not private clinics) confirmed the NYI unit had authority over some aspect of the facility budget. Of the facilities with budgetary authority, 100% reported being able to contribute to budget preparation and procurements (requests for drugs, commodities, and equipment), 92% confirmed they could request additional funds, 58% could negotiate the budget, 17% prepared reports on funds, and 8% were able to authorize procurement.

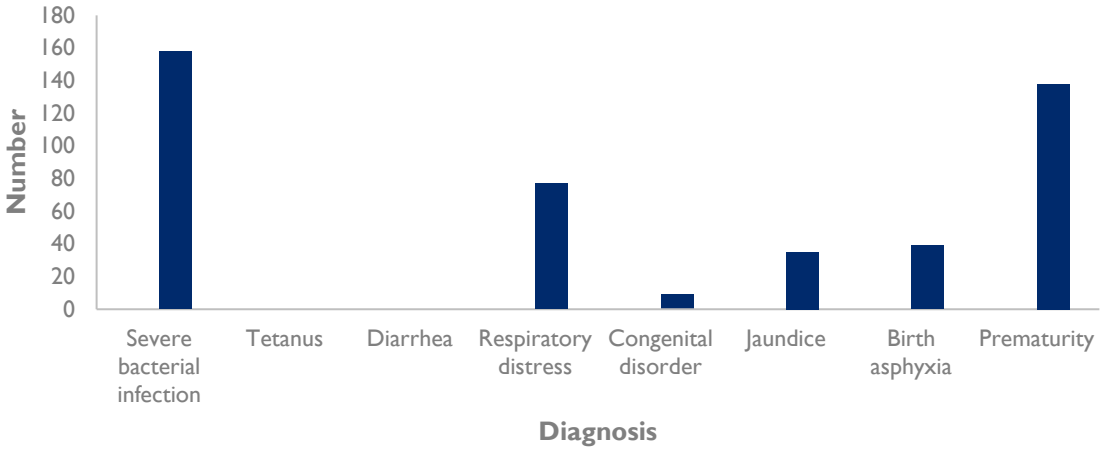
Monitoring and Evaluation

All facilities monitor and report indicators to the district-level MOH on LBW, livebirths with birth asphyxia requiring resuscitation, facility births with newborn sepsis, and inpatient infant deaths by cause. Only one facility monitors indicators on very LBW babies (< 1,500 g) and very preterm babies (less than 32 weeks of gestational age). Ninety-three percent of facilities use standardized sets of forms to record the patient's medical records, but over half of the facilities reported stock-outs of patient charts in the previous 3 months.

Most facilities conduct and document newborn assessments (Apgar score: 79%, additional newborn assessment: 79%), history (79%), and physical status (86%), but ongoing, routine monitoring is less adhered to (48%). The facilities make a daily progress note on the patients' conditions, but the more time-intensive recordings (e.g., number of times the infants urinated each day) are irregularly monitored (32%). This most likely results from staff shortages.

Diagnoses: As described in Figure 3, the 72 medical records reviewed by the data collection team on the day of assessment at the 15 surveyed facilities identified the three most common primary and secondary diagnoses as severe bacterial infection (158), prematurity (138), and respiratory distress (77). Before 2015, newborn death audit reports identified birth asphyxia as the top cause of newborn death, so the lower number of asphyxia diagnoses suggests improved treatment at the facility level, despite reports that only 47% of staff had received training on newborn resuscitation in the past year.

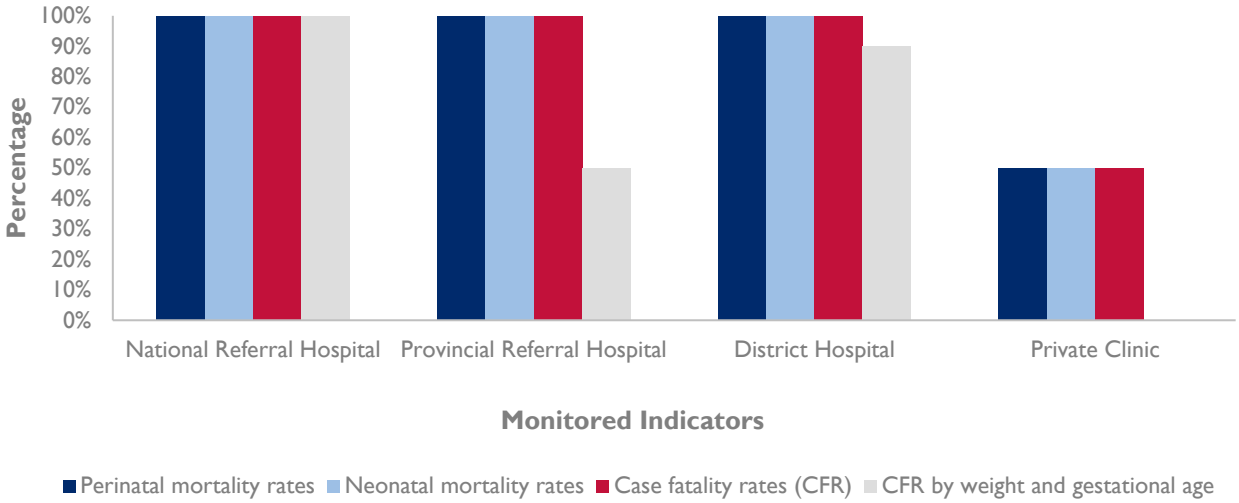
Figure 3: Inpatient newborn and young infant diagnoses from 72 reviewed medical records at 15 surveyed facilities



Quality of Care

All facilities routinely monitor quality of care indicators (Figure 4), but less than half hold routine meetings to review the findings. The monitored indicators were reported most consistently at the government facilities, despite both private and government facilities being required to report to the DHIS2.

Figure 4: Percentage of facility types monitoring quality of care indicators (N = 15)



As included in Rwanda's national guidelines for the maternal, perinatal, and newborn death audit process, including the review and use of results, perinatal death reviews[21] or newborn death reviews[22] took place at 93% of the facilities, but less than half of the facilities (47%) conducted patient case reviews.[23]

[21] Perinatal death reviews include stillbirths and infants who were born alive but died within 7 days. Rwanda's HMIS disaggregates fresh and macerated stillbirth. The definitions are detailed in the *Rwanda Health Indicator Reference Manual* (January 2016).

[22] Newborn death reviews include infants born alive who die within the first 28 days.

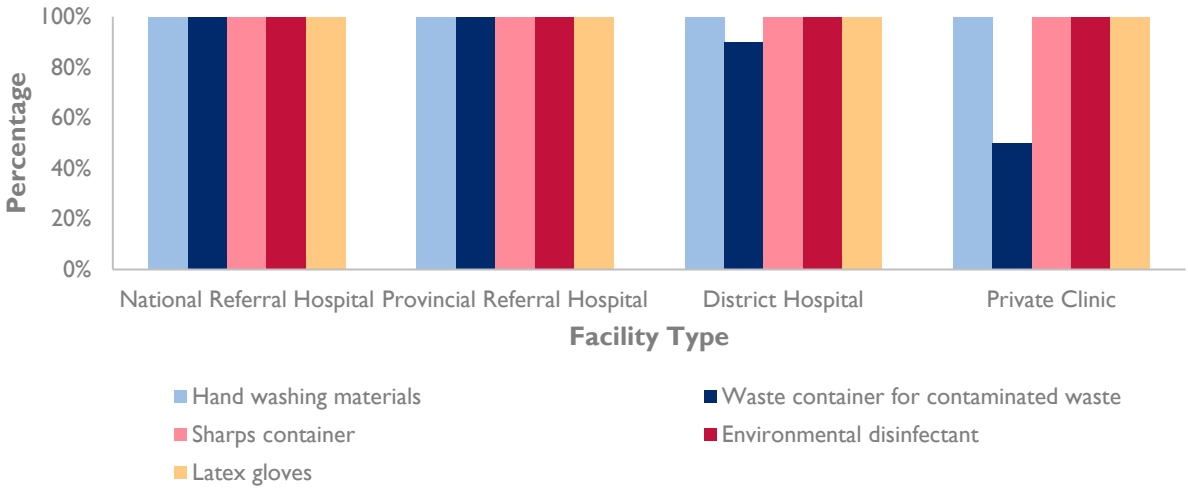
[23] A case review is a formal meeting where information about a current or discharged patient is presented, usually by the primary doctor for that patient, and issues related to diagnosing, treating, and improving the outcome are discussed. Suggestions from peers are sought.

Rwanda promotes accreditation, but only one of the 15 facilities (7%) was designated Baby-Friendly. This underlines an opportunity for the wide-scale rollout of WHO's Baby-Friendly Hospital Initiative (BFHI).

Infection Prevention

The availability of infection control supplies in the service areas where NYIs are treated (or immediately adjacent so that the service provider could reasonably be expected to use them with or in between seeing patients) was impressive. As described in Figure 5, the facilities had all necessary supplies aside from a container for contaminated waste, which was seen at 87% of facilities.

Figure 5: Infection control items in the highest level of infant care unit by facility type (N = 15)



Referrals

Outreferrals: All 15 facilities refer NYIs out when necessary to facilities known for better inpatient care, including the national referral hospital, though this is not a standard referral pathway. All facilities use registers to record outreferrals and accompany the patient with information on printed referral forms. Ninety-three percent of facilities had an ambulance for patient transport. Of these, 100% had fuel available for its use. Seven percent used a vehicle from another facility within 30 minutes that can be called to transport patients.

During outreferrals, family members always accompany the infant, and 93% of the time, a doctor or nurse will too. None of the facilities used transporter incubators; only 27% of facilities transfer the patient in skin-to-skin position.

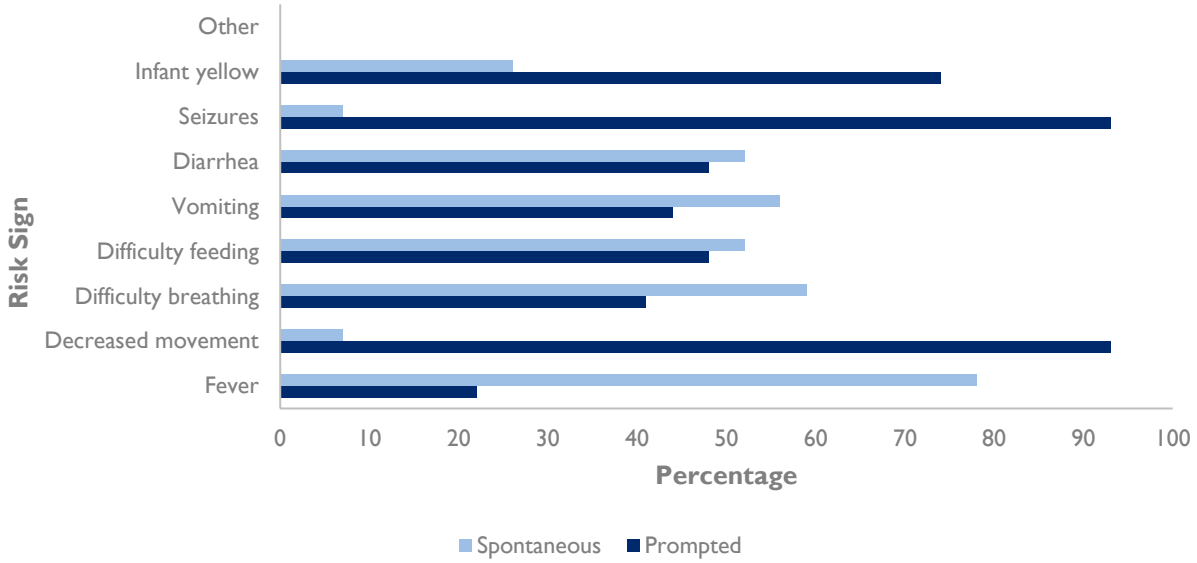
Inreferrals: Only two (15%) of the 15 facilities had units to receive NYI inreferrals: one district hospital and one private clinic. The fragility of NYI patients requires a rapid assessment (< 15 minutes of arrival) to enable a prompt start to treatment, but both facilities confirmed that infants were sometimes not assessed within this window (e.g., if the infant did not appear seriously ill).

Discharge Planning

Systems for planning NYI discharges were observed in 87% of the facilities (no private facilities). Of 41 interviewed NYI caregivers, 90% knew they could seek help at a local facility postdischarge, but only 46% knew that they could benefit from home visits by health workers, and just 2% knew that facility staff could telephone them to check on the infant postdischarge. None knew of any postdischarge financial support available to them, nor any emergency telephone numbers to call for help.

There is a clear need to strengthen discharge planning, follow-up care, and postdischarge services to include scheduling home visits. The distribution of materials describing postdischarge danger signs would be an important component of predischarge counseling, given the low level of awareness by caregivers described in Figure 6.

Figure 6: Postdischarge risk signs identified by caregivers (N = 27)



Parental Support

NYI best practice encourages the close involvement of parents (particularly the mother) with infant care, but expenses can be prohibitive. Of 41 interviewed mothers of inpatient NYIs, 88% reported out-of-pocket payments for the cost of care. Though each facility offers space where accompanying parents can sleep and cook, financial support offered by the national government covers the costs of services for the babies only with limited, financial help available to support the cost of the families' stay.

The expenses most commonly reported related to infant care included medicine, diapers, breast milk substitute, and additional items for the infant. Overnight accommodation, food, and transport to and from the facility were the most commonly reported types of expenditure not directly related to infant care.

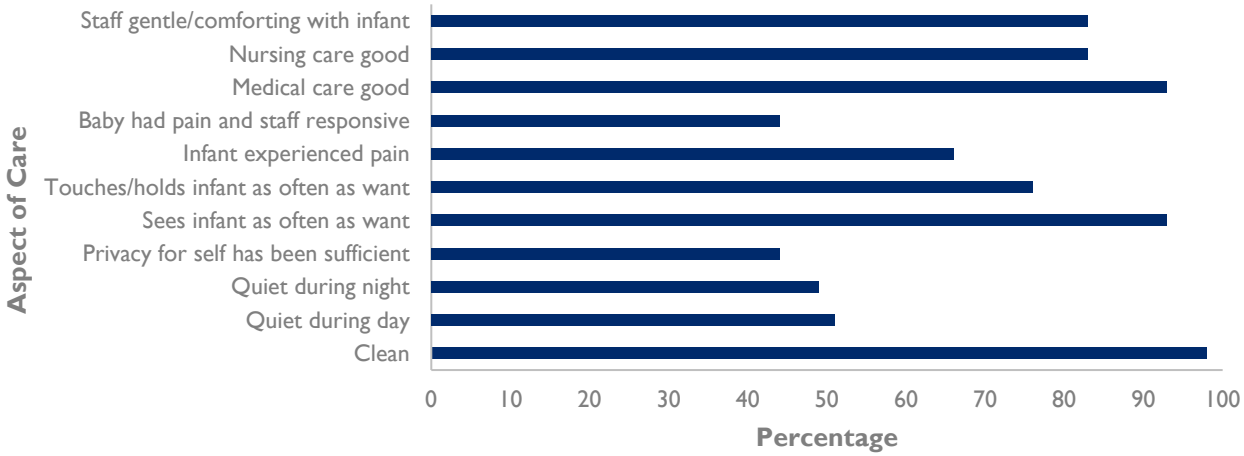
Experience of Care

Though mothers reported positive experiences of care by doctors and nurses, they also reported that communication was inadequate, privacy was lacking, and staff did not respond sufficiently when infants were in pain, suggesting that the experience of care was not as positive as reported. Since caregivers were interviewed while their NYIs were still inpatients, their responses may have been tempered by concern that any criticism may invoke retaliation by those responsible for their baby's care.

The private clinics provided the best experience of care (92%), followed by the national referral hospital (80%), the district hospital (71%), and the provincial referral hospital (47%), which received the lowest scores for each domain of experience of care.

The Tool 2 results revealed that the MOH's newborn protocol guidelines for beneficial practices did not include the maintenance of a low-stimulation environment (low light/noise). As described in Figure 7, it follows that only 51% of caregivers described the care areas as quiet during the day, and 49% described them as quiet at night. The noise was largely due to radios and mothers' phones.

Figure 7: Caregivers' perception of respectful care (N = 41)



Dissemination

The preliminary findings of this situation analysis of inpatient care for NYIs in Rwanda were shared at the Rwandan Paediatric Association's Annual Scientific Conference in Kigali on September 5–7, 2018. The workshop was attended by the director generals of hospitals, the chief of newborn services, representatives of the MOH and Rwanda Biomedical Center, government and private-sector pediatricians, and national and international neonatology experts. The participants collectively generated suggestions in response to the results, the highlights of which are described in the Recommendations section below. Action plans were subsequently developed by pediatricians, district health care administrators, and providers, and offered for consideration by the MOH and USAID to inform future Mission support.

The workshop identified the immediate issues influencing the quality of NYI inpatient care as:

1. Infrastructure and the lack of space within newborn units
2. A national human resources shortage
3. Inconsistent leadership skills at the facility level
4. Insufficient use of guidelines by health care providers

Recommendations

The priority recommendations discussed at the workshop are included in Table 5.

Table 5: Highlights of identified issues and suggested recommendations by assessed theme

Assessed Theme	Identified Issue	Recommendation for MOH Action	Priority
1. Newborn and young infant (NYI) unit infrastructure	Rwanda has only four newborn intensive care units (NICUs) and 360,000 live births per year.	Establish NICUs in each province either by incorporating within provincial and referral hospitals or by establishing specialized satellite NYI hospitals.	High
	Gaps identified in national guidelines/protocols include maintaining low-stimulation environments in newborn wards.	Revise to include description of appropriate environment (e.g., low light and noise and policy on unit environment) to manage use of phones, radio, and staff conversations.	Medium
2. NYI services	There is limited diagnostic capability for infection and targeted antibiotic therapy.	Advocate for laboratories and kits with newborn-specific equipment.	Medium
		Improve adherence to antibiotic treatment protocols (with the goal of limiting antibiotic resistance).	High
	There was inadequate promotion of kangaroo mother care (KMC) in private clinics and minimal Baby-Friendly Hospital Initiative (BFHI)-accredited facilities.	Private clinics should introduce KMC resources and conditions in line with global recommendations.	High
		Encourage the national rollout of the BFHI among government and private facilities.	High
	There was a lack of national planning documents and service guidelines available at the district level.	Assess the number of facilities lacking appropriate documentation and distribute.	Medium
	Gaps identified in national guidelines/protocols included maintaining low-stimulation environments in newborn wards.	Revise to include description of appropriate environment (e.g., low light and noise and policy on unit environment) to manage use of phones, radio, and staff conversations.	Medium
	Inreferral NYIs were not always assessed on time.	Management teams of facilities receiving NYI inreferrals should revise assessment procedures to take place within 15 minutes of arrival.	Medium
3. Provision of care: human resources	There is a national shortage of neonatology specialist staff (just one neonatologist, 18 newborn nurse specialists, and no pediatric ophthalmologists nationally)	Hold a recruitment drive to increase the number of staff to meet need.	High
		Test innovative methods of improving working conditions.	Medium
		Strengthen professional development opportunities for existing staff.	Medium

Assessed Theme	Identified Issue	Recommendation for MOH Action	Priority
	Neonatology care is categorized as intensive care, so nurse-to-patient ratios must be low to provide the appropriate standard of care.	Revise neonatology unit standards to include recommendations of nurse-to-patient ratios.	Medium
	There are staff shortages and gaps	Neonatology unit standards should be revised to incorporate recommendations of nurse-to-patient ratios.	Medium
		Conduct survey on staff motivation and retention of health care providers to inform national clinical staff retention strategy.	Medium
	Refresher trainings on newborn resuscitation and advanced care for small and sick newborns were insufficient.	Increase regularity of newborn trainings to ensure all staff are trained, including practice with manikins, at least annually.	High
4. Commodities for newborn services	There was lack of preventive maintenance for NYI equipment.	Hospital technicians should establish facility-level preventive maintenance plans.	Medium
		Coordinate training of local maintenance personnel concurrent with equipment procurement.	Medium
	There are insufficient oxygen producers, concentrators, and tanks for district supply.	Establish oxygen plants in each province to facilitate facility-level management of procurement and supply.	Low
5. Management systems	There are insufficient numbers of management teams at facility level to address NYI services.	District hospital units should encourage facilities to establish specific teams to lead NYI service care management.	Medium
6. Monitoring and evaluation	All facilities monitor and report indicators to the district-level ministry of health, but evidence was scarce of use of data at district hospital unit level.	Coordinate training of local maintenance personnel concurrent with equipment procurement.	High
7. Quality of care	Insufficient facilities routinely review the findings of quality of care monitoring.	NYI management teams should review data on a monthly basis and act accordingly.	Medium
	Only one of 15 facilities was BFHI accredited.	As above, encourage national rollout of BFHI.	High
8. Infection prevention	All necessary supplies are available, but additional work can be done on adherence to infection prevention and control, including collecting data on health care-associated infections.	Perform audits of adherence to infection prevention and control, and collect data on health care-associated infections.	Medium

Assessed Theme	Identified Issue	Recommendation for MOH Action	Priority
9. Referrals	Suboptimal conditions exist for infant/maternal-infant transport.	Improve newborn transportation within and between facilities by ensuring transmission of NYIs in skin-to-skin position.	High
10. Discharge planning	Discharge planning is limited. Follow-up care and awareness of postdischarge services also represent major gaps.	Formalize process of handing over from facility to community health worker or follow-up clinic to implement postnatal care guidelines using standardized written/verbal discharge form.	High
		Improve efforts to follow up with babies postdischarge.	High
11. Parental support	Government insurance mechanisms cover the cost of the care of the NYI only.	Encourage the government to extend coverage to include an allowance for accompanying family members to offset costs of stay at the hospital.	High
12. Experience of care	Parents expressed dissatisfaction with communication by providers and respectful care for newborns (quiet environment, response to pain/stress).	Explore feasibility of family-centered care for newborns.	Medium
		Encourage facilities to implement a suggestion box to identify and improve on communication issues for review by the NYI service management teams.	Medium

Conclusion

The steep improvements in Rwanda's newborn and infant mortality rates underscore the commitment of the Rwandan MOH to newborn health and the opportunities to develop inpatient care of NYIs based on the findings of this situational analysis. The recommendations generated at the results workshop vary significantly in terms of effort and finances required to implement. Some are relatively simple fixes, such as additions and amendments to existing policies, whereas others, such as the establishment of NICUs in each province, require extensive funding, lengthy logistical planning, and ongoing changes within the overall health system (e.g., staffing) to be sustainable.

Staff shortages are a persistent problem within Rwanda's broader health system, but a survey of existing providers on motivation and staff retention may inform a strategy to initiate steps to create lasting change.

The rollout of the BFHI nationally, including in private facilities, appears to be a feasible option for improving the promotion of exclusive breastfeeding and skin-to-skin contact immediately after birth, and has been effectively implemented in comparable contexts.

The MOH and district hospital units should also assess options for offering financial support to enable accompanying family members to stay at the facilities and to ensure that the amenities and infrastructure are in place to facilitate the longer stays necessary to implement family-centered care.

The multicountry brief, which is being compiled by Every Preemie–SCALE in collaboration with the collaborating MOHs, is expected to present the findings from Bangladesh, Ghana, Nepal, Rwanda, Tanzania, and Uganda. The findings will be presented as a webinar, at annual general meetings, and at professional conferences locally and internationally. Publications of the findings may also be submitted to peer-reviewed journals. The involvement of local and global partners is intended to ensure the translation of the findings into policy and programming at the national level and to inform the effort to define, standardize, and mainstream inpatient care of small and sick newborns globally, building on the ENC platform.