

# STRATEGIES TO IMPROVE INFECTION PREVENTION AND CONTROL IN HEALTH FACILITIES

May 2022

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## BACKGROUND

Health care acquired infections (HAIs), also known as nosocomial infections, are among the leading causes of maternal and neonatal mortality. HAIs are not present or incubating at the time of a patient's admission in a health care setting, but are observed during the patient's stay or after discharge (Leaper and Edmiston 2016). These infections broadly include catheter-associated urinary tract infections, surgical site infections, ventilation-associated pulmonary infections, bacteremia transmitted primarily by intravenous catheterizations, and cutaneous infections, among others (Boev and Kiss 2017). Although HAIs affect quality of care around the world, the challenge is more pronounced in low- and middle-income countries where their prevalence is up to 20 times higher (Shahida et al. 2016). Although data on the prevalence of HAIs in sub-Saharan Africa are sparse, a few studies have shown that it is much higher than in other regions of the world and that the true picture of nosocomial infections may be more serious than reported because of poor diagnostic and disease surveillance capabilities in often resource-poor hospital settings (Bagheri et al. 2011). A review of the prevalence of HAIs in various African countries showed rates ranging from 1.6% to 28.7% (Mbim, Mboto, and Agbo 2016). Similarly, a study conducted in Rwanda at a tertiary hospital revealed an alarmingly high rate of HAIs (32%) in acute care surgical patients (Muvunyi et al. 2020). These infections are a major burden on health systems due to an increase in the length and cost of hospitalization and morbidity and mortality among hospitalized patients.

About a fifth of deaths in children under five have been attributed to neonatal sepsis, while maternal sepsis due to obstetric infections accounts for 11% of maternal deaths globally, making it the third leading cause of maternal mortality after hemorrhage and hypertension (GLOSS 2020). A study at the University Teaching Hospital of Kigali, the largest tertiary referral hospital in Rwanda, showed that the leading cause of maternal near misses and mortality was maternal sepsis, which accounted for up to 40% of such cases at the hospital (Benimana, Small, and Rulisa 2018).

The danger posed by HAIs has been exacerbated by the discovery of emerging and re-emerging multidrug-resistant strains of infectious organisms in hospitals, which have reduced the efficacy of the available therapies and increased treatment costs (Liu and Dickter 2020). Health systems in low- and middle-income countries often rely on the availability of cheap antimicrobials and are not equipped to cope with the increasing burden of drug resistant infections, which require treatment with more expensive second- and third-line drug therapies (WHO 2018).

Implementation of robust multimodal infection prevention and control (IPC) practices goes a long way in reducing the impact of HAIs when effectively adopted. Although it is unrealistic to expect infection reductions of 100% even in the most resource-rich settings, as many as 65% to 70% of cases of catheter-associated bloodstream infection



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and catheter-associated urinary tract infections and 55% of cases of ventilator-associated pneumonia and surgical site infections may be preventable by implementing evidence-based IPC strategies (Umscheid et al. 2011). Compliance with IPC policies and strategies at health facilities is therefore key in provision of quality care while ensuring the safety of patients, health providers, and caregivers (WHO 2019).

## **USAID INGOBYI ACTIVITY'S IPC EFFORTS**

The USAID Ingobyi Activity is a five-year cooperative agreement led by IntraHealth International to improve the quality of reproductive, maternal, newborn, and child health (RMNCH) and malaria services in a sustainable manner. The Activity builds upon the tremendous gains Rwanda has made in the health sector as well as previous USAID investments in the sector. IPC is a critical area of focus for Ingobyi since preventing infections contributes to reduction of infant and maternal morbidity and mortality, the Activity's main goal. Ingobyi utilizes high impact interventions to build and sustain capacity for IPC in supported health facilities. The low-cost, bundled interventions for quality improvement (QI) in IPC include targeted on-site trainings on IPC; post-training supportive supervision; development and tracking of small QI projects based on IPC data; advocacy for active engagement of facility leaders in IPC activities and resource mobilization; support to hospital rapid response teams, and provision of critical IPC materials. The project's bundled interventions have been rolled out in all 26 supported hospitals and 325 health centers across 20 districts in Rwanda.

## **IMPLEMENTATION APPROACH**

### **TARGETED ON-SITE TRAINING FOR MULTIDISCIPLINARY TEAMS ON IPC**

A well-trained, skilled, and informed workforce is key in prevention and control of infections. To improve knowledge, skills, and compliance with IPC standards, Ingobyi Activity conducts continuous training of health providers from the 20 supported districts, including facility managers, doctors, nurses, midwives, paramedics, and cleaners. Since 2019, Ingobyi has trained 4,599 health workers

to increase their IPC knowledge and skills. For each hospital, the training was conducted in four interactive sessions, each lasting two days. Training topics included introduction to IPC at hospitals, communicable diseases, disease prevention, environmental hygiene, antimicrobial resistance in maternity and neonatal units, hand hygiene, aseptic techniques, waste management, PPE use practices, IPC in the postpartum period, integration and monitoring and evaluation of IPC, and initiation of IPC-related QI projects, such as those intended to reduce post-caesarean section and neonatal infections.

Ingobyi employs a knowledge cascade capacity development model that encourages peer-to-peer training within supported health facilities. Initially, an IPC focal person from each hospital is trained by Ingobyi IPC specialists; that person in turn trains health providers at their hospitals on effective IPC measures. IPC knowledge and skills are reinforced through continuous monthly mentorship where trainees are paired with experienced clinical mentors based at the facility who provide in-service training and coaching on IPC practices until providers are deemed to have the requisite skills by passing their assessments at the end of the mentorship.

Validated hospital health providers are then selected to train other health workers, usually health center managers, within their catchment areas who will, when fully validated, train their staff on IPC principles. This cascade model is particularly effective and sustainable in disseminating skills because it ensures ownership of IPC practices by reinforcing the fact that it is everyone's responsibility to learn about preventive measures, implement them, and assist peers to acquire the necessary knowledge to reduce HAIs and ensure patient safety.

At the end of each training session, general cleaning and disinfection exercises are conducted in various hospital departments as part of trainees' practicum. In addition to practical sessions, service rounds are conducted to assess medical waste management and the use of incinerators.

## **SUPPORT TO HOSPITAL RAPID RESPONSE TEAMS**

To increase disease surveillance and facility preparedness for outbreaks, the Ingobyi Activity conducts regular mobilization and capacity building of hospital rapid response teams (RRTs) to respond to medical emergencies and disease outbreaks. RRT members include an integrated disease surveillance and response (IDSR) focal person, IPC focal person, doctors, nurses, midwives, paramedics, and hospital leaders who are tasked with use of service data on various indicators to identify IPC gaps and promptly respond to them to prevent further morbidities and mortalities and identify effective epidemic management strategies.

## **POST-TRAINING SUPPORTIVE SUPERVISION**

Facility supervision and monitoring is necessary in ensuring application of IPC principles as well as identifying barriers preventing providers from adhering to preventive measures. In partnership with the Ministry of Health (MOH)/Rwanda Biomedical Centre (RBC) and district health teams, Ingobyi Activity conducts routine supportive supervision of supported health facilities at least quarterly to assess the quality of service delivery.

During supportive supervision, Ingobyi technical staff, MOH/RBC and district health teams assess provider performance and the general work environment through direct observations, use of checklists, and data reviews and encourage providers and supervisors to work in tandem to identify critical gaps that might lead to increased incidences of HAIs. Results and feedback are used to tailor facility-specific interventions.

## **DEVELOPMENT AND TRACKING OF QUALITY IMPROVEMENT PROJECTS**

To sustain improvement in IPC, Ingobyi Activity supports the development of QI projects in all supported health facilities. These projects are based on systematic, data-guided initiatives or processes to improve clinical care, patient safety, health care operations, services and programs, or for developing new programs or services. The QI projects provide a formal ongoing process by which the health facility objectively monitors

and evaluates the quality of services, both clinical and operational. The approach includes problem identification, root cause analysis, identification of interventions to resolve observed root causes, implementation of the interventions, and routine review of data to monitor progress made in addressing the gaps.

Examples of successful QI projects implemented by hospitals in 2021 include reduction of post-caesarean-section infections, increasing hand hygiene compliance, and improving handwashing and alcohol rubbing practices in neonatology.

## **PROVISION OF CRITICAL IPC MATERIALS AND PERSONAL PROTECTIVE EQUIPMENT**

Through routine clinical mentorship and supportive supervision, Ingobyi Activity discovered that some facilities lacked the necessary supplies and equipment needed to enforce IPC measures. To ensure supported facilities adhere to national and international IPC standards, Ingobyi has procured and distributed necessary equipment to protect both patients and health providers.

## **RISK COMMUNICATION AND COMMUNITY ENGAGEMENT**

Lessons from the management of Ebola Virus Disease (EVD) and COVID-19 have highlighted the need to increase disease awareness and equip communities with the required knowledge to prevent the risk of contamination and slow down the rates of contagious infections. Ingobyi Activity continues to work with the Rwanda Health Communication Centre to update EVD, COVID-19, and other IPC messages focused on personal hygiene and prevention of outbreaks (e.g., proper handwashing hygiene and cough etiquette). These messages have been continuously delivered to the public using existing Ingobyi dissemination platforms, such as radio broadcasts, radio sketches, radio dramas, community outreach, and educational materials like posters and flipbooks. In 2021, Ingobyi printed and posted 7,500 posters in public places, including health facility entrances and waiting areas.

## **ENVIRONMENTAL SWABBING IN KEY SERVICE AREAS**

The relative importance of environmental contamination in HAIs is still debated; however, it is clear that patients in rooms previously occupied by individuals with antimicrobial-resistant organisms are at increased risk of colonization or infection with these same microbes (Mitchell et al. 2015). Health facilities must develop a culture of continuous disease surveillance through swabbing and culturing pathogens to assess cleanliness and track multidrug resistant pathogens. Ingobyi Activity is supporting hospitals to implement environmental swabbing to gauge environmental hygiene and map drug-resistant pathogen patterns. Ingobyi is working with district health and hospital colleagues to use the findings to increase awareness of IPC among health providers and their leaders, prepare IPC interventions tailored to specific facility needs, develop targeted prevention interventions, and make environmental swabbing a routine activity.

## **ADVOCACY FOR ACTIVE ENGAGEMENT OF FACILITY LEADERSHIP AND RESOURCE MOBILIZATION**

During supportive supervision, IPC gaps that need advocacy at higher levels are routinely discovered by both Ingobyi Activity staff and IPC committees. These gaps include staff shortages; lack of IPC equipment like incinerators, washing machines, and sterilization machines; high bed occupancy; and inadequate supplies. In an advocacy role, Ingobyi takes these gaps up with district leadership and MOH/RBC to keep IPC front and center during annual planning and budgeting; for example, advocating for improved performance of cleaning companies as well as maintenance and upgrading of aging equipment and infrastructure that are not supportive of IPC measures. The renovation of the neonatology ward at Kabgayi District Hospital in 2021 is one example of such advocacy efforts.

## **RESULTS**

### **IMPROVED PROVIDER CAPACITY**

Since 2019, all 26 supported hospitals have been reached with targeted on-site training on IPC. The IPC focal points were able to cascade training to their colleagues with support from Ingobyi, and a total of 859 hospital staff were trained between 2020 and

2021. Of these, five clinical staff from each hospital were validated as mentors and have in turn cascaded the same trainings to 325 health center managers, who in turn trained 3,378 health center staff on IPC.

Ingobyi also supported increased facility and provider preparedness to manage epidemics and contain emergencies by training 280 RRTs, with each hospital providing at least 10 workers. The RRTs were taught effective use of data to carry out surveillance aimed at foreseeing possible outbreaks due to COVID-19, EVD, or other possible future epidemics.

Reports from clinical mentors and supportive supervision highlighted IPC improvements in health facilities including increased frequency of general cleaning, presence of IPC committees and trained staff, ownership of IPC by facility leadership, and implementation and tracking of QI projects in the majority of the facilities.

### **IMPROVED IPC COMPLIANCE DUE TO QUALITY IMPROVEMENT PROJECTS**

Most hospitals achieved significant accomplishments on the QI projects they implemented between 2020 and 2021. Of the 18 IPC-related QI projects that were initiated in 2020 across supported hospitals, 17 (94%) were fully implemented and targets achieved. In 2021, a total of 29 QI projects were initiated. About 34% of them were completed, 35% were on course to meet their targets, and the remaining 31% were recently initiated.

An example of a successful QI project was seen at Kiziguro District Hospital, which set out to reduce the rate of post-cesarean-section infection from 4.8% to 2% from June 2020 to June 2021. Through a combination of targeted training, mentorship, and increased efforts of staff to adhere to IPC protocols, the hospital exceeded the target, and as of December 2021 the rate is 1%. Similar positive impact of intensive IPC support was observed in Muhororo District Hospital, where the post-cesarean-section infection rate decreased from 6% to 1%.

Another success story was recorded at Gitwe Hospital. During supportive supervision, it was discovered that only 28% of health providers adhered to proper hand hygiene. A QI project was initiated in December 2020 and the hospital improved hand hygiene compliance to 47% by May 2021.

## IPC EQUIPMENT AND MATERIALS ACQUISITION FOR HEALTH FACILITIES

Through advocacy efforts from Ingobyi, RBC procured automated washing machines for all 26 supported hospitals and a sterilization machine for Kabgayi Hospital, where the old one had broken down. The Activity also successfully advocated for provision of incinerators at Nyanza and Gitwe hospitals in 2021. Another positive note has been increased cognizance by health facilities to mobilize resources to make IPC a critical area of focus (e.g., procurement of new linen for maternity and neonatology by Masaka and Kibagabaga district hospitals).

## ENHANCED FACILITY EPIDEMIC PREPAREDNESS THROUGH PROVISION OF CRITICAL IPC MATERIALS AND PERSONAL PROTECTIVE EQUIPMENT

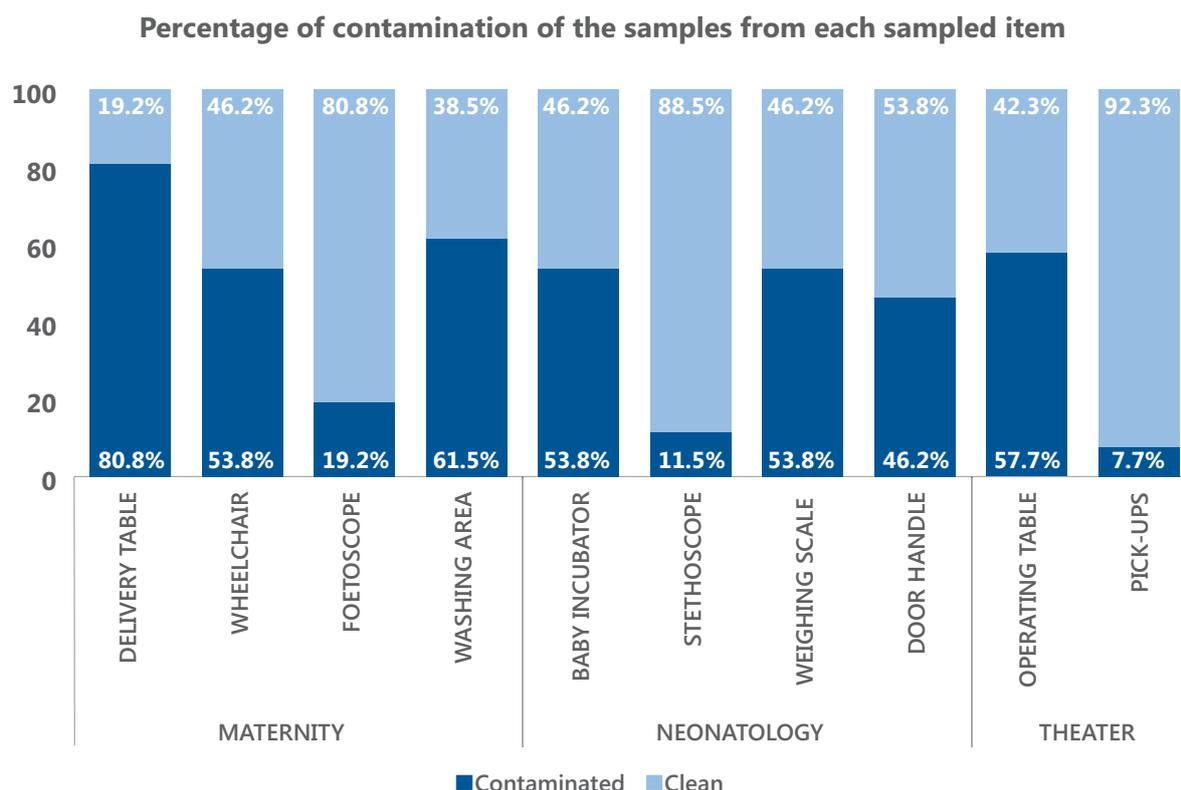
In 2021, Ingobyi Activity procured and distributed needed IPC materials to supported hospitals to enhance IPC measures. The materials included 550 boxes of examination gloves, 550 boxes of face masks, 550 aprons, 165 bucket bins, 55 five-liter bottles of alcohol-based hand sanitizer, 55 rolls of hand-drying paper towels, 55 spill absorbent pads,

110 rolls of 50-liter biohazard bags, 440 scrub suits, 220 aprons, 55 buckets of chlorine powder, and 55 heavy duty tapes. Ingobyi continues to advocate so that health facilities are able to procure these essential supplies to maintain IPC standards. In addition, in 2021 Ingobyi renovated and fully equipped isolation units in eight hospitals. These were initially established as part of the response to the EVD outbreak but were repurposed to serve as isolation units for COVID-19 patients.

## ENVIRONMENT SURFACE SAMPLING TO IDENTIFY AND CONTROL POTENTIAL ANTIMICROBIAL RESISTANT GERMS

Ingobyi Activity is supporting standardization of quarterly environmental surface sampling methods for the collection, transportation, recovery, and culture of microbial samples to objectively assess and compare the efficacy of newer antimicrobial technologies. Results of the last exercise conducted in 2021 showed that of the 26 hospitals involved in the swabbing activity, only one had no growth from all collected samples. Up to 45% of samples were found to be contaminated: around 81% of hospitals had bacteria on delivery tables; 62% on washing areas; 58% on operating tables; 54% on maternity wheelchairs; 54% on baby incubators; 55% on weighing scales, 46% on neonatology door handles; 19% on fetoscopes; 12% on stethoscopes; and 92% on pickup forceps (Figure 1).

Figure 1. Results from environmental swabbing in supported hospitals



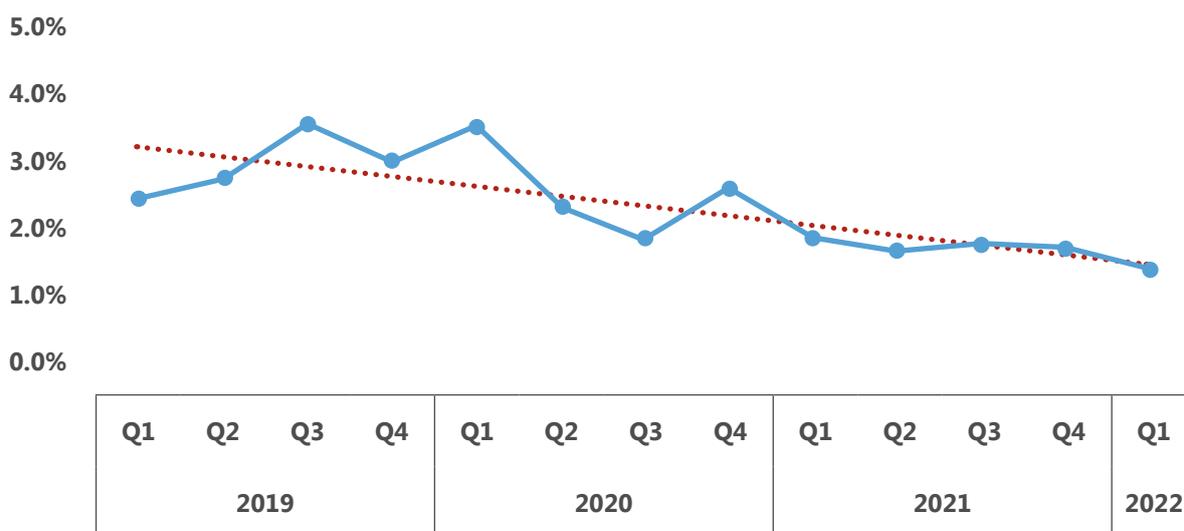
From the cultures, acinetobacter species were the most prevalent (36%), followed by bacillus (17%) and pseudomonas (14%); many isolates were resistant to most antibiotics commonly used in district hospitals. Ingobyi immediately supported hospitals to clean and disinfect the departments and put in place further mitigation measures. Ingobyi presented the results to all supported hospitals and the MOH, and action plans were developed including increasing compliance with

hand hygiene, conducting regular general cleanings, and promoting appropriate use of antibiotics.

## IMPROVED IPC OUTCOMES

Based on the service data reviewed by Ingobyi Activity from the 26 supported hospitals, there has been a substantial reduction in the incidence of post-cesarean-section infections (Figure 2).

Figure 2. Trends in post-cesarean-section infections



## LESSONS LEARNED

- Results from Ingobyi’s environmental swabbing showed that more emphasis needs to be placed on environmental hygiene to ensure cleanliness of different hospital units. Swabbing should become more routine, at least on a quarterly basis, as a measure of both cleanliness and tracking multidrug resistant pathogens in hospital units.
- The cascade training model allows peer-to-peer training, which not only increases provider knowledge but also teamwork that enables everyone to work together to identify and solve IPC gaps. The post-training general cleanings conducted by the whole facility reinforce that cleaning and waste disposal are not just the duty of cleaning staff but rather everyone’s responsibility.
- Ownership by facility leadership is key in ensuring the success of IPC measures. Facilities where administrators understood the importance of IPC, reallocated funds from budgets to procure necessary supplies, and followed up with health providers to ensure protocols were being followed generally had better performance. More trainings and sensitization need to be arranged targeting administrators to reinforce the benefits of IPC implementation.
- Implementation of QI projects is effective in improving IPC compliance. QI projects allow for root cause identification and prioritizing of the most critical gaps that all staff can put their efforts into solving.

## IMPLEMENTATION CHALLENGES

- Lack of a national IPC guideline created a situation where each health facility tried to approach IPC interventions in their own way. Ingobyi Activity is supporting the MOH to develop an IPC guideline for health services to provide standardized guidance across all levels of care.
- Lack of essential supplies and equipment like personal protective equipment, incinerators, sterilizers, and washing machines at hospitals hinder providers from applying their IPC knowledge and practices, thereby frustrating efforts to follow evidence-based IPC guidelines. Ingobyi has procured and distributed essential IPC supplies to supported facilities and is stepping up its advocacy efforts with high-level stakeholders like district leadership, MOH and RBC to prioritize IPC and provide these supplies.
- The COVID-19 pandemic has slowed the implementation of a number of activities. Nationwide lockdowns prevented movement of trainers and clinical mentors without private means of transport to their designated facilities to offer guidance to facility staff on quality delivery of IPC and RMNCH services. Disrupted supply chains also led to increased delays in receiving necessary supplies and equipment. Ingobyi stepped in and facilitated health providers with transport to facilities to ensure continuity of RMNCH and malaria services.

## CONCLUSIONS

Assuring implementation of IPC standards is possible but requires commitment from several actors. The Ingobyi Activity is currently engaging all levels of care in discussions on IPC. Health facility managers have been critical in ensuring trainings on IPC are cascaded to as many health providers as possible. Providers now understand the importance of IPC in their facilities, especially as it relates to protecting themselves and their patients from infections. Implementation of QI projects in IPC is proving to be helpful in resolving key gaps that were previously very hard to tackle.

Facilities are still challenged by lack of standard IPC guidelines, lack of appropriate IPC materials, and

inadequate budgets. Efforts to reinforce advocacy to prioritize IPC should be supported. Ingobyi and the MOH are working on the national IPC guideline, which is expected to standardize IPC measures nationwide to reduce the incidence of HAIs.

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*This technical brief is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of IntraHealth International and do not necessarily reflect the views of USAID or the United States Government.*

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