

QUALITY OF CARE AND FACILITY-BASED SERVICE DELIVERY: EVALUATION OF QUALITY IMPROVEMENT ACTIVITIES IN SAJIDA HOSPITALS

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ACKNOWLEDGEMENT

SAJIDA Hospitals are committed to a systematic process of continuous quality improvement (CQI) that fosters a culture of patient-centric approach in clinical service delivery ensuring quality of care. This evaluation was carried out to explore the quality improvement activities in SAJIDA Hospitals with specific focus on hygiene and IPC practices across the different units.

First of all, we would like give thanks to the Hospital Management Team, Hospital Improvement Group (HIG) members of SAJIDA Hospitals and all participants without whose profound support, the execution of this evaluation would have never been possible.

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Finally, we must keep on records with gratitude that the overall guidance and encouragement for hospital quality initiative was received from Ms. Zahida Fizza Kabir, the Executive Director of SAJIDA Foundation, without her continuous push for quality improvement we could not accomplish the task with success. The Executive Director of SAJIDA Foundation deserves heartfelt thanks and special compliments for that.

Research Unit

SAJIDA Foundation

LIST OF ABBREVIATIONS

BEmOC	Basic Emergency Obstetric Care
CEmOC	Comprehensive Emergency Obstetric Care
CQI	Continuous Quality Improvement
HCAIs	Healthcare Associated Infections
HCPs	Healthcare Providers
HIG	Hospital Improvement Group
IPC	Infection Prevention and Control
KH	Keraniganj Hospital
LMICs	Low- and middle-income countries
MRSA	Methicillin resistant Staphylococcus Aureus
NH	Narayanganj Hospital
NICU	Neonatal Intensive Care Unit
OPD	Out Patient Department
OT	Operation Theatre
SOH-D	Determinants of the State of Hygiene
SOH-V	Visually Assessed State of Hygiene
SPSS	Statistical Package for the Social Sciences
UK	United Kingdom
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

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EXECUTIVE SUMMARY

Background

Aligned with organization's core value to improve quality of life, SAJIDA Hospitals are on a never-ending journey of quality improvement - employing new technologies and techniques and research on what works, as well as continuously training new workers and meeting the needs of patients. While current hospitals of SAJIDA Foundation are at different points on their quality path, both hospitals are committed to a systematic process of continuous quality improvement (CQI) that fosters a quality management process of ensuring participation of all hospital team members and encouraging them to continuously ask the questions, "How are we doing?" and "Can we do it better?" As the maternity care is one the major service provision of SAJIDA Hospitals, and hygiene and infection prevention is the key focused areas of quality improvement initiative, there are potential challenges of maintaining standards of hygiene and preventing healthcare-associated infections (HCAs) in mothers and babies. Adequate water, sanitation, and hygiene (WASH) and infection prevention and control (IPC) in SAJIDA Hospital settings should be seen as integral parts of the broader domain of quality care. Assessment approaches are needed which capture standards for both WASH and IPC, and so inform quality improvement processes. Thus this evaluation was carried out to explore quality improvement activities in SAJIDA Hospitals with specific focus on hygiene and IPC practices on maternity units.

Evaluation Design

An evaluation was conducted in the maternity units of two SAJIDA Hospitals in October - November 2016. The evaluation

study developed and applied a suite of tools - a 'walkthrough checklists' which included photo capturing from different sites, a facility vigilance assessment tool and document review, and qualitative interviews with staff and recently delivered women - to establish the state of hygiene as measured by visual cleanliness, adherence to quality protocols and individual and contextual determinants or drivers.

Results

The overall summary score for the visually assessed state of hygiene (SOH-V score) across different units of SAJIDA Hospitals was 82%, indicating a 'very good' state of visible cleanliness. There was comparatively significant variability; with summary scores for Keraniganj Hospital was 85% indicating a 'very good' state of hygiene according to visual inspection and for Narayanganj Hospital was 79% indicating a 'good' state of hygiene. The average summary scores for the determinants of the state of hygiene (SOH-D score) across all units in Keraniganj and Narayanganj were 87% and 81%, respectively, indicating a 'very good' presence of key determinants or requirements for maintaining IPC; there was very little variability between sub-units and departments of both hospitals with most of the sub-units (Basic Emergency Obstetric

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Care, Comprehensive Emergency Obstetric Care, postoperative wards, maternity wards, NICU wards, emergency departments) rating 'very good' and the remainder 'good'. Reassuringly, there is a clear and predictable positive association, with high visual states of hygiene matching high scores for the overall provision of determining factors. Differences between the positive responses for the subcomponents of the Walkthrough Checklist were examined. Albeit in some cases the numbers were small, the results do show some priorities for improvement indicating differences between facilities in terms of specific areas of IPC, such as waste storage and disposal, and maternity ward toilets were much better in Keraniganj than Narayanganj Hospitals. Findings from qualitative interviews and the facility questionnaire found while the awareness of the importance of IPC and hand hygiene practices was good among all staff, there was further need of training for HCPs and demand for systematic training for cleaners which was highlighted as major challenge to adhere with the standard IPC practices as set out in recent protocols by the management and HIG. The respondents noted currently training is 'suboptimal' and discussed the problem associated with outsourced cleaning services; cleaner drop-out and employment of new cleaning staff; and lack of knowledge and awareness of cleaning staff. The interview results also suggested that overall implementation of protocols and monitoring of IPC were good across the facilities, reflecting a system of formal committees (Hospital Improvement Committee) charged with this role as captured by the Facility Vigilance Assessment Tool. Several respondents discussed further improvements in practices that could result from regular supervision using recently developed checklists, attitudinal change for responsive and patient centric care (particularly in relation to nurses/paramedics as care providers and outsourced cleaning staff).

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Client's level of satisfaction was mostly shaped by the care they received from the hospital staff which they considered as the most important marker of their overall contentment.

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The main themes that emerged from the analysis and influenced women's level of satisfaction and perceptions of cleanliness can be summarised under four broad headings – perceived importance of care they received; staff behaviour; overall appearance of the environment; and physical cleanliness. Client's level of satisfaction was mostly shaped by the care they received from the hospital staff which they considered as the most important marker of their overall contentment. Most of the women interviewed said they would want to use the facility again due to the good quality of care and a clean environment. However, only two women raised their concern about non-responsive behaviour of the providers. The respondents reported that although doctors had treated them very well but some of the nurses and support staff had not behaved well with them. Overall, most of the women were satisfied with the cleanliness of both hospitals, although they had a low level of understanding of the importance of IPC practices and did not have a clear idea about the importance of safe delivery and how it mattered to their own and their newborns' health. As a result most women cited overall environment of the facility and visible cleanliness as the main indicator of facility cleanliness and satisfaction, and thus quality of care.

Conclusions

Although state of hygiene determinants score (SOH-D score) and the visual state of hygiene score (SOH-V score) in both hospitals were found very good, visual assessment of cleanliness and hygiene is an inadequate marker for 'safety' in terms of the presence of potential pathogens and associated risk of infection. Routine environmental screening of high-risk touch sites using simple microbiology could improve detection and control of pathogens. IPC training for both healthcare providers and cleaning workers represents an important opportunity for quality improvement at SAJIDA Hospitals. This should occur in conjunction with broader systems changes, including the establishment of functioning IPC committees (in addition to HIG), implementing standard policies and protocols as regular practice, behavioural training of providers on responsive care and patient-centrism, and improving health management information systems to capture information on HCAs especially maternal and newborn infections tracking system across the hospitals.

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IPC training for both healthcare providers and cleaning workers represents an important opportunity for quality improvement at SAJIDA Hospitals.

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INTRODUCTION

Improved maternal and newborn health and improved water, sanitation, and hygiene (WASH) are targets of the Sustainable Development Goals and were the subjects of heightened attention of the Millennium Development Goals. However, the synergies between these two targets have been neglected until recently and have tended to focus on WASH in households and the wider community rather than in healthcare institutions [1, 2]. However, the state of WASH and infection prevention and control (IPC) in health facilities is slowly gaining attention, as seen in the first global assessment of WASH in health facilities conducted by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) [3]. The report reveals that 38% of facilities surveyed in 54 low- and middle-income countries (LMICs) did not have access to even the most basic WASH services, including soap and water for hand washing.

A long-standing and robust evidence-base shows the links between poor hygiene practices and environment at the time of birth contributing to life-threatening infections in mothers and babies [4, 5]. Sepsis remains a leading cause of maternal and neonatal mortality and morbidity, recently estimated to account for up to 10.7% of maternal deaths [6]. The Global Burden of Disease Study 2013 further notes that the magnitude of sepsis could be underestimated in countries with high maternal mortality due to difficulties in diagnosis. It also states that the prevention of sepsis should include improved sanitation [7]. The importance of addressing inadequacies in facility-based WASH and IPC is becoming ever more acute given the increasing institutionalisation of deliveries in LMICs, with many countries having reached a tipping point with over 50% of births now taking place in facilities [8]. The prospects of this trend leading to health gains for mothers and

babies are seriously undermined where health facilities do not have the capacity to cope with the increased demand in terms of trained healthcare workforce and the physical environment, and will inevitably lead to an increase in infection-related morbidity and mortality [5, 9]. Few studies exist on the link between increasing institutional deliveries in LMICs, poor IPC, and maternal and newborn infection. Yet what evidence does exist suggests that poor WASH and IPC adversely affect maternal health outcomes through a variety of mechanisms and should be taken into consideration in efforts to improve maternal health [5, 10].

Despite the importance of facility cleaning workforce and their critical role in maintaining hygiene standards, there is a lack of published literature on these members of the healthcare workforce. SAJIDA Hospitals are committed to a systematic process of continuous quality improvement that fosters a culture of quality service delivery across hospitals. This evaluation was conducted in October-November 2016 by the Research Unit of SAJIDA Foundation. The evaluation aimed to assess the impact of intensified quality improvement initiative in SAJIDA Hospitals and improve understanding of the determinants of cleaning practices and so inform improvements in the state of cleanliness and safety in maternity care units. As part of quality improvement activities in SAJIDA Hospitals, a suite of tools was developed and applied to two SAJIDA Hospitals (with specific focus on maternity care units) in Bangladesh to answer the following questions: What are the levels of cleanliness and the determinants (structures), processes, and outcomes of cleaning on the maternity unit? What are the knowledge, attitudes, and practices of stakeholders involved in maintaining cleanliness and their interrelationships? What are the hygiene-related outcomes in terms of visual cleanliness, hospital infection rates, and satisfaction of women and healthcare providers (HCPs)?

As this was a novel, exploratory piece of work, a significant amount of data was generated to determine areas where further improvement across the hospitals is merited. Here we report on selected findings on different units including maternity and neonatal units of the SAJIDA Hospitals that have primary relevance to interventions, highlighting areas with regard to quality improvement as the main, overriding goal of the evaluation.

EVALUATION METHODS

Pilot and needs assessment

The study tools were piloted from June 2016 to September 2016 in two maternity units of SAJIDA Hospitals in Dhaka Division. Following the pilot, the main formative phase needs assessment was undertaken in October - November 2016 again in same maternity units and other units of SAJIDA Hospitals. To ensure a representative sample, maternity units were purposively selected to include high and low caseloads and facilities offering both Comprehensive Emergency Obstetric Care (CEmOC) and Basic Emergency Obstetric Care (BEmOC).

Conceptual framework and evaluation tools

Following a review of published and grey literature a conceptual framework was developed, differentiating between three consequences of the state of WASH and IPC in Hospital environment with specific focus on maternity units: 1) patient safety, as could be captured by microbiological assessment of potential pathogens on high-risk touch surfaces (not evaluated in this study), 2) visual cleanliness, and 3) satisfaction of care users and HCPs. The determinants of these outcomes were differentiated into contextual factors (hospital infrastructure, standard

operating procedures, practices and systems) and individual actors (management staff, HIG members, HCPs, support staff and cleaning workers). Using this framework, existing audit and observational instruments were adapted

to develop a suite of data capture tools: Walkthrough Checklists, Facility Vigilance Assessment Tool and Document Capture, and semi-structured interviews with key stakeholders (*Table 1*).

TABLE 1: EVALUATION TOOLS

Tool	Data Collection	Data capture topics grouped according to evaluation framework
Walkthrough Checklists	<p>Information collected on the following areas:</p> <ol style="list-style-type: none"> 1. Determinants of the 'state of hygiene' of the maternity unit environment, labour room environment, and availability and storage of maternity unit cleaning materials 2. Outcomes i.e. the state of hygiene as determined through visual observation, photographs, identification of potential pathogens at selected swab sites, and provider and patient satisfaction 	<p>SAJIDA Hospitals - healthcare environment (systems level determinants)</p> <p>Visible cleanliness (outcome)</p> <p>Presence of potential pathogens (outcome – not evaluated here)</p>
Facility Assessment Tool	Questionnaire administered in an interview format with the Head Nurse, or equivalent, of the maternity unit	<p>SAJIDA Hospital as Healthcare institution, system and operations (systems level determinants)</p> <p>(Human) resources (systems level determinants)</p> <p>IPC and healthcare practices in SAJIDA Hospitals (individual and systems level determinants)</p>
Document Capture	Checklist of policies and protocols relevant to IPC	SAJIDA Hospital - healthcare system and operations (systems level determinants)
Semi-Structured Interviews	Semi-structured interviews with management, healthcare providers, cleaners and recently delivered women	<p>Motivation, skills and self-efficacy (individual level determinants)</p> <p>IPC and healthcare practices (individual and systems level determinants)</p> <p>Healthcare organisation, system and operations (systems level determinants)</p> <p>(Human) resources (systems level determinants)</p> <p>Finance and resource management (systems level determinants)</p> <p>Providers and managers' satisfaction (outcomes)</p> <p>Women's satisfaction (outcomes)</p>

THE WALKTHROUGH CHECKLISTS

The Walkthrough Checklists involved recording standard aspects of IPC at specific moments and locations while passing (walking) through different units of hospitals including maternity unit. Walkthrough Checklists data were captured through two modalities: 1) completion of observational checklists, and 2) taking photographs of different sites as well as relevant infrastructure and equipment, such as delivery beds, labour room, operation theatre, laboratory, duty stations, emergency department, neonatal unit, and hand washing stations.

Checklist questions related to the determinants of the state of hygiene, such as 'Is provision of running water available 24/7 in hand washing stations of the hospitals and in the delivery room and operation theatre?' Are liquid soaps and alcohol-based hand sanitizers available at all point of care and delivery room and operation theatre?, and to the state of hygiene, such as 'Are water points for hand washing in the delivery room visibly clean? Are they free from debris?'. Responses to the questions were pooled and used to create summary percentage scores for each facility. The state of hygiene determinants score (SOH-D score) and the visual state of hygiene score (SOH-V score) were then grouped according to quintiles (identifying five equal subgroups), with a score of 80% or more labelled 'very good', 60-79% 'good', 40-59% 'moderate', 20-39% 'poor', and 0-19% 'very poor'. This approach to scoring and the use of quintiles is common practice in 'improvement science' - providing benchmarks of performance, aiding priority setting, and providing markers for tracking progress [5, 11].

During the walkthrough process, photographs of different sites (OPD, emergency department, consultation rooms, laboratory, maternity ward, doctor and nurse duty station, delivery room, operation theatre, postoperative ward, neonatal and paediatric units, toilets and cleaners' storeroom etc) were taken as a means of verifying the reported visual assessments made when conducting the checklists. To minimise the Hawthorne effect, efforts were made to apply the Walkthrough Checklist before the remaining tools. Hospital management was requested to provide support during data collection. As part of the approval process, management was aware of the data to be captured; however, this was not conveyed to the wards, laboratory, operation theatres and other sites where data capture took place.

Facility Vigilance Assessment Tool and Document Capture

Through the Facility Vigilance Assessment Tool (questionnaire) and Document Capture we gathered information on infrastructure and utilities; equipments; training; IPC resource availability, policies, and protocols; and routine IPC and medical waste management

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The state of hygiene determinants score (SOH-D score) and the visual state of hygiene score (SOH-V score) were then grouped according to quintiles (identifying five equal subgroups), with a score of 80% or more labelled 'very good', 60-79% 'good', 40-59% 'moderate', 20-39% 'poor', and 0-19% 'very poor'.

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practices. Data collectors completed the questionnaire during an interview with the senior nurse, or equivalent, from different units including the maternity unit and operation theatre.

Semi-structured interviews with stakeholders

Semi-structured interviews were conducted with a range of stakeholders (four members of management and technical team including HIG members, 10 HCPs, 8 cleaning workers, and 20 women who had received maternity care from Keraniganj and Narayanganj Hospitals). Interviews used a technique called photo-elicitation whereby photo prompts are used to generate discussion and insights rarely gained through direct questioning [12]. Photo-prompts in this study included examples of delivery rooms, operation theatres, post-operative wards, laboratory, NICU, emergency department, maternity and child care outdoors and toilets. Qualitative analysis took a framework approach based on the conceptual framework with the aim of exploring views and perceptions of the determinants of hygiene and the state of hygiene in the maternity unit. The framework approach was selected as an effective and flexible approach to qualitative data analysis, particularly in mixed method studies [13].

Data analysis

Categorical data from the Walkthrough Checklist and Facility Vigilance Assessment Tool were entered into an SPSS database. Prior to analysis, the data were checked for internal consistency. Descriptive statistics were produced using SPSS 20. ATLAS.ti was used to undertake thematic analysis of the qualitative interview data. Interviews were conducted, transcribed, and analysed in Bengali. Results of the transcript analysis were translated into English and back-translated.

KEY FINDINGS

Due to their relevance to interventions and highlighting areas with regard to quality improvement, findings related to the Walkthrough Checklist (SOH-V score, and SOH-D score), and training, monitoring, and document availability have been selected for this reporting. Differences between hospitals with regard to structural and geographical context (location, number of beds, service provision etc.) and caseload did not show any consistent patterns; while differences existed, they did not lie reliably in one direction. Thus, the results are presented only by obstetric functionality and location, that is, Narayanganj or Keraniganj and BEmOC or CEmOC.

Visual state of hygiene (SOH-V) and Determinants of the state of hygiene (SOH-D)

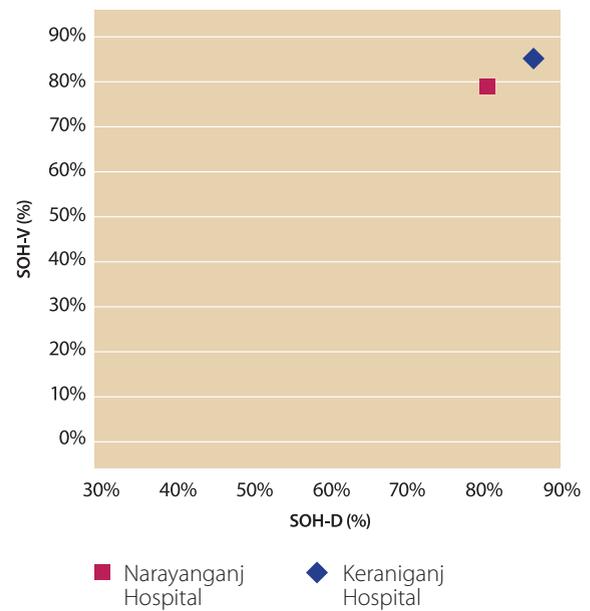
The overall summary score for the visually assessed state of hygiene (SOH-V score) across all maternity units of SAJIDA Hospitals was 82%, indicating a 'very good' state of visible cleanliness. There was comparatively significant variability; with summary scores for Keraniganj Hospital was 85% indicating a 'very good' state of hygiene according to visual inspection and for Narayanganj Hospital was 79% indicating a 'good' state of hygiene.

The average summary score for the determinants of the state of hygiene (SOH-D score) across maternity units in Keraniganj and Narayanganj were 87% and 81%, respectively, indicating a 'very good' presence of key determinants or requirements for maintaining IPC. There was very little variability between sub-units and departments of both hospitals with most of the sub-units (BEmOC, CEmOC, postoperative wards, maternity wards, NICU wards,

emergency departments) rating 'very good' and the remainder 'good'.

Figure 1 provides a simple illustration of the relationship between the SOH-V score and the SOH-D score. Reassuringly, there is a clear association, and predictable positive association, with high visual states of hygiene matching high scores for the overall provision of determining factors. Differences between the positive responses for the subcomponents of the Walkthrough Checklist were examined. Albeit in some cases the numbers were small, the results do show some priorities for improvement indicating differences between hospitals in terms of specific areas of IPC, such as waste storage, management and disposal, and visible cleanliness of emergency unit and maternity ward and toilets were much better in Keraniganj than Narayanganj Hospital (Table 2).

FIGURE 1: RELATIONSHIP BETWEEN SCORES FOR VISUALLY ASSESSED STATE OF HYGIENE (SOH-V) AND DETERMINANTS OF THE STATE OF HYGIENE (SOH-D) BY HOSPITALS



Training and monitoring

Interviews were conducted with key stakeholders (clinicians, HCPs, management staff, cleaning workers and recently delivered women) exploring views and perceptions of the determinants of hygiene and the state of hygiene in the hospital in general and maternity unit specifically. As stated above, due to their relevance in terms of intervention, only selected findings pertaining to training and monitoring are reported here.

Training was a key area of need as raised repeatedly throughout the interviews with

HCPs and management staff. Findings on training provision, as captured by the Facility Vigilance Assessment Tool, are presented in Table 3. IPC training were limited to specific issue-based orientation, formal IPC training was notably absent in both hospitals until recently¹. (Recently after the evaluation completed, two batches of 3-day long formal IPC training was arranged in December 2016 for 24 staff including Managers and Cleaning Workers of both hospitals in collaboration EngenderHealth Bangladesh)

¹ It is worth mentioning here that recently after evaluation completed, two batches of 3-day long formal IPC training was arranged in December 2016 for 24 staff including Managers and Cleaning Workers of both hospitals in collaboration EngenderHealth Bangladesh.

TABLE 2: VISUAL STATE OF HYGIENE AND DETERMINANTS OF IPC:

Unit wise Summary Scores	KH*	NH*
Overall State of Hygiene Determinants Score (SOH-D)	87%	81%
Overall Visual State of Hygiene Score (SOH-V)	85%	79%
Overall Management Score – License, stock, logistics, finance, fire and electric safety, generator maintenance, vehicle management etc.	94%	91%
OPD, consultation areas, reception and general areas, toilets, waste disposal and hand washing facilities and practices	93%	85%
Emergency Unit - general areas, toilets, waste disposal and hand washing facilities and practices	94%	83%
Laboratory Unit - general areas, toilets, waste disposal and hand washing facilities	95%	86%
USG Unit - general areas, toilets, waste disposal and hand washing facilities and practices	93%	94%
X-Ray - general areas, toilets, waste disposal and hand washing facilities	90%	87%
Paediatric/Neonatal Unit - general areas, toilets, waste disposal and hand washing facilities and practice	98%	91%
Dental Unit - general areas, toilets, waste disposal & hand washing	87%	83%
Eye Unit - general areas, OT, toilets, sterilization, waste disposal and hand washing facilities and practices	93%	NA
Operation Theatre – general areas, equipments, toilets, storage, waste disposal and hand washing facilities and practices	97%	89%
Post Operative – general areas, beds, equipments, storage, toilets, and hand washing facilities and practices	88%	84%
Proper hand washing station with provision of running water at all points of care (out of 20 points spot-check)	100%	100%
All hand washing stations appear visibly clean (20 points spot-check)	95%	85%
Liquid soap available in all hand washing stations (20 points spot-check)	95%	90%
Hand sanitizer available all point of care (out of 30 points spot-check)	100%	100%
Providers’ washing or sanitizing hands as per protocols (out of 30 points spot-check)	93.3%	90%
All toilets of Hospital visible clean and without bad smell (out of 20 points spot-check)	95%	85%

Unit wise Summary Scores	KH*	NH*
Special safety box for medical sharps disposal available in all point of care (out of 20 points spot-check)	100%	100%
Medical sharps disposed off as per protocol instructions (out of 20 points spot-check)	95%	95%
Sterilization Unit – equipments, storage and hand washing facilities	84%	79%
Maternity Unit general area, toilets, waste disposal and hand washing	89%	84%
Maternity Unit beds and equipments	87%	82%
Maternity Unit floor and toilets	86%	79%
Maternity Unit bed sheets and linen	84%	79%
NICU Unit general area, toilets, waste disposal and hand washing	91%	85%
NICU Unit beds and equipments	100%	97%
NICU Unit floor and toilets	98%	91%
NICU Unit bed sheets and linen	88%	87%
Labour/delivery unit general area and hand washing	85%	81%
Labour/delivery unit waste storage and disposal	87%	83%
Labour/delivery unit bed sheets and linen	84%	79%
Operation theatre gowns, sheets and linen	88%	87%
Separate cleaning materials available for OT, labour room, maternity ward general areas and toilets	97%	95%

**Summary percentage scores of multiple sub-variables for each indicator under consideration*

TABLE 3: INFECTION PREVENTION AND CONTROL TRAINING AND MONITORING

Indicators	KH*	NH*
Obstatic functionality	BEmOC & CEmOC	BEmOC & CEmOC
Overall State of Hygiene Determinants Score (SOH-D)	87%	81%
Overall Visual State of Hygiene Score (SOH-V)	85%	79%
Any formal training in IPC & hygiene conducted in the last year?	NO	NO
Orientation with information on IPC & Hygiene conducted in the last year	YES	YES
Orientation program with information on IPC for new HCPs?	NO	NO
Training program in IPC for all HCPs & management staff?	NO	NO
Training program in IPC for non-clinical staff (Cleaning staff, maintenance staff, etc.)	NO	NO
Functional HIG with monthly meetings held regularly?	YES	YES
Functional IPC Committee?	NO	NO
Checklist available for monitoring quality improvement activities?	YES	YES
HIG focal point use quality checklists on regular basis during walk through?	YES	YES
Policies and protocol on IPC, hand hygiene, medical waste disposal etc	YES	YES
Resources and materials available for IPC practice	YES	YES

*KH, Keraniganj Hospital

**NH, Narayanganj Hospital

While the awareness of the importance of IPC and hand hygiene was good among all stakeholders, interviewees in Keraniganj and Narayanganj Hospitals reported that inadequate formal IPC training for HCPs and no systematic training for cleaners was major challenge to adhere with the standard IPC practices as set out in recent protocols by the management and HIG. Management staff noted that currently training is 'suboptimal' and discussed the problem associated with outsourced cleaning services; cleaner drop-out and employment of new cleaning staff; and lack of knowledge and awareness of cleaning staff:

If cleaning staff is given education and various training regarding infection, and what are the

problems to the patient due to infection, and what is the effect of infection on maternal and infant death,.....in their local language, so it will be a good improvement. (Management Staff, Narayanganj Hospital)

However, in both settings the Clinicians, HCPs, and Management Staff highlighted remarkable improvement in terms of structural rearrangement and hygiene practices focusing quality of care over the last one year. They also highlighted that the Hospital Management is more concerned now about developing capacity of all category of staff to drive the implementation of quality improvement initiatives establishing a system of continuous improvement across the hospitals.

You know, we are going through a process of continuous improvement. Over the last one year we did a significant amount of works focusing quality improvement. We identified infection prevention and hand hygiene practices as important areas of our quality improvement....and putting more efforts on developing capacity of our staff on IPC and hygiene practices through both formal and informal training. (Management Staff, Keraniganj Hospital)

Both facilities with high SOH-V scores reported providing informal IPC training for new staff, non-medical staff, and all existing staff. However, interview results revealed inconsistencies in the reported availability of formal training and actual delivery of training. Nine out of the 10 HCPs interviewed had received training on hand hygiene, medical sharps disposal and patient privacy only, while just 5 of the 8 cleaners interviewed had received one day orientation training on hand washing and overall cleanliness. Most training appeared to be informal and/or 'on-the-job':

We received only one day orientation training on IPC here... but it was not very formal. (Cleaning Worker, Narayanganj Hospital)

I did not get any formal training on IPC here. I have enriched myself, learning by doing. Cleaner (HCP, Keraniganj Hospital)

One Clinical Staff however appeared contradictory, stating that while training should be provided, it is not necessary to formally train all staff due to on-the-job training.

Training is suboptimal in a hospital like this. Because it is not necessary to have all trained staff. Staff learn when they work and learn with seniority. In any set up, it is better to give facility-specific training. (Clinical Staff, Keraniganj Hospital)

According to Management Staff of two facilities, arranging formal IPC training for clinic assistants and cleaners was not a priority issue until recently²:

The Management and HIG asked us to arrange one day hygiene and protocol implementation related training for all providers, clinic assistants and cleaners. HIG Team members conducted those trainings. We organised the training session and HIG facilitator delivered information to providers, cleaners and clinic assistants, which was mostly focused on recently developed hand hygiene, medical sharps disposal and privacy related protocols implementation. Although that was essential, I do not consider that as formal training on IPC.... in fact, we really need more formal and comprehensive training on IPC to drive our improvement work forward. (Management Staff, Keraniganj Hospital)

Initially we only instructed cleaners verbally about cleaning procedure in hospital. Recently in June 2016 a half-day long orientation on hygiene practices was provided to all staff including cleaning staff by the Management and HIG. I think that is not enough to comply all standards of IPCformal training on IPC is necessary. (Management Staff, Narayanganj Hospital)

² It is worth mentioning here that recently after evaluation completed, two batches of 3-day long formal IPC training was arranged in December 2016 for 24 staff including Managers and Cleaning Workers of both hospitals in collaboration EngenderHealth Bangladesh.

The interview results also suggested that overall monitoring of IPC was good across the facilities, reflecting a system of formal committees (Hospital Improvement Committee) charged with this role as captured by the Facility Vigilance Assessment Tool. Several stakeholders discussed further improvements in practices that could result from regular supervision using structured checklists, attitudinal change for responsive and patient-centric care (particularly in relation to nurses/paramedics as care providers and outsourced cleaning staff):

It is also important to know whether implementation is done or not as per the protocol and training. Regular audit and supervision should be done to evaluate activities and monitor progress. (Clinical Staff, Narayanganj Hospital)

Personal responsibility and motivation for monitoring activities was also acknowledged.

Actually it is not possible to monitor all IPC related activities by a person. Everyone should be responsible for it. In order to organise and monitor day-to-day activities on IPC and quality improvement we assigned one senior staff member for every critical units of the hospital including outsourced cleaning team (HCP Keraniganj Hospital)

Although some undocumented information was captured about hospital infections in both hospitals, but a lack of documentation on infection/sepsis cases was noted across facilities, reflecting lack of hospital infection surveillance system as gold standard for good monitoring practices integrated with hospital information management system. In general, presence of policies and protocols was good in both hospitals and found available during audit period.

Both facilities had selected written policies and protocols (both in Bengali and English) related to IPC, hand hygiene, waste disposal and laboratory management, and forms and registers related clinical records of patients including pantograph for labour progress monitoring in the maternity units, indicating good clinical clerkship practices.

Women's Satisfaction with Services and understanding about IPC practices

The women interviewed had an average age of 23 years (range 15-34 year). The majority of them had completed primary education and had two or more children. All interviewees lived in peri-urban areas either in poor statements or slums, but had access to electricity and water. However, sanitation facilities were not well structured with up to 10-16 people sharing a common toilet and water point.

The main themes that influence women's level of satisfaction and perceptions of cleanliness emerging from the analysis can be summarised under four broad headings – perceived importance of care they received; staff behaviour; overall appearance of the environment; and physical cleanliness.

In general, women's satisfaction was mostly shaped by the care they received from the facility staff which they considered as the most important marker of their overall contentment.

Physical cleanliness of the facility remained at the top in order of importance. Overall, women had a low level of understanding of the importance of IPC practices and did not have a clear idea about the importance of safe delivery and how it mattered to their own and their newborns' health. As a result most women cited overall environment of

the facility and visible cleanliness as the main indicator of facility cleanliness. All women (n = 20) interviewed were satisfied with the cleanliness except one mother.

This is a good hospital, everything is clean. All essential medicines were available here and covered within the package price. Labour room was very clean. Toilet was also clean and there was no bad smell coming out of it. The cleaners cleaned the room and hospital regularly. (Recently Delivered Woman, Respondent Code KH8)

Attached toilet of the delivery room was not clean enough. May be some blood clot was there. Even the toilet was a bit muddy. (Recently Delivered Woman, Respondent Code NH3)

Here mopping and cleaning is being done regularly. Bed sheets are changed and operation theatre is very modern and clean. Everything is just perfect for me. (Recently Delivered Woman, Respondent Code KH5)

This facility is very clean; I will not deliver my baby in a dirty place. I like this hospital. Here doctors and nurses conduct the delivery after washing their hands. The maternity ward and beds are clean here. Bathrooms and toilets are very clean. (Recently Delivered Woman, Respondent Code NH2)

Most of the women interviewed said they would want to use the facility again due to good quality of care and a clean environment. However, only two respondents raised their concern about unexpected behaviour of providers. The respondents reported that although doctors had treated them very well and they are satisfied about overall care of the hospitals, behaviour of some of the nurses/ paramedics was not up to their expectation.

The window of the maternity ward was open. I felt really annoyed when mosquitoes and flies were buzzing around my nose. My sister-in-law requested the duty nurse twice to close the window... she was not responding... was doing some paper work... after requesting her several times she closed the window! (Recently Delivered Woman, Respondent Code NH9)

The hospital is really clean. I am happy with the care I received from this hospital. Although the behaviour of doctors was well enough but one nurse's behaviour was not up to my expectation... she never smiles and even does not answer to all my queries. (Recently Delivered Woman, Respondent Code KH4)

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DISCUSSION AND CONCLUSION

Much of the global focus on preventing HCAs has concentrated on hand hygiene [14]. This is an essential intervention but needs to be accompanied by a hygienic physical environment in order to break the transmission chain of infection [5, 15]. Although we did not perform microbiological tests as means of confirming hygienic physical environment, evidence suggest that this is particularly important for clinical areas caring for patients at higher risk, and with vulnerable sites, such as delivery beds, operation theatre tables, postoperative beds etc. A crucial enabling factor in the physical environment is the basic requirement for water and sanitation - a requirement which the combined results of our study and other assessments in low-income settings (e.g. GLAAS and WHO & UNICEF) indentified few gaps in the care delivery systems [3, 5, 16]. This gap also represents a major opportunity for further improvement.

While differences exist between the two participating hospitals, for example, the Facility Vigilance Assessment Tool results in terms of the reported provision of training in IPC, here we focus on common themes emerging from the results in relation to visual cleanliness and the determinants of the state of hygiene, training and monitoring, and policies and protocols.

As observed in SAJIDA Hospitals, currently, health facilities are often deemed 'clean' based on visual inspection alone [5, 17]. A few papers on the relationship between cleaning, visual cleanliness and microbiological risk noted that, where wards appeared visibly clean, less than half were safe in terms of the presence of potential pathogens posing an infection risk [5, 18]. A further study by

Dancer et al. [19] provided evidence of the role of cleaning in healthcare-associated infections (HCAs). The study highlighted that enhanced cleaning of the intervention ward was associated with a significant reduction in levels of contamination, and a 26.6% reduction in new methicillin resistant *Staphylococcus Aureus* (MRSA) cases compared with the control ward. The reliance on visual cleanliness as a proxy for 'safety' is currently widespread; national and international guidelines often use visual cleanliness and frequency of cleaning as indicators of the extent to which IPC standards are met [e.g. the Centres for Disease Control and Prevention, and the UK National Health System [20, 21]. In this assessment, there does not establish any relationship between the presence of the clinically important pathogen *Staphylococcus Aureus* (which may cause life threatening infection to mothers and newborns) at key maternity unit sites and visually assessed cleanliness, which may suggest the need for routine monitoring of hygiene safety going beyond subjective observation.

A non-trivial proportion of specific potential pathogens, such as *Staphylococcus Aureus*, exist in the healthcare environment due to normal human carriage from the community (5, 11, 22); thus, it is not unusual for a proportion of high risk sites in clinical settings to be contaminated by *Staphylococcus Aureus* and thus if tested may be found positive for *Staphylococcus Aureus*. It is well accepted that patients on maternity units - both mothers and babies - face particular risks owing to the physiological processes of birth, such as cutting the umbilical cord, perineal tears, or caesarean section wounds. The facilities with provision of CEmOC face particular challenges regarding cross-infection, particularly where space is constrained and high-risk cases are managed post-operatively in the same beds and/or clinical area as uncomplicated cases.

Based on our evaluation results and the current literature, there is a strong case to argue that visual assessment of cleanliness on maternity units alone is an inadequate basis on which to determine safety in terms of the presence of potential pathogens (since microbiological tests for potential pathogens were not performed during this evaluation, we do not know about the presence of such pathogens in the vulnerable sites of SAJIDA Hospitals). In our evaluation, although both facilities were found visibly clean with 'very good' to 'good' scores; it is uncertain if the patients are at risk of infection by potential pathogens since we did not perform any microbiological tests during our study. Yet in many low-income healthcare settings overall laboratory capacity is often not well advanced, helping to explain the limited application of environmental screening and the heavy reliance on visible cleanliness alone. While the need to strengthen medical laboratories is widely acknowledged [23], options for simplifying environmental microbiology techniques for swabbing hard surfaces, and culturing and reading plates, along with training technicians, could have significant benefits for routine monitoring and supervision of hygiene on maternity units at many levels of facilities like SAJIDA Hospitals.

In the evaluation of CQI in SAJIDA Hospitals, the findings from the application of the Walkthrough Checklists show a clear association between the composite scores for the visually assessed state of hygiene (SOH-V score) and for the determinants of the state of hygiene (SOH-D score). However, the results of the Facility Vigilance Assessment Tool suggest a more complicated picture as regards the reported availability of resources crucial to IPC. Although some of the IPC resources and training were lacking, both facilities are performing a high proportion of IPC practices, perhaps suggesting strong aspiration of facilities for good compliance. The findings also point to the consequence

of staff shortages on IPC practices, problem associated with outsourced cleaning services, high drop-out rate among cleaning workers and of training and staff motivation enabling good performance even in the face of resource shortage. The certain lack of training provided to cleaners and HCPs across facilities as a whole in this evaluation is an area warranting future improvement, including the development of novel methods of engagement suitable for personnel with minimal formal education (e.g. cleaning workers).

Common bottlenecks to IPC included a lack of up-to-date protocols, protocols implementation in non-customised hospital building, in-house monitoring of activities on regular basis by respective hospital staff, and providers' responsiveness. Gaps were also identified during the evaluation that warrant implementation of systematic quality improvement initiative, such as in addition to HIG establishing and sustaining effective IPC committees in each hospital, routine supportive monitoring and supervision of cleaning staff, and strengthening the use of simple audit cycles within a culture of hygiene safety.

The reported lack of the implementation of formal, systematic training for providers and cleaners was common across both facilities, reflecting a general need for formal training immediately. This was also apparent from the interviews where ward cleaners' poor remuneration and benefits, and a lack of contractual security in many instances, were reported. The lack of training for cleaners and HCPs across facilities is an area warranting future improvement.

The experience from our evaluation points to the potential to develop and test a bundle of interventions around IPC, hygiene and cleaning practices, and providers/cleaners - taking into account the context of SAJIDA

hospital environment, current level of hygiene practices and cleaning, skills mix, and educational background of paramedical and cleaning staff in Bangladesh. Training must also address socially and culturally specific drivers and beliefs relating to cleanliness and hygiene, and attitudinal training to improve patient-centrism and responsive behaviour towards clients that are not amenable to influence solely by standard IPC policies and processes. Development of such training should take into account successful community-based interventions around behaviour change in this area, such as Curtis et al. [5, 24, 25]. The experience of our evaluation study and evidence elsewhere points to the value of mixed methods and sources of data to monitor the state of hygiene on Hospital specifically maternity units. These include observational and microbiology techniques (not performed for this study) and practical mechanisms to triangulate findings and handle data by the facilities themselves.

In terms of limitations, the evaluation did not capture data on hospital infection rate - maternal or newborn sepsis occurring among deliveries in the participating facilities, and thus the findings cannot be linked directly to health outcomes. Although SAJIDA Hospitals had an established health management information system, the lack of available routine data on the prevalence and risk factors for sepsis for mothers and newborns was notable in both facilities. The second limitation, common to other studies using observational methods, was the difficulty of avoiding the Hawthorne effect. Although we sought to minimise inter-rater variability as far as possible, inevitably data collectors' perceptions would have influenced reporting of visible cleanliness. However, the researchers who analysed the data and interpreted the findings were independent from the data capture processes.

We did not perform the environmental microbiology analysis for establishing laboratory evidence to complement visual inspection, which is not usually undertaken in Bangladeshi facilities including SAJIDA Hospitals. Yet this evaluation study has provided an indication of the potential to use environmental microbiology as an objective assessment of hygiene risk to complement visual inspection.

In terms of the qualitative data collection, there is a general difficulty interviewing health workers in busy hospital like Keraniganj, which may have had an impact on the quality of data captured. A further limitation was the use of simple 'yes/no' responses to questions in the Walkthrough Checklist rather than a scale to capture degrees of visual cleanliness. However, this practice was consistent with the generic tools from which the evaluation study instruments were developed and avoided creating an overly complex data set. By pooling variables in the checklist to create an overall score, the analysis is also potentially masking areas for improvement and/or of existing good practice which are important for actions at a facility level; the study did not differentially weigh the variables used in the summary scores, as this was not recommended by the generic tools.

However, further analysis will investigate simple means of weighting. Future research into the pathways of infection and quality improvement in SAJIDA Hospitals is needed. What evidence exists suggests a link between environmental hygiene and risk of infection, yet little research has been conducted in Bangladesh and LMICs, and even less around risks posed specifically to mothers and newborns. The lack of routine data on the prevalence and risk factors for maternal and newborn sepsis was notable in the participating facilities. To generate

management support and secure buy-in at SAJIDA Hospitals, there is a need to find practical mechanisms for the healthcare workforce to appreciate the consequences of poor hygiene practices for the patients they care for, and to provide further evidence of the link between environmental hygiene and infection. Research is needed not only to strengthen health information systems, but also assess the impact of direct feedback to staff on HCAs in terms of motivating them and changing their hygiene behaviour and practices to ensure patient-centric and respectful health care across the hospitals.

Publications including the recent WHO and UNICEF report on WASH in health facilities and increasing global attention on the importance of improving WASH and IPC in health facilities provides us with a major opportunity and an obligation to act [3, 5]. Our evaluation study demonstrates the importance of addressing the multifaceted nature of WASH and IPC on different units including maternity units of SAJIDA Hospitals. Starting with a low baseline - absence of dedicated training for providers and cleaners, shortage of well trained workforce to perform IPC activities, etc. - means there is considerable room for sustained quality improvement in both SAJIDA Hospitals, but more focus should be given in Narayananj Hospital. Ultimately, such a focused intervention should be integrated with other systems improvements for IPC in SAJIDA Hospitals. Such actions will not only benefit mothers, newborns, and staff on maternity and neonatal units but also those seeking or providing care in other important clinical units/settings of the hospitals.

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