

# MATERNAL & NEONATAL HEALTHCARE QUALITY MEASUREMENT: REAL AND DESIRED

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## EXECUTIVE SUMMARY

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**Background:** The World Health Organization (WHO) published its Standards for Improving Quality of Maternal and Newborn Care in Health Facilities (QoC Standards) in 2016. However, assuring performance against its 352 indicators in routine quality improvement efforts is impractical in most settings: prohibitively expensive, and uncertain to lead to better outcomes. Using the WHO QoC standards as our starting point, we look for those indicators most likely to improve health outcomes, and most relevant to the clinic managers who will collect and track these indicators on a regular basis in low and middle-income countries (LMICs).

**Methods:** Our study was done in three stages: 1) an assessment of a plausible causal link between WHO QoC Standards indicators and outcomes and whether improvements as reflected by the indicator were within the control of a facility 2) a rapid review of supporting literature and an evaluation of the quality of evidence using Grading of Recommendations, Assessment, Development and Evaluations (GRADE) analysis, and 3) a qualitative exploration of the usefulness and feasibility of indicators through interviews with multiple stakeholders in Bangladesh. In the last stage, 25 interviews were conducted with doctors and nurses at both public (tertiary, secondary and primary levels) and private facilities, researchers, program managers, and representatives of the government and a donor organization in the Dhaka and Khulna districts.

**Results:** Applying Hill's causal criteria and assessing whether an indicator was within the control of a facility manager in the first stage, 113 (32%) of the total 352 indicators were retained. The GRADE analysis revealed that 56 (50%) of the 113 indicators received a score of "moderate" or "high" for the quality of evidence presented. These indicators were pre-

sent to stakeholders in Bangladesh, who identified 43 (77%) as high priority, 8 (14%) as medium priority, and 5 (9%) as low priority for quality assurance in their facilities. Stakeholders valued indicators around training, emergency obstetric care and immediate newborn care, but were particularly concerned about the challenges of implementing data collection in resource limited and overburdened health facilities.

**Conclusion:** Implementing the current list of indicators of the WHO QoC Standards is not feasible in LMICs, and the evidence for inclusion of most current indicators is unclear. Prioritization of indicators based on evidence of correlation to outcomes and on service-level assessments of utility and viability for collection should guide reduction from the current 352 quality indicators to a validated and parsimonious set.

List of 43 Indicators that had GRADE score of “High” or “Moderate” and were given high priority by Bangladesh practitioners

QS*	#	Indicator	Participant Comments
1.2	1	The health facility has supplies of oral and intravenous antihypertensive agents and magnesium sulfate available in sufficient quantities at all times in the antenatal, labour and childbirth areas of the maternity unit.	Clear definition of "sufficient quantities" is needed
1.3	2	The health facility has uterotonic drugs and supplies for intravenous fluid and blood administration (syringes, needles, intravenous cannulas, intravenous fluid solutions, blood) available in sufficient quantities at all times in the childbirth and postnatal care areas.	Clear definition of "sufficient quantities" is needed
1.3	3	A functional blood transfusion service is available in the health facility at all times.	Applicable to facilities providing CEmOC
1.2	1	The proportion of all women with severe pre-eclampsia or eclampsia in the health facility who received the full dose of magnesium sulfate.	
1.2	2	The proportion of all women with severe pregnancy-induced hypertension in the health facility who received the recommended antihypertensives.	
1.3	1	The proportion of all women with post-partum haemorrhage in the health facility who received therapeutic uterotonic drugs.	
1.3	2	The proportion of all women in the health facility with post-partum haemorrhage due to a retained placenta for whom manual removal of the placenta was performed by a skilled birth attendant.	
1.4	2	The health facility has the essential supplies and equipment for vacuum or forceps-assisted delivery, including newborn resuscitation equipment, available in sufficient quantities at all times in the childbirth area of the maternity unit.	Clear definition of "sufficient quantities" is needed
1.7a	1	The health facility has supplies of oral and injectable first- and second-line antibiotics (ampicillin or penicillin and gentamicin, clindamycin, cephalosporin and metronidazole) available in sufficient quantities at all times for the expected case load.	Clear definition of "sufficient quantities" is needed
1.1a	2	The proportion of all women who gave birth in the health facility who received oxytocin within 1 min of the birth of their baby.	need observer to collect this time-sensitive data
1.4	2	The proportion of all women in the health facility with prolonged and/or obstructed labour who gave birth by caesarean section.	
1.4	3	The proportion of all women who gave birth in the health facility who underwent instrumental vaginal birth for delayed second stage of labour.	
1.4	5	The proportion of all women in the health facility with confirmed delay in progress of the first stage of labour who received oxytocin for augmentation.	
1.7a	3	The proportion of all women in the health facility with third- or fourth-degree perineal tears who	

		received antibiotics.	
1.9	1	The proportion of all uncomplicated, spontaneous vaginal births in the health facility in which an episiotomy was performed.	
1.1b	2	The health facility has supplies of sterile cord ties (or clamps) and scissors (or blades), available in sufficient quantities at all times for the expected number of births.	Clear definition of "sufficient quantities" is needed
1.5	1	The health facility has a suction device, at least two sizes of neonatal mask and a self-inflating bag in the childbirth and neonatal areas of the maternity unit.	
1.6a	2	The health facility has supplies of antenatal corticosteroids (dexamethasone or betamethasone), antibiotics and magnesium sulfate available in sufficient quantities at all times to manage preterm birth in accordance with WHO guidelines.	Clear definition of "sufficient quantities" is needed
1.6b	2	The health facility has supplies and materials to provide optimal thermal care to stable and unstable preterm babies, including kangaroo mother care (support binders, baby hats, socks), clean incubators and radiant warmers.	
1.7b	1	The health facility has supplies of injectable antibiotics (at least first- and second-line antibiotics for neonatal sepsis and meningitis) available in sufficient quantities at all times for the expected case load.	Clear definition of "sufficient quantities" is needed
5.2	2	The health facility has a system whereby the mothers of small, sick newborns can be close to and nurse their babies.	
8.2	1	The health facility has a dedicated area in the labour and childbirth area for resuscitation of newborns, which is adequately equipped with a table or resuscitaire, radiant warmer, light and appropriate resuscitation equipment and supplies.	
1.8	2	The proportion of newborns with suspected severe bacterial infection who received appropriate antibiotic therapy.	
1.1b	4	The proportion of all newborns whose umbilical cord was clamped 1–3 min after birth.	need observer to collect this time-sensitive data
1.1b	5	The proportion of all newborns who were dried immediately and thoroughly at birth.	
1.1b	1	The proportion of all newborns who were breastfed within 1 h of birth.	need observer to collect this time-sensitive data
1.1b	2	The proportion of all newborns who were kept in skin-to-skin contact (with body and head covered) with their mothers for at least 1 h after birth.	need observer to collect this time-sensitive data
1.1c	1	The proportion of all newborns on postnatal care wards or areas in the health facility who received vitamin K and full vaccination as per national guidelines.	
1.1c	4	The proportion of all newborns in the health facility who received a full clinical examination before discharge.	

1.8	2	The health facility ensures safe handling, storage and final disposal of infectious waste.	
1.8	1	The health facility has a reliable water source on site and soap and towels (preferably disposable) or alcohol-based hand rub for hand hygiene.	
8.1	4	The health facility has energy infrastructure (e.g. solar, generator, grid) that can meet all the electricity demands of the facility and associated infrastructure at all times, with a back-up power source.	
3.2	1	The health facility has ready access to a functioning ambulance or other vehicle for emergency transport of women and newborns to referral facilities.	
3.3	2	The health facility has reliable communication methods, including a mobile phone, land line or radio, which is functioning at all times, for referrals and consultation on complicated cases.	
3.2	1	The proportion of all newborns who died before or during transfer to a higher-level facility for further management.	Edit indicator to remove "during transfer"- not measurable
3.2	2	The proportion of all pregnant or postpartum women who died before or during transfer to a higher level facility for childbirth for further management.	Edit indicator to remove "during transfer"- not measurable
2.1	1	The health facility has registers, data collection forms, clinical and observation charts in place at all time for routine recording and monitoring of all care processes for women and newborns.	
2.2	1	The health facility has conducted reviews of maternal and perinatal deaths and near-misses at least once a month within the past six months and has a mechanism for implementing the recommendations of reviews.	
4.1	2	Health care staff in the maternity unit are oriented and receive in-service training at least once every 12 months to improve their interpersonal communication and counselling skills and cultural competence.	
7.1	1	The health facility has skilled birth attendants available at all times, in sufficient numbers to meet the anticipated work load.	Clear definition of "sufficient quantities" is needed
7.2	1	The health facility has a programme for continuing professional development and skills development for all skilled birth attendants and other support staff and conducts regular training.	Specify exact type of trainings
7.3	2	The health facility has a written, up-to-date leadership structure, with defined roles and responsibilities and lines of accountability for reporting.	
7.3	3	The health facility has a designated quality improvement team and responsible personnel.	

\*QS refers to the Quality Standard as listed in the WHO QoC Standards report

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## ABBREVIATIONS

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BBS	Bangladesh Bureau of Statistics
BEmOC	Basic emergency obstetric care
CCT	Conditional cash transfer
CEmOC	Comprehensive emergency obstetric care
DGFP	Directorate General of Family Planning
DGHS	Directorate General of Health Services
DHIS-2	District Health Information System 2
EMEN	Every Mother Every Newborn
ENAP	Every Newborn Action Plan
GRADE	Grading of Recommendations, Assessment, Development and Evaluations
ICD	International Classification of Diseases
INGO	International non-governmental organization
IRB	Institutional review board
JSY	Janani Suraksha Yojana
LMICs	Low and middle-income countries
MIS	Management Information System
MMR	Maternal mortality ratio
MOHFW	Ministry of Health and Family Welfare
NVD	Normal vaginal delivery
OT	Operation theater
PPH	Postpartum hemorrhage
QI	Quality improvement
QIS	Quality Improvement Secretariat
QoC	Quality of care
QoC Network	Network for Improving Quality of Care for Maternal, Newborn and Child Health
SBA	Skilled birth attendance
SDG	Sustainable Development Goals
SVRS	Sample Vital Registration System
WHO	World Health Organization

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# TABLE OF CONTENTS

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Executive Summary.....	iii
Abbreviations.....	vii
Background.....	9
UNICEF Every Mother Every Newborn Quality Standards.....	9
WHO Standards for Improving Quality of Maternal and Newborn Care.....	10
Methods.....	12
Assessment of Causality and Actionability.....	12
Rapid Review and GRADE Analysis.....	12
Qualitative Design.....	12
Qualitative Analysis.....	14
Ethical Review.....	15
Results.....	16
Assessment of Causality and Actionability.....	16
Rapid Review and GRADE Analysis.....	16
Qualitative Results.....	17
<i>Systemic Challenges in Service Delivery</i> .....	18
<i>Usefulness of QoC Standards &amp; Indicators</i> .....	20
<i>Resources Needed for Routine Measurement of QoC Indicators</i> .....	21
<i>Indicators Should Be Prioritized</i> .....	22
Discussion.....	28
Policy Implications.....	29
Recommendations.....	31
Reflections and Limitations.....	32
Conclusions.....	34
References.....	35
Appendices.....	37
Appendix A: Bangladesh Ministry of Health and Family Welfare Organogram.....	37
Appendix B: Interview Guide.....	38
Appendix C: Flowchart of the Indicator Exclusion Process Across Each Stage.....	41
Appendix D: Final Status and Reason for Exclusion for Each of the 352 WHO 2016 QoC Indicators.....	Created as a Separate Document
Appendix E: Categories of Indicators with GRADE Scores of "Moderate" and "High".....	42
Appendix F: Prioritization of Indicators.....	46



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## BACKGROUND

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Globally, the maternal mortality ratio (MMR) reduced by 44% from 385 deaths in 2000 to 216 deaths per 100,000 live births in 2015 (1), and the child mortality rate declined by more than 50% from 93 deaths in 1990 to 41 deaths per 1,000 live births in 2016 (2). However, recent years have seen a slowing of this progress, especially in reductions of maternal and neonatal mortality. To achieve the Sustainable Development Goals (SDG) health targets of reducing the global maternal mortality ratio to less than 70 per 100,000 live births and reducing neonatal mortality to less than 12 per 1,000 live births by 2030, it is essential to focus on high quality of maternity health care (3) as it is critical to the health and survival of pregnant women and newborns. Overall, the quality of maternal and neonatal healthcare provision is poor in low- and middle-income countries (LMICs), and there are significant variations across facilities (4).

Maternal and neonatal healthcare quality can encompass a range of care provision, including pregnancy and antenatal care, childbirth, post-partum care, and newborn care. Yet there is limited agreement on the definition of quality in healthcare received during labor, birth and the postnatal period (5). The domains of the quality care are effectiveness, efficiency, patient-centeredness, equity, safety and timeliness of care, as defined by the World Health Organization (WHO) and the Institute of Medicine (6,7). Application of this definition of quality to a health area of interest (e.g. antenatal care, labor and delivery, post-natal care) requires identification of specific indicators. Currently, there is no agreement on what these indicators should be nor what framework should be used. Adapting a standard global framework and identifying a set of indicators that are feasible in the context of LMICs can help to guide stakeholders in LMICs in improving the quality of maternal and neonatal health services. In order to pro-

vide actionable information for policy, programs, providers, and managers, quality must be assessed at the structure and process levels, using a framework like that developed by Donabedian (8). Policymakers, program leaders and service providers need to better understand quality, and what affects quality variations, in order to improve service delivery effectiveness and efficiency.

### **UNICEF EVERY MOTHER EVERY NEW-BORN QUALITY STANDARDS**

The Every Newborn Action Plan (ENAP), launched in 2014 and jointly led by the WHO and the United Nations Children's Fund (UNICEF), presents a strategic roadmap for ending preventable newborn deaths and stillbirths and contributing to reductions in maternal deaths (9). A key objective of ENAP is to improve the quality of maternal and newborn care (9). In 2015, UNICEF led efforts to develop the Every Mother Every Newborn (EMEN) Standards for Quality Improvement (QI) (10). The nine quality standards focus on clinical care delivered in a health facility setting, respect and dignity for mothers and newborns, and provision of supporting factors, such as governance, resources (supplies, equipment, competent staff) and a safe environment (10). Along with these standards, a guide was developed to instruct users at the facility level on implementing a systematic QI approach using supplemental tools to achieve the EMEN Standards (10). The guide outlines four steps in establishing a QI system for maternal and newborn care: 1) forming a quality team, 2) conducting baseline and ongoing assessments, 3) supporting implementation of the standards, and 4) guiding QI (10).

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## WHO STANDARDS FOR IMPROVING QUALITY OF MATERNAL AND NEWBORN CARE

In August 2016, the WHO published its Standards for Improving Quality of Maternal and Newborn Care in Health Facilities to complement the EMEN Standards (11). While the EMEN QI guide describes the approach for implementing a QI system, the WHO document focuses on presenting a set of indicators to measure progress towards achieving good quality of care. A three-phased process was used to develop the WHO standards. In the first, members from departments within WHO were convened to achieve consensus on the WHO vision: “Every pregnant woman and newborn receives high-quality care throughout pregnancy, childbirth and the postnatal period.” In the second phase, a working group comprised of members within the WHO searched for resources from international quality and safety organizations, government agencies, nongovernment and professional organizations for definitions of quality of care, models of care, frameworks, and strategic approaches. These materials were then used to develop a definition of maternal and newborn quality of care, a conceptual framework and standards of care. An expert meeting made up of 24 representatives from international organizations, academic institutions, nongovernmental organizations, and ministries of health was held to finalize the framework and the drafted standards of care. This Quality of Care (QoC) framework is composed of eight domains of quality of care, each supported by one standard of care, and a total of 31 quality statements. These standards largely overlap with those presented in the EMEN QI guide. In the third phase, the working group of WHO staff consulted its technical departments to draft quality indicators for each standard of care, totaling 318 indicators. Next, 116 of 130 invited participants from low-, middle- and high-income countries completed the first round of an online Delphi survey to review indicators, provide comments and propose additional measures. This resulted in the deletion of 10

indicators and the addition of 44 new measures, for a total of 352 indicators. In a second round of the Delphi survey, 81 of 116 participants from the first round provided online responses ranking the quality indicators. At the end of the Delphi surveys, all 352 input, output and outcome indicators were included in the final report.

Following the release of its QoC standards, the WHO convened a group of partner countries to create the Network for Improving Quality of Care for Maternal, Newborn and Child Health (the QoC Network) to implement these standards under the WHO’s shared vision for maternal and newborn care (12). In February 2017, the QoC Network was launched with the participation of nine countries: Bangladesh, Cote d’Ivoire, Ethiopia, Ghana, India, Malawi, Nigeria, Tanzania and Uganda. The goals of the QoC Network are to 1) reduce maternal and newborn deaths and stillbirths in participating health facilities by 50% over five years and 2) improve the experience of care by enabling measurable improvements in user satisfaction with the care received (12).

The WHO QoC standards and set of quality indicators targets in-country policy-makers, program managers, health planners, and providers at the national, subnational, district and facility levels. However, implementing these large sets of indicators in quality improvement efforts at facilities in LMICs may be challenging and resource prohibitive. Moreover, while many of the WHO QoC indicators may be suitable and desirable in terms of good practices, some such indicators may not be useful in providing actionable guidance on minimum standards from the perspective of routine monitoring at the facility level. Better data and better methods to routinely measure quality are needed in order to develop and implement effective solutions. There has been notable interest in developing improved tools to measure maternal and newborn healthcare quality at the facility level, including simple data collection methods and visualizations

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that can be used regularly. Existing measures are often long, difficult to administer, and require significant financial and human resources to implement. In addition, the large number of indicators can make it difficult to routinely assess quality (13). Indicators for all aspects of maternal and newborn healthcare should be evidence-based, associated with important maternal and newborn health outcomes that can be influenced by provider actions, easy to measure reliably and across various settings, effective at differentiating between good and poor care, acceptable to healthcare providers, and affordable to implement (14).

We hypothesize that the 2016 WHO QoC indicators, developed through an additive rather than selective Delphi methodology, includes many indicators for which there is not strong evidence, that may not be relevant to facility

managers, providers, program managers, nurses, government officials, implementing partners, donors and researchers, or for which facility data is unlikely to be available. All of these factors would thus limit the utility of the indicators to improve quality of care. We aimed to distill the set of indicators to those most likely to be causally related to improved health outcomes, supported by the best quality of evidence, and that were most relevant to in-country stakeholders. We conducted our investigation in three stages: 1) an assessment of causality linking an indicator to intended outcomes through application of Bradford Hill's causality criteria and whether indicators were within the control of a facility manager, 2) a rapid review of supporting literature and an evaluation of the quality of evidence, and 3) a qualitative exploration of the usefulness and feasibility of indicators using interviews with stakeholders in Bangladesh.

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## METHODS

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### **ASSESSMENT OF CAUSALITY AND ACTIONABILITY**

In the first stage, we assessed whether indicators fulfilled Hill's causality criteria and whether they represented actions that were within the control of a facility manager. Hill's causality criteria was applied to the 277 input and output indicators to assess the likelihood of a causal relationship between an indicator and improved maternal and newborn outcomes (15). In addition, indicators that were deemed to be beyond the control of a facility manager were excluded at this stage. Two senior investigators independently conducted the subjective assessment on the probable association. All 9 criteria of strength of the effect, consistency, specificity, temporality, dose-response, plausible mechanism, coherence, experimental evidence, and analogy were considered, however, the plausibility criterion was given greater weight. This criterion was met if there is a known biological explanation or a plausible explanation for how the exposure of interest might result in or contribute to the outcome of interest. The investigators also assessed whether improvements as reflected by the indicator were within the control of a facility. Following independent assessments, adjudication was conducted through verbal discussion and agreement between the two investigators. Items for which there was consensus that an indicator did not meet multiple criteria were excluded. Where there was any disagreement or uncertainty, the indicator was retained.

All 75 outcome indicators of the 2016 WHO QoC Standards were excluded because they are an ex-post-facto assessment of whether quality was provided, rather than a guide for assessing the readiness or likelihood of a facility providing quality going forward. More importantly, measures of outcome quality cannot guide improvement, only indicate that

failures occurred somewhere. This makes them useful for evaluation, but not for quality assurance or quality improvement. Applying Donabedian's framework (8), indicators of quality identified at the structure and process levels are then predictive of quality outcomes. Tracking structure and process indicators over time creates a system through which outcomes can be improved.

### **RAPID REVIEW AND GRADE ANALYSIS**

Following application of the Bradford Hill criteria, the second stage involved a rapid review of the literature and a Grading of Recommendations, Assessment, Development and Evaluations (GRADE) analysis to further reduce the number of indicators to those supported by the best quality of evidence. Rapid reviews offer a streamlined alternative to systematic reviews that allow for synthesizing evidence in a timely manner (16). Three investigators conducted a rapid review of literature supporting each indicator with an emphasis on research conducted in low- and middle-income settings. Using literature gathered through the rapid review, two investigators performed a GRADE analysis of the research to assess the quality of evidence and strength of recommendations following an approach adapted from BMJ Clinical Evidence (17). Evidence quality for each of the indicators was assigned an overall GRADE score of "high," "moderate," "low," and "very low." Indicators with GRADE scores of "high" or "moderate" were retained; those with GRADE scores of "low" or "very low" were removed from the reduced list of indicators.

### **QUALITATIVE DESIGN**

In the third stage, we conducted qualitative interviews with key stakeholders to better understand how the QoC indicators might be incorporated in ongoing efforts to improve the

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quality of maternal and neonatal healthcare in Bangladesh.

Bordering India and Myanmar, Bangladesh is the most densely populated country in the world with population of more than 162 million (18). In 2016, the life expectancy at birth was 72 years and the total fertility rate was 2.1 births per woman (18). Bangladesh has long demonstrated a commitment to health since establishing independence in 1971. With a total fertility rate of 6.9 the year of the Liberation War (18), family planning policies and programs introduced community-based female health workers as part of a household outreach strategy supported by local NGOs (19). Since instituting these programs, the country has experienced a continuous decline in growth, where small population increases are expected in coming years (19). In 2017, the Ministry of Health and Family Welfare (MOHFW), one of the largest ministries of the Government of Bangladesh, was divided into two divisions: the Health Services Division and the Medical Education and Family Planning Division (Appendix A) (20). The Health Service Division, led by the Directorate General of Health Services (DGHS), is responsible for administrating the operation of health care service delivery from national to community levels (20). It works in policy development related to health, management and maintenance of nursing care, hospitals at all levels, construction of clinics, standardization and manufacturing of biological and pharmaceutical products, among others (20). The healthcare infrastructure under the DGHS is made up of six tiers: national, divisional, district, Upazila/sub-district, union, and ward (20). The role of the Medical Education and Family Planning Division, led by the Directorate General of Family Planning (DGFP), is to promote medical education, family planning, maternal and child health, and reproductive health care services (20). It also oversees the registration and quality control of medical, dental, nursing and midwifery professionals as well as alternative medical personnel (20). In January 2015, a separate Quality Im-

provement Secretariat (QIS) was established within the MOHFW to set strategic guidelines jointly with the DGHS and DGFP and to oversee quality improvement activities in healthcare nationwide (20).

Prior to its commitment to the QoC Network, Bangladesh had already made great gains towards reducing maternal and child deaths. Bangladesh successfully achieved Millennium Development Goal 4, with the under-five mortality rate falling from 133 deaths in 1994 to 46 deaths per 1,000 live births in 2014 (19). According to the Bangladesh Maternal Mortality Survey 2010, the MMR also improved from 322 deaths in 1998-2001 to 194 deaths per 100,000 live births in 2007-2010 (19). A different source, the Sample Vital Registration System (SVRS) of the Bangladesh Bureau of Statistics (BBS), estimated an MMR of 315 in 2001 that increased to 348 in 2005 and then gradually decreased to 197 per 100,000 in 2013 (21). With its engagement in the QoC Network, Bangladesh recognizes that prioritization of investments in improving quality of care at all levels of its health system is necessary to achieve the SDG health targets (12). In a recent multi-country bottleneck analysis, minor to significant gaps in health systems building blocks were identified for skilled birth attendance (SBA), basic emergency obstetric care (BEmOC), and comprehensive emergency obstetric care (CEmOC) in Bangladesh (22). Additionally, the lack of appropriate metrics for measurement of QoC remains a major challenge (22). As one of the nine priority countries of the QoC Network, in-country discussions about adapting the QoC Standards were ongoing at the time of these interviews.

Qualitative interviews with stakeholders were conducted from November 2017 to February 2018 using a semi-structured interview guide (Appendix B). Stakeholders included facility/ward managers, doctors, nurses, government leaders, program managers/directors at international non-governmental organizations (INGOs), advisors at donor organizations, and researchers/academic program directors in

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Dhaka and Khulna, Bangladesh. Dhaka was selected because it is the geographical location of many academic institutions, headquarters of INGOs and higher level facilities that likely have more experience in implementing interventions related to improving maternal and neonatal quality of care. The 2010 Bangladesh Maternal Mortality and Healthcare Survey reported Khulna District as having the lowest maternal mortality ratio (MMR) across all districts in Bangladesh (23). Higher quality of maternal healthcare may partly contribute to this low MMR in Khulna District. Therefore, we aimed to include participants who work in facilities in Khulna to investigate whether respondents believed the WHO indicators would be useful and feasible based on their experiences and whether any overlap existed with their current quality of care measures.

Participants were conveniently and purposively selected from a range of health facilities in and around Dhaka and Khulna based on their accessibility and geographical location. We employed maximum variation sampling to include those working within different facility ownership models (public, private for-profit, private non-profit), different levels of care (primary (i.e. Upazila Health Complex), secondary, and tertiary), and stakeholders who work in supporting roles like those at INGOs, donor organizations and academic/research institutions.

Interviews focused on understanding the current quality systems for maternal and newborn care at facilities and whether incorporating the WHO standard indicators would be useful and feasible. The remaining indicators with “high” or “moderate” quality of evidence from the GRADE analysis were organized by topic: emergency obstetric care, emergency newborn care, immediate newborn care, facility infrastructure and infection prevention, referrals, data systems, staff & training, and respectful care. Each interview focused on specific categories of indicators depending on the expertise of the participant, given the amount

of time a participant was available was often limited.

Two investigators conducted the interviews in English or Bengali in a private setting, for example, participants’ offices. Participants were provided a copy of the consent form explaining the purpose of the study and were given the opportunity to ask any questions. Those who agreed to participate were asked to provide written informed consent. Participants were also asked whether interviews could be audio-recorded; for those who agreed, interviews were recorded and transcribed verbatim. For those who declined, the interviewer recorded herself summarizing the content immediately following the interview and the recorded summary was transcribed for analysis. A notetaker was also present to take interview notes during the course of the interview. Debriefing sessions between the interviewer and notetaker were conducted after each interview to summarize the content and quality of interviews. The transcript or summary of the interview was prepared from both the interviewer’s recording and the interview notes taken by the notetaker. Interviews conducted in Bengali were transcribed and translated into English for analysis.

## **QUALITATIVE ANALYSIS**

Data analysis was conducted by the two investigators who conducted the interviews and were most immersed in the raw data. Interviews were analyzed using thematic analysis (24,25). Each of the two investigators reviewed all transcripts closely to familiarize themselves with the data. Initial codes were informed deductively by the interview guide and the categories of indicators following the GRADE analysis. Codes were first generated based on aspects of the data that most related to the research objectives. Initial codes were applied to each transcript by one of the two investigators. An inductive process allowed for investigators to create additional codes that emerged from the analysis. Codes were then reviewed and refined to minimize

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duplicate or redundant codes. Each interview was re-read to edit the analysis using the refined set of codes. Memo writing was conducted to aid in summarizing and reflecting on concepts and patterns during the coding process. Network analysis was also used to visually explore how codes were related and to identify overarching themes. Data analysis was conducted using ATLAS.ti version 8.

Responses in qualitative interviews were then used to loosely categorize indicators as high, medium or low priority in terms of their per-

ceived usefulness and feasibility in the current health system in Bangladesh. Indicators were categorized as high if participants agreed that they were of high priority, medium if there were differing viewpoints, and low if participants agreed that they were of low priority.

#### **ETHICAL REVIEW**

Approval for this study was obtained from the BRAC James P. Grant School of Public Health, BRAC University Institutional Review Board (IRB).

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## RESULTS

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### ASSESSMENT OF CAUSALITY AND ACTIONABILITY

Appendix C presents a flowchart of the indicator exclusion process across each stage. Following the first stage of indicator reduction, 113 (32%) of the total 352 indicators were retained. All 75 outcome indicators (representing 21% of all indicators) were excluded at this stage. For the 164 (47%) input and output indicators that were excluded later in this stage, verbal agreement that an indicator would either not be causally related to improved maternal and newborn health outcomes or not be within the control of a facility manager was achieved among the two investigators conducting this assessment. Multiple reasons for exclusion may have been cited for an individual indicator. Of the 164 input and output indicator excluded, 32 (20%) lacked specificity, 55 (34%) lacked temporality, 3 (2%) did not show a biological gradient, 56 (34%) lacked plausibility, 83 (51%) lacked coherence, and 71 (43%) were beyond the control of a facility manager.

Appendix D lists all 352 WHO QoC indicators and notes the reason for exclusion, if applicable. For example, input measure #4 of quality statement 1.1a was excluded: “Health-care staff in labour and childbirth areas receive at least monthly drills or simulation exercises and supportive supervision in routine care and detection of obstetric complications during labour and childbirth.” The two investigators agreed the indicator should be excluded based on the Hill criterion of specificity. Here, no details about the content of the training included in the monthly drills or simulation exercises are provided, making it difficult to conclude that these drills and exercises would lead to improved health outcomes.

As another example, output measure #5 of quality statement 5.2 was excluded: “The pro-

portion of women who gave birth in the health facility who were aware of the existence and location of a complaints box.” Agreement was reached to exclude this indicator due to the lack of coherence and plausibility. It is unclear how a woman’s awareness of the existence and location of a complaints box would be linked to better health outcomes.

An example of an indicator that was excluded because it was deemed beyond the control of a facility manager is output measure #3 of quality statement 1.2: “The proportion of all women with pre-eclampsia in the health facility whose condition progressed to eclampsia.” The indicator is process focused and not specific to the care of the woman. Therefore, it does not capture actions or steps that may be taken by a provider to prevent progression to eclampsia. In contrast, an indicator that provides actionable information that may be more useful to a facility manager is output measure #1 of quality statement 1.2: “The proportion of all women with severe pre-eclampsia or eclampsia in the health facility who received the full dose of magnesium sulfate.” Here, the indicator describes actions that should be taken to improve the quality of care that is within the control of a provider and has a clear, plausible link to improved health outcomes.

### RAPID REVIEW AND GRADE ANALYSIS

The GRADE analysis following a rapid review of supporting literature for the 113 retained indicators resulted in the exclusion of 57 (50%) of the remaining input and output indicators. Among those excluded, no supporting evidence was found for 22 (19%) indicators. The majority of the indicators for which no evidence was found were input indicators describing the presence of clinical protocols in the health facility. For example, input measure #1 of quality statement 1.9 was excluded:



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“The health facility has written, up-to-date guidance on harmful practices and unnecessary interventions during labour, childbirth and the early postnatal period.” In these cases, there may be evidence that adherence to protocols resulted in improved health outcomes, however, none that suggested the presence of protocols in a facility alone affects outcomes (26,27). Adherence to protocols would be considered output or process indicators; no such indicators were included as part of the WHO QoC Standards.

As part of the GRADE analysis, 12 (11%) indicators with a GRADE score of “very low” and 19 (17%) indicators with a GRADE score of “low” were also excluded. Input measure #3 of quality statement 3.3 provides an example of an indicator with a GRADE score of “very low” that was excluded: “Evidence that the health facility has formal agreements, communication arrangements and a feedback system with referral centre(s).” While prior qualitative research identified potential options for improved referral systems, no prior research was found that aimed to specifically link the presence of formal referral agreements to improved outcomes. An example of an indicator with a GRADE score of “low” that was excluded is output measure #1 of quality statement 4.2: “The proportion of women attended during labour and childbirth for whom a partograph has been completed.” A 2013 Cochrane review, including six randomized and quasi-randomized controlled trials mainly conducted in high-income settings comparing partograph versus no partograph or different partograph designs, found no difference in caesarean section, instrumental vaginal delivery or Apgar score (28). A 2017 review that also included non-randomized studies, including pre/post designs, with a focus primarily toward low-resource settings concluded that partographs can lead to improved outcomes, however, in many settings, partograph use is incomplete, which likely limits the effects seen on clinical outcomes (29). Both reviews called for more

robust trials, especially in low-resource settings (28,29).

Four of the indicators with a GRADE score of “moderate” were duplicates and were dropped. Of the 56 indicators that were retained, 38 had a GRADE score of “moderate” and 18 had a GRADE score of “high.” An example of an indicator with a GRADE score of “moderate” is input indicator #1 of quality statement 5.1, which stipulates “The physical environment of the health facility allows privacy and the provision of respectful, confidential care, including the availability of curtains, screens, partitions and sufficient bed capacity.” A mixed-method systematic review identified several articles linking the lack of privacy with poor patient satisfaction and hesitancy to deliver at a health facility (30). Output indicator #5 of quality statement 1.4 had a GRADE score of “high”: “The proportion of all women in the health facility with confirmed delay in progress of the first stage of labour who received oxytocin for augmentation.” Prior research suggests that while the use of active management does not reduce the rate of caesarean section, it does consistently reduce the first stage of labor without resulting in other morbidities (31–33). The 56 retained indicators were grouped into categories (Appendix E) to facilitate discussion in the qualitative interviews.

## **QUALITATIVE RESULTS**

A total of 25 interviews were completed; five were conducted in English and 20 were conducted in Bengali. Of note, only 13 participants allowed interviews to be recorded; for these interviews verbatim transcripts were analyzed. Ten of the 12 participants who did not allow interviews to be recorded were staff at government facilities; one was an MOHFW representative and one was an advisor at a donor organization. In these cases, the interviewer recorded a verbal summary of the interview immediately following the session. This recording was transcribed and used for analysis. Interviews with staff at facilities, both

public and private, were often no longer than 30 minutes as they often had clinical duties to return to. Two additional individuals were approached with requests for interviews, but they refused to provide written informed consent. Both had initially agreed to the interview

but did not feel comfortable providing a signature on the consent form and thus, were not included. Table 1 summarizes the types of participants interviewed.

**Table 1: Participant Summary**

Participant type	No. of interviews
INGO representative	2
Researcher at an academic/research institution	3
MOHFW representative	1
Advisor at a donor organization	1
Physician at a tertiary level academic hospital	2
Senior physician at a tertiary level public hospital	2
Mid-level physician at a tertiary level public hospital	3
Physician at a tertiary level private hospital	2
Physician at a private practice	2
Physician at a secondary level public facility	3
Nurse at a secondary level public facility	3
Physician at a primary level public facility/ Upazila Health Complex	1
TOTAL	25

Overall, stakeholders in Bangladesh recognized a shift in focus toward improving quality of healthcare services is needed to continue making gains in reducing maternal and neonatal mortality. However, in terms of the feasibility and utility of the WHO indicators, several factors should be considered within the current context of healthcare delivery in Bangladesh, presented thematically below. Each quote includes the participant’s position, type of organization, and level of health facility, if applicable.

### **SYSTEMIC CHALLENGES IN SERVICE DELIVERY**

A consistent theme that emerged across many of the interviews with providers, program implementers and researchers was the challenge in effectively implementing and translating current Bangladesh policies and strategies adapted from global recommended guidelines into programs and interventions within the healthcare system. Participants acknowledged that strategic documents and operational plans are helpful to establish best

practices, but these need to be implemented across the health system consistently and not sporadically. On top of that, the health policies should take into account the realities of working in settings that may have limited resources and space.

“You have strategies, you have policies, but those needs to be activated... Those need to be working in the field. Only writing the new strategy, okay, fine, but that needs to be established... lacking is the establishment of the policies and strategies throughout the system. So that needs to be done.” (Health program director, INGO)

Key factors cited as contributing to this gap in effectively translating policy in healthcare delivery include the lack of human resources, equipment, supplies and medicines, facility space, and financial resources. The issue of a lack of human resources or low competency among staff was raised across all interviews.

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Specifically, participants described aspects related to unfilled vacancies for support staff positions or positions stationed in rural locations, low retention rates, the gap in skill levels of current staff to meet patient needs at a facility, primarily those of nurses. They explained that this gap in staff skill levels can result in the subsequent referral of cases to higher level facilities and the over-burdening of these facilities because lower levels are not appropriately staffed or provided with the required training.

“[The] lack of human resources is ... for two reasons: one is the proportion between nurses and doctors are less in Bangladesh in comparison to the WHO. Government is not trying to do a lot of recruitment of the doctors, nurses as well and now midwives...The healthcare providers... are not interested to stay there and provide the services in the remote areas of Bangladesh, in the rural areas... for that, I not necessarily blame all the healthcare providers that they're not going... At the same time, they need environment, they need the system to work with, and they need... the facilities. So those things has to be developed.” (Researcher, academic/research institution)

The large patient volume and over-burdening of higher level facilities was discussed by many of the providers interviewed. They described the lack of sufficient physical space in their facilities to meet patient demand. Overcrowding was a frequent issue at many of the tertiary level hospitals, and participants described needing to turn patients away for lack of space. In the case of newborns treated in neonatal units, facilities often cannot provide the space for mothers to stay with their children. A physician at a tertiary level public facility stated, “Our biggest problem is the sick kids we are treating. We don't have space for their mother. They lay down in very narrow spaces like in the veranda or corridor. While

managing her, we see the infection rate is very high.” In some wards, a high volume of patients may mean that complete treatment cannot be ensured before discharging the patient.

“Here we have to work with many limitations- like our bed number is very low, very few manpower, as we four professors manage many responsibilities. Then we get very few training resources, we have to manage patient services, like we have many patients in the [ward] but we cannot admit them because of a bed shortage. Those who we admit many of them come with such severe conditions, sometimes they die before completing the treatment.” (Senior physician, tertiary level academic hospital)

Participants also described challenges related to maintaining functioning equipment at tertiary and district level facilities and not meeting the demand for patients in need. When reviewing an emergency newborn care indicator related to supplies and equipment for thermal care for stable and unstable preterm babies, one physician explained:

“This has two components- one is kangaroo mother care and the other is whether there is supplies and materials to provide optimal thermal care- when you are talking about adequate supply, in Bangladesh we'll get inadequacy at every level. At every level, even if you ask me whether [my facility] has adequate supply- my answer would be no. In terms of a ventilator, we do not have enough ventilators, sometimes we have to reject some babies. We have incubators, but it is definitely not sufficient. In the district level, there is also insufficiency. I also want to talk about the maintenance of equipment. Suppose the government has provided me with some equipment. The instrument or equipment is

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there, but when it requires servicing, it cannot be done because the biomedical technology department is not functioning in many medical college hospitals. When UNICEF is providing the support, there is a group called HAMA which does the servicing and maintenance for those equipment. I am a bit scared how long it will continue if UNICEF withdraws its support and the government does not establish a biomedical technology department in all medical colleges. It will be a big challenge to continue it. Kangaroo mother care is an achievable intervention for newborn babies. The barrier is the socio-economic culture. It may take time for the society to accept it. In our department, we can provide kangaroo mother care for the eligible babies. As per the protocol, the challenge is the duration. The protocol says KMC should be given for 20 hours/day, frankly speaking we have not achieved it... but we are trying.” (Physician, tertiary level academic facility)

A nurse at a secondary level facility also discussed pay-for-service challenges affecting healthcare delivery, stating, “There is no ambulance service available at the facility, but the process is ongoing. If the need arises the patient has to pay for a private ambulance service.” Another concern was that many emergency medicines and antibiotics for maternal and neonate patients are not in supply or go out-of-stock in hospitals. As a result, providers frequently have to ask their patients or their attendants to buy medicines and supplies. Many attributed these challenges to financial resource constraints, explaining that the budgets allocated for health do not reflect what is actually needed for service provision. As a representative at an INGO mentioned, “I think we really need to have a comprehensive approach that has more; a lot of investment is required.”

## **USEFULNESS OF QOC STANDARDS & INDICATORS**

Given the current systemic challenges in service delivery, participants stated that having indicators to guide quality of care improvement is useful as it sets a standard and allows for monitoring of programs and performance. In interviews with representatives from an INGO and an academic/research institution, participants mentioned the MOHFW had recently held meetings to adapt UNICEF’s Every Mother Every Newborn (EMEN) QoC Standards into national policy, and that meetings had been planned to do the same for the WHO QoC Standards. Specific to the WHO QoC Standards, one researcher viewed the list as useful for the evaluation of programs, but not helpful as a program management tool as it does not indicate what needs to be done to achieve the indicators. The WHO QoC Standards require in-country stakeholders to adapt the document to the country context and to use it as an advocacy tool for pushing the QoC agenda forward.

“This is, this actually helps some, you know, understand why it is the way it is. It isn’t designed to be everything for everybody... So, you pick and choose what you want to use from it and you know. The fact that now we have something from the WHO allows us to use it as the standard, as a basis for this and push it in the agenda. But... by itself it’s not going to do a whole lot for us unless we do a lot of adaptation and conversation here in this country.” (Researcher, academic/research institution)

A researcher also explained that having a standardized QoC tool is useful to hold people accountable and to provide motivation for staff to improve their performance. A QoC tool might then address concerns shared by a representative from the MOHFW who described a high rate of government sector worker absenteeism and the need for proper monitoring and supervision. These standards require a

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regular supervisory structure be maintained that would ultimately benefit staff morale and accountability in facilities.

“Most of us, we do it, we have a job, we get paid for it... you know, there’re, there is certain level of motivation to produce good work. What drives the motivation? One of the things that drives the motivation is that you do want to see that your boss is happy. Right? It, especially in a bureaucracy, you know, and the public system, that’s a major driving force. So, if your boss never turns up and asks you, asks you, how is the work, never comes around and sees what you’re doing, why would you work? Why would you care to produce good outputs? You wouldn’t. So, I think for me, the biggest thing is that there’s absolute, zero-level accountability in many of these low-level facilities... things could be a lot better, even despite those challenges, if the accountability was in a better shape.” (Researcher, academic/research institution)

The MOHFW representative also mentioned the usefulness of these indicators to hold providers working in the private sector accountable and asserted that the quality of services cannot be assured as long as the private sector is not regulated. He provided an example of a nearby private facility, where both a mother and her newborn had died, and the event went unreported. The mother had undergone a caesarean section two months prior by someone identifying himself as a “surgeon,” who had only completed higher secondary education and then assisted in some clinics as an operation theater (OT) assistant.

In contrast, a physician at a secondary level public facility argued that the WHO indicators may lead to unfair judgements about the performance of a facility. He asserted that these indicators do not take into account the shortage in per capita investment and the lack of

manpower and resources. He emphasized that any failings would not necessarily be the fault of the manager at a single facility if these larger systemic issues can only be addressed at higher levels of the government.

### **RESOURCES NEEDED FOR ROUTINE MEASUREMENT OF QOC INDICATORS**

The same barriers that currently hinder service delivery overlap with the challenges participants identified when asked if routine quality measurement could be feasibly built into the current health system in Bangladesh. Participants mentioned that recording quality data requires designated personnel, which most facilities currently lack. At many of the facilities, the registers are maintained by sisters-in-charge (nurses) or a physician, which is often an activity they perform in addition to their clinical workload. If additional data is required for routine indicators, designated quality improvement personnel are needed to collect and monitor this type of data. From the perspective of a high volume facility, one senior physician at a tertiary level academic facility stated that indicator measurement “should be easier. Indicators should be more feasible and easy. To get the ratio, you have to maintain a register, you have to assign a person to record data of 24 hours. It is tough.”

In addition, a robust supervisory mechanism should be established with a strong commitment to complete and accurate data collection by facility leadership. Currently, data may be collected but it may not be accurate. One physician at a tertiary level public facility explained, “If you say that you’ll visit some facility to measure how many babies were clamped within 1-3 minutes, you’ll get some document, but that is not the reality.” Other participants also agreed that poor quality data in registers is problematic. A program director at an INGO stated, “[the] problem is whether you are maintaining that register with [the] right quality or not. The manager can show you, but when you dig deep down into the tools, those are not followed.”

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The issue of collecting data but not using the data was also cited as a barrier to accurate data and buy-in to routine measurement from facility staff. Consequently, decisions at the facility level are not informed by the available data. One physician in private practice challenged, “With keeping this [data for indicators], [the providers] also need to know how to use it. If they cannot use that, then what is the benefit of keeping this?” Similar deficiencies in the use of data in facilities were echoed by a researcher.

“...people are there for monitoring. They need tools, they need supervision and they need proper feedback mechanism from their supervisors. Like you do the monitoring, do your own, you do not give any feedback as a supervisor and then you submit the data. It won't work.” (Researcher, academic/research institution)

At the higher levels of the government, a parallel situation was also described by a researcher, where better coordination and communication is required between the divisions and the QI secretariat of the MOHFW to make progress in QoC initiatives.

“[Program implementers] have almost no idea how we are adopting these standards to the Bangladeshi context and how these indicators are being in, are being adopted to our context. So therefore, now, we've been a victim of having a very narrow way where we have progressed forward with adaptation with no buy-in from the program itself. No, it has to be used by the facility. It has to be, let's say to take the first example, the essential newborn care, the Newborn Health Program, the program responsible for ensuring that newborn services are available in the country, they have to understand exactly what needs to be done to ensure good quality of care. All the inputs they need to provide, what all the

outputs that need to be produced of that, they have to have a very good understanding of it. It doesn't make sense to say- start measuring it, these indicators, when the program is going on a different track.” (Researcher, academic/research institution)

### **INDICATORS SHOULD BE PRIORITIZED**

All participants agreed that the list of 52 indicators was still too long to be measured routinely. Many of them stated that the indicators should be prioritized given the existing strain on resources to deliver care, much less to collect data to monitor quality. When asked to prioritize the indicator categories, most participants identified those related to staff and training as high priority and useful for improving the skill level and capacity of providers, and thus improving quality of care provided.

“...in the Bangladesh set up, the most, the critical thing is that most of the trainings are one-off, where they're very much classroom-based. These are not competency-based training, and there is no follow-up and mentoring support...We are just training people, and these trainings are of questionable quality, whether this is really transforming the competency and skill. And this cannot be one-off. You continue, you have to continuously nurture and then support and mentor...” (Health program director, INGO)

In terms of training in emergency obstetric care, some cases are not very common and without regular refresher training, it is difficult to retain the knowledge and practices to appropriately treat these complications. One of the participants from a tertiary public hospital mentioned that if a provider does not see cases like PPH or birth asphyxia regularly, remembering how to manage these cases correctly can be challenging, especially in rural areas where facilities may not have adequate supplies. A participant from an academic/research institution mentioned that the

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nurses are provided training for handling normal vaginal deliveries (NVD). While nurses and midwives can help to relieve some of the burden on physicians for non-complicated cases, they should not be expected to treat complications on their own.

Indicators tracking the presence of medicines and supplies were also of high priority. These indicators list supplies of oral and intravenous antihypertensive agents and magnesium sulfate, uterotonic drugs and supplies for intravenous fluid and blood administration, essential supplies and equipment for vacuum or forceps-assisted delivery, oral and injectable antibiotics, supplies of sterile cord ties/clamps and scissors/blades, a suction device with neonatal masks and self-inflating bag, and antenatal corticosteroids.

“I think this is very important. Because without the supplies you cannot do anything. So those things has to be ensured. But this is important. Without one of them, you cannot have a very good labor and childbirth.” (Researcher, academic/research institution)

All three nurses/sisters-in-charges we spoke to explained that they currently use register data to forecast the amount of supplies to be ordered from the hospital supply manager on a weekly or monthly basis. They mentioned that while taking estimates from register data is not problematic, their orders may not be completely filled. In these cases, patients and their family members are asked to purchase medicine from other sources to bring to the hospital. In some hospitals, providers will purchase medicine that are out-of-stock with their own funds. The nurses were not able to provide information on the process for hospital procurement of supplies and medicines. In terms of the phrasing of indicators, many of the participants commented on the need to reword or define phrases like “sufficient quantities” in many of these input indicators related to supply management. One participant from a donor organization explained that this

phrase could be interpreted very differently between two people, so having a guideline for consistent interpretation is necessary for routine measurement.

In addition, indicators monitoring the clinical decisions and actions taken by providers were generally thought to be of high importance and useful for tracking quality of services. When reviewing the list of emergency newborn care indicators, a neonatologist at a tertiary level public hospital explained that his department has the supplies and medicine listed in the input indicators but that currently, “facilities don’t have any system to collect this information but if it is monitored slowly then it is possible to keep.” This same participant explained that while he thought the output indicators related to emergency and immediate newborn care were necessary to record, he was concerned with who would maintain these records.

“It’s necessary but who will do that? Like ‘the proportion of all newborns in the health facility who received a full clinical examination before discharge’ – how will I keep this proportion? ... if I tell the proportion, how will I get that? Who will get that? It is really tough. To measure this, you have to record the details. That is very tough...” (Physician, tertiary level public hospital)

A physician at a secondary level public facility agreed that proportions for these output indicators would be very difficult to collect. He explained that with the shortage of human resources, it would be unlikely for this information to be maintained accurately. In contrast, another provider felt strongly about an output indicator intended to track the proportion of newborns with suspected severe bacterial infection who received appropriate antibiotic therapy.

“Being a newborn service provider, I believe that it is necessary to keep it as one of the core indicators because

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newborn infection is one of the major cause of newborn death.” (Physician, tertiary level academic hospital)

With regards to indicators related to immediate newborn care, many providers thought data needed to calculate the output indicators related to drying of the newborn, breastfeeding, and skin-to-skin contact could be maintained by pediatric wards. However, collecting this data would be difficult to coordinate since many of the indicators are time sensitive and staff from the pediatric ward are often not present during or immediately following a birth, so these indicators would require an observer or a person assigned to this task. In contrast, a neonatologist at a tertiary academic hospital suggested the obstetrics department would be the most appropriate source for this information.

“If you talk about collecting information, then I have to say that this is a part of the obstetrics department... In that case with the cooperation from obstetrics department, it would be easier to collect information. In that case you have to keep in mind –whom you are talking to, how is his/her mindset, whether s/he is cooperative or not, whether he is interested in the work that is more related to public health- it depends on these factors. As far as I know it should not be a difficult task.” (Physician, tertiary level academic hospital)

In another example, a physician at a tertiary level academic hospital supported the use of the output indicators monitoring care received in emergency obstetric cases. She asserted that recording information for these indicators would be useful to better understand cases of post-partum hemorrhage (PPH) in a facility as a whole. She described providers noting in a patient’s death certificate PPH as a cause of death, but further information as to the cause of PPH or when PPH occurred and for how

long is not currently collected systematically in a central register.

This same participant explained that current documentation of these clinical services is often poor, not only at primary or secondary level health facilities, but also at tertiary level facilities, like the one in which she works. Discussing the output indicator measuring the proportion of women with PPH due to a retained placenta for whom manual removal of the placenta was performed by a skilled birth attendant, she explained that the current register maintained by birth attendants in her facility does not include information about total cases of PPH. In addition, birth attendants conduct procedures like manual placenta removal, but record keeping of these types of procedures is poor and inconsistent.

In contrast, a physician at a tertiary level public hospital asserted that routine data is collected at the tertiary level but not at the lower levels when discussing the output indicator measuring the proportion of women with prolonged and/or obstructed labor who gave birth by caesarean section.

“... upazila health complexes do many NVDs [normal vaginal deliveries], but the register isn’t being maintained. We maintain the register very seriously in here. In there, if it is officially said that you have to maintain this... it is actually not very tough for them to maintain a register.” (Physician, tertiary level public hospital)

One participant thought that the input indicator stating a functional blood transfusion service should be available at all times would only be relevant “if it is Upazila Health Complex and above, it is blood transfusion is needed if caesarean section is going on... if it is EmOC [emergency obstetric care] center you have to have blood transfusion. Kind of, it depends on what kind of service that Upazila Health Complex is providing.” One of the maternal health indicators that many providers thought should be removed from the list is the



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output indicator that measures the proportion of women undergoing caesarean section according to Robson classification groups. All the providers we spoke to about the emergency obstetric care indicators explained that they were not familiar with the Robson classification and that it was not practiced in Bangladesh. An output indicator that participants identified as missing from the shortened list was the proportion of women attended during labor and childbirth for whom a partograph has been completed. A researcher explained that requiring midwives to use partographs is necessary in order for them to be able to make clinical decisions about whether a woman is experiencing prolonged and/or obstructed labor.

“Partograph should be there and, and my point is if... the doctors do not have to do it, if you don't want to, but midwives has to do it. My point is how would you know that it was a prolonged labor or obstructed labor? That should be proved by the partograph. Because, in the health facility with prolonged and/or obstructed labor or somebody would say that fetal distress was there and that is why the caesarean was done so partograph would say that. I think the forms in all the hospitals should emphasize on causes of why you have decided on this caesarean section and the proof is partograph.” (Researcher, academic/research institution)

For the group of input indicators related to infection prevention and facility infrastructure, participants suggested that not all indicators were necessary. In wanting to reduce the burden of data collection, one participant suggested that selecting two or three indicators would be sufficient.

“...whether [supplies are] there, and whether gloves are there, and maybe the light. And the water, uh, with soap. So maybe two, three indicators on the

facility because our problem, one of the problems is facility preparedness. So those are the main things. The infection might be there. Infection doesn't always mean what they are doing, the preparedness is very important.” (Researcher, academic/research institution)

Referral indicators were regarded as high priority; however, some participants did not think data could be collected for the output indicators. These output indicators measure the proportion of all newborns and all pregnant or postpartum women who died before or during transfer to a higher-level facility for further management.

“...the staff can provide you with information on like, newborns who died before the transfer, but because many of these will not have their own functioning ambulance or anything, and sometimes... a newborn dies during transfer so it is difficult to collect the data in this situation. So maybe you change the indicator to like, ‘number of newborns who died before the transfer.’ The same is true for the pregnant or postpartum women.” (Researcher, academic/research institution)

Many participants also highlighted the importance of the facility having access to a functioning ambulance and having reliable communication methods for referrals of complicated cases but stated that having a list of network facilities was less important.

“so I will prefer like, whether they have a functional transportation and then communication method. This list of referral facilities is not that important... Like most of the health service providers, they know which facilities they want to refer to so, for example, some of the cases may be different for referral depending on the complications, they may need to go to medical col-

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lege... it doesn't matter whether I have a list in my room or in the maternity room, that's less important." (Researcher, academic/research institution)

In terms of data systems indicators, participants explained that not all levels of health facilities collect the type of data outlined in the indicators. They also asserted that facilities were likely not carrying out the activities the output indicators intended to measure. These indicators list the proportion of all perinatal deaths and maternal deaths and near-misses occurring in the facility that were reviewed with standard audit tools. Participants asserted that a change in practice would be required for these output indicators to be relevant and were, therefore, of lower priority at this stage.

"...the first one is important but this is again like, it asks for the 'registers, data collection forms, clinical and observation charts' so some facilities may have some but not all... I mean like these lower level facilities will have just registers... only in the [inpatient] facilities, they will have the clinical and observation charts... the facilities, they can provide you with the information, whether they had any review of maternal and perinatal deaths and near-misses, but the 'proportion of all perinatal deaths that are review with standard audit tools' I don't think that, especially in the government sector, they don't tend to do that. They don't have that information." (Health program director, INGO)

A participant at a tertiary level academic hospital explained that current registers were generally focused on clinical data points and include information related to date of admission, primary and final diagnosis, the treatment plan, and the cause of patient mortality. These records are kept in patient files and registers within the respective departments.

She expressed the importance of maintaining such records as they contribute to national statistics through the District Health Information System 2 (DHIS-2). When asked about current data systems, another physician at a tertiary level academic facility stated, "Before we didn't have any information database. Now we are giving data input day-to-day through MIS [Management Information System] section of DG [Directorate General] health; it is being disseminated and everyday data is going to the DG office. The data are being input according to ICD [International Classification of Diseases] code. We have a delegated personnel for this; he is doing these daily."

Participants varied in their opinions about indicators related to respectful care and privacy. In general, providers explained that patient privacy cannot be guaranteed given the large patient volume and the lack of space in their facilities. Participants agreed that respectful care and privacy are not currently a focus in care provided in many of the facilities but disagreed on whether it should be a priority for measurement of QoC indicators at this time. Some asserted that because the provision of respectful care and privacy requires significant investment, it should be a high priority for measurement.

"Privacy of routine systems measures zero! ...The fourth standard is about respectful care, the fifth standard is about the experience of care. These two standards, all the input, process, and outcome indicators that they have proposed is not even measured- ... You can't even measure them with surveys let alone routine systems. And the definition of accountability... The definition is that are we satisfied with privacy... How do we measure that? Even with surveys, I think, I think we really, really need to work on 4 and 5. And for the rest, I think we really need to prioritize." (Researcher, academic/research institution)

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Others stated that social norms of a country should be considered when deciding if investing in the measurement of indicators related to respectful care and privacy is useful, suggesting that these indicators were of lower priority especially among those in more rural settings.

“...these are kind of more indicative of very final level individual and social norms issues...The value of the woman here is not generally very high, particularly in the rural context, in every context. So, these are indicative of the overall societal development, particularly, how society values women, in terms of empowerment, in terms of valuing privacy, rights perspective. So, I mean, it will be very difficult if you start measuring it now.” (Health program director, INGO)

Another participant focused his responses on eliminating redundancy of indicators related to respectful care and privacy. He explained that one of the two input indicators could be eliminated focusing on the physical environment: 1) the physical environment allows for privacy and the provision of respectful, confidential care, including the availability of curtains, screens, partitions and sufficient bed capacity, and 2) the labour and childbirth areas are organized in such a way as to allow a physical private space for the woman and her companion at the time of birth. He also described consolidating two input indicators related to protocols and policies: 1) the facility has written, up-to-date protocols to ensure privacy and confidentiality for all women and newborns in all aspects of care, and 2) the facility has written, up-to-date, zero-tolerance non-

discriminatory policies with regard to mistreatment of women and newborns.

“...the written protocol and policies, you can retain only one of them. Like ‘protocols to ensure privacy and confidentiality’ but like the ‘zero-tolerance non-discriminatory, discriminatory policies with regard to mistreatment’ that can also be part of this privacy and confidentiality protocol.” (Researcher, academic/research institution)

Finally, the same participant favored the output indicator that measures the proportion of women who gave birth in the health facility who reported they were given the opportunity to discuss their concerns and preferences over the input indicator that stipulates having easily understood health education materials, in an accessible written or pictorial format, are available in the languages of the communities served by the health facility.

“..it doesn’t depend on like, the education materials displayed. So you can also drop that one, provided you retain the opportunity to discuss their concerns.” (Researcher, academic/research institution)

Based on these results, Appendix F presents the indicators categorized as high, medium or low priority considering responses from participants about their usefulness and feasibility. Of the 56 indicators retained following the GRADE analysis, 43 (77%) were high priority, 8 (14%) were medium priority, and 5 (9%) were low priority.

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## DISCUSSION

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Until recently, efforts to reduce maternal and neonatal mortality largely focused on increasing coverage of deliveries attended by a skilled birth attendant by both providing training to community-based workers and by encouraging deliveries at facilities (34). However, recent research has found that merely increasing coverage with little focus on improving quality has minimal impact on maternal and neonatal mortality (35,36). For example, an evaluation of a conditional cash transfer (CCT) program in India, the Janani Suraksha Yojana (JSY) incentivizing facility-based deliveries, found that while the program succeeded in increasing facility-based births from 20% to 49% in five years, only a small, non-significant reduction in MMR was detected (35). Similarly, no significant decrease in neonatal mortality was observed (36). In a systematic review that included articles that assessed the effect of voucher programs on facility-based deliveries and health impact, the authors concluded that evidence to support increased utilization was high, but overall, there was a lack of evidence that such programs improved health status (37–40). Findings from such studies have led to the global recognition that high quality care is a critical component of service delivery that is necessary to further the progress that has been made in reducing maternal and neonatal mortality (6,41).

With quality of care now in the forefront, the creation of the WHO Standards for Improving Quality of Maternal and Newborn Care in Health Facilities to guide efforts in quality measurement is welcomed. However, the volume of indicators included in the report reflects the numerous and wide-ranging initiatives promoting various indicator lists on maternal and neonatal health indicators worldwide. Thus, we lack both consensus on the definition of quality of care and evidence of factors that drive high quality maternal and

neonatal healthcare in LMICs (14,42,43). Therefore, it is not yet clear that improving performance as measured by the proposed indicators will ultimately lead to further reductions in maternal and neonatal mortality, as is the intention of the WHO QoC Standards. For example, the output indicator measuring the proportion of women attended during labor and childbirth for whom a partograph has been completed had a GRADE score of “very low” in the rapid review. Randomized trials from mainly high-income countries found no improvements to clinical outcomes comparing partograph versus no partograph or different partograph designs (28). A more recent review including non-randomized studies in LMICs suggested that while current partograph use in many settings is imperfect, it may lead to better outcomes if used correctly (29). During interviews, this indicator was identified as missing from our reduced list and a recommendation was made that it be added back in. This example reflects the initial additive process that was used to construct the WHO indicators. Applying a more selective approach requires limiting a short-list of indicators to only those for which evidence for improving quality of care currently exists. It may be possible that, as Bedwell *et al.* suggest, the lack of an observed effect is due to incomplete partograph use in LMICs (29), however, this has yet to be demonstrated. This supports the need to generate more robust evidence correlating components of clinical practice to improved outcomes in LMICs.

Additionally, the nature of maternal healthcare makes it difficult to assess quality since the practice of good, evidence-based clinical care may not always prevent obstetric complications, like PPH (14). This unpredictability of complications makes linking QoC components with clinical outcomes difficult, especially given that maternal deaths have become a rela-

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tively rare event with recent improvements (14). For these reasons, no standardized, simplified short-list of indicators currently exists for maternal and neonatal healthcare services.

This is a first attempt so far to understand the usefulness and feasibility of the WHO indicators through interviews with stakeholders in Bangladesh, potential users of these indicators in a participating country of the WHO QoC Network. Participants in our study agreed that a set of metrics to guide quality improvement is necessary; however, the current WHO indicators create a burden of measurement that may only work to overwhelm the current health system in Bangladesh. Similarly, a recently published scoping review concluded that a vast number of existing, recommended maternal and newborn indicators lack sufficient guidance on establishing a data collection system that would facilitate feasible reporting of such indicators (43). In addition, the researchers acknowledged that further studies are required to identify which indicators are useful in specific national and subnational contexts (43).

In our study, the stakeholders suggested an approach that prioritizes a short-list of indicators to make implementing a quality improvement strategy more feasible. High on this list of prioritized indicators were those related to staff and training. Participants highlighted the need for follow-up refresher training and continuing education for staff to maintain and further develop necessary knowledge and skills as opposed to one-off trainings that are often the current practice in Bangladesh. Previous research has found the use of audit and feedback mechanisms and continuing education meetings using mixed interactive and didactic formats can lead to small, positive improvements in provider knowledge; however, much of this work took place in developed countries and evaluations of the effects on longer term professional practice or health outcomes are limited (44,45).

Indicators related to emergency obstetric care, newborn care and immediate newborn care were also of high priority. However, most participants did not recognize the Robson criteria for caesarean section. Prior research has shown that audit and feedback using the Robson classification resulted in a reduction or maintenance of caesarean section rates without any increases in adverse outcomes in the mother or the newborn (46). It seems that while evidence for this intervention exists, measurement of this indicator may not be practical for countries like Bangladesh that do not apply these criteria as part of standard practice. Participants agreed that more work needed to be done to improve respectful care in Bangladesh but were split on whether to currently prioritize these set of indicators. Respectful maternity care has been increasingly recognized in the international sphere as a critical human rights issue in the provision and experience of care during pregnancy and childbirth (47). Research has shown that women's experiences of mistreatment, leading to low expectations of care provided, can impact their decision to deliver in a health facility in the future (30). While participants expressed the need to change social norms in Bangladesh toward valuing and empowering women, especially in rural communities, they explained that any changes would be slow. Therefore, respectful maternity care indicators were identified as important, but not as critical, for quality of care in Bangladesh.

## **POLICY IMPLICATIONS**

A commitment to monitor and improve quality of maternal and newborn healthcare will require countries that already experience a strain on their existing health systems to invest further resources into developing often nascent quality improvement arms. International documents like the WHO QoC Standards can help to bring the importance of quality measurement to the national discourse but attempting to incorporate all 352 indicators is likely to overwhelm a system that is already overstretched. In addition, some of these indi-

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cators, like those referencing the Robson criteria, may not be aligned with the care that is currently provided. Furthermore, since many of the recommended indicators lack evidence, countries risk investing in measurement systems that may not lead to improved maternal and newborn health outcomes.

Specific to Bangladesh, many of the barriers highlighted by participants that prevent effective implementation of strategies and policies for healthcare practice across the system, like the lack of human resources, regular refresher training, equipment, supplies and medicines, facility space, and financial resources, are consistent with bottlenecks in service delivery in Bangladesh as described in previous research (4,22). This suggests the need to prioritize input indicators first in low-resource setting as these same factors are likely to also hinder any quality improvement strategies. Many participants mentioned that facilities are not currently equipped to meet demand for the high volume of patients they receive.

Furthermore, during discussions with providers at facilities, their primary concerns were often related to who would be responsible for collecting the data required to calculate these indicators, especially output indicators that require the collection of accurate counts for the numerator and denominator. Participants explained that another important factor to facilitate feasibility is creating a designated quality improvement team and responsible personnel to avoid burdening clinical staff with additional data collection activities. In a review conducted by Raven *et al.*, quality improvement teams were integral in activities related to identifying barriers, prioritizing problems and developing solutions (48). These teams, with the support of facility leadership, also helped to establish a culture of quality improvement across all levels of staff (48). Because staff are already stretched to meet their basic care provision obligations, implementation of the WHO QoC Standards would likely be unsuccessful unless additional human resources can be allocated to quality measure-

ment tasks. As a consequence, quality measurement initiatives may be plagued by inaccurate and inconsistent data that do not inform strategies to improve quality of care. On the other hand, quality indicators are meant to generate information that can be used to improve issues related to a shortage of human resources, out-of-stock supplies and medicine, and lack of beds to meet patient volume. If the implementation of a quality improvement policy is accompanied by an investment in creating designated quality improvement teams at facilities, routine quality data that is accurate and reliable may be more feasible. Similar efforts have been made when implementing DHIS-2 in Bangladesh, where participants mentioned separate data personnel positions had been created to collect and report this data centrally to the MIS office. A similar mechanism for central reporting of quality of care indicators, or even incorporation of quality measures within the existing DHIS-2 system, can produce key, evidence-based, actionable indicators at the national level to guide programmatic decisions in alleviating the bottlenecks stakeholders described as hindering the current health system. However, while some providers in facilities recognized that collecting data for DHIS-2 was important for generating national statistics, none described using this data to inform their own clinical practice. If routine quality improvement data are similarly only reported centrally and not also used in facility management, WHO QoC indicators may have limited impact on maternal and newborn quality of care. Facility and district managers should be supported in learning how to make decisions based on QoC indicators and should be empowered to make changes in their facilities in order to maximize the benefit of routine quality indicators on the performance of health systems in Bangladesh.

Some participants also highlighted the need to extend quality improvement initiatives to the private sector. The increase in the proportion of births at health facilities in Bangladesh can be largely attributed to the sharp increase

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at private facilities, indicating a growing demand for facility-based deliveries that public facilities alone are unable to meet. Deliveries at private hospitals increased from 8% in 2007 to 22% in 2014 compared to deliveries in public hospitals, which rose from 8% in 2007 to 13% in 2014 (19). While there is recognition that increased regulation of the private sector is needed (49), providers classified as “low-quality and underqualified” cannot be effectively regulated if no reasonable alternatives of acceptable quality are available to patients in need (50,51). This is consistent with participants’ accounts of secondary and primary public facilities lacking appropriately trained staff, equipment and supplies that have led to the over-referral of patients and the overburdening of higher level public facilities. Centrally reported quality indicators can help government stakeholders identify where additional training, support and resources may be needed at lower level facilities to improve performance. Therefore, by improving efficiency and quality of care at public facilities, especially at lower levels, these low-quality providers of the private sector can be out competed (50,51), further emphasizing the need for higher performing public facilities.

## RECOMMENDATIONS

The following recommendations are specific to Bangladesh’s implementation of the WHO QoC Standards as part of its maternal and newborn healthcare quality improvement initiative:

- Measure quality of care in maternal and newborn health using evidence-based, actionable indicators that are harmonized across the government’s existing quality standards and reasonable care practices.
- Prioritize specific WHO indicators supported by the strongest evidence and identified as relevant to the current health system by stakeholders. As quality measurement is relatively new

to the Bangladesh health system, prioritization may help provide policy-makers a place to start and identify which components of quality measurement may make the most efficient use of limited funds.

- Strengthen coordination between DGHS, DGFP and the Quality Improvement Secretariat with the MOHFW. Better communication across divisions will support efforts to adapt guidance like the WHO QoC Standards and EMEN Standards in implementing quality measurement strategies that are aligned with the provision of care.
- Develop and disseminate tools that outline steps for facilities to take to improve the provision of care in order to achieve better quality of maternal and newborn care that are harmonized with quality measurement indicators. The WHO QoC Standards provide guidance on quality measurement, but do not detail the action steps required of a facility to improve its performance as measured by these indicators.
- Clearly define the level and type of health facility for which each indicator is applicable. For example, a facility that does not perform caesarean sections may not require a functional blood transfusion service available at all times. It will be important to avoid imposing a higher standard of care that is beyond the capacity, or need, of lower level clinics.
- Invest in improving the accuracy and reliability of data collection systems. Creating a designated quality improvement team is necessary to avoid adding to the burden of clinical staff at facilities. This team may be shared across geographically proximal loca-

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tions. High quality data can help district and facility managers to take ownership of quality improvement as a tool they can use to assess and improve their own performance.

- Expand the existing central data reporting system to incorporate quality measures that will be collected and reported by the quality improvement teams. Routine and timely reporting of quality indicators can help programmatic decision makers at the MOHFW identify opportunities for improved performance, especially at lower level public facilities.
- Grant authority to managing personnel at facilities to implement quality improvements to ensure they can take timely action based on indicators that is not restricted to an edict from the MOH. They must be empowered to make decisions based on these indicators to adjust service delivery.
- Develop and provide training to staff on how to use quality indicators and understand how tracking quality of care indicators can ultimately improve maternal and newborn health outcomes. Buy-in from staff in facilities is critical to the success of any quality improvement strategy.
- Encourage increased transparency of information that is collected and how care is delivered among facility staff. Removing barriers that hinder access to information will facilitate detecting deficiencies and improving accountability.
- Strengthen mechanisms for oversight of the private sector. With increasing proportions of deliveries occurring in private facilities in recent years, incorporating the private sector as part of

quality improvement initiatives will be necessary in order to maximize health impacts.

## REFLECTIONS AND LIMITATIONS

One of the two co-investigators who conducted the interviews was from the United States and did not speak Bengali and, therefore, conducted five interviews that could be completed in English. Although participants were offered the choice to speak in either English or Bengali, they may have felt less comfortable expressing certain ideas in their non-native language. Furthermore, participants may have been less likely to share their opinions with a foreigner, perhaps thinking that a foreigner may not be as familiar with the health system in Bangladesh or not wanting to portray their country in an unflattering light. On the other hand, participants may have been eager for the opportunity to educate an outsider on the health programs and progress made in Bangladesh. The other co-investigator who conducted the interviews was from Bangladesh is a physician from a well-known public medical education institute in Dhaka and had relatively recently completed her public health degree from BRAC James P Grant School of Public Health. Prior to the start of interviews, participants often asked when and where she had completed her training, and this appeared to help establish a rapport with participants. In addition, it is possible that since both co-investigators are female, participants may have answered questions differently than they might with a male colleague, especially in regards to discussions about the social norms and the value of women in Bangladesh. Finally, in reflecting on these findings, it is important to acknowledge that this formative research was conducted in only one country. The priorities and barriers to high quality of care identified in these interviews may be different in other countries; however, we anticipate that the need to prioritize indicators, especially those with a strong evidence-base that can be correlated with improved health outcomes, could



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be generalized to other settings that also experience a strain on existing health systems.

This study has several limitations. A combination of applying Hill's causal criteria and assessing whether indicator performance was within the control of a facility was used in the first stage of indicator reduction. This subjective assessment excluded indicators that are listed in other WHO recommended guidelines, such as the WHO Safe Childbirth Checklist (52). Such checklists include important measures of the larger health systems required to ensure safe childbirth; however, these are less well-adapted as a guide for self-assessment by the health facility. In addition, a rapid review rather than a systematic review of the literature was used to assess the quality of evidence in the interest of time and resources. A systematic review of the literature available for each of the 352 indicators would have required resources that were well beyond that allotted for this activity; however, we acknowledge that a systematic review approach would have generated a stronger body evidence and we encourage others to carry out this activity. In addition, our interviews with stakeholders in Bangladesh were restricted to those located primarily in urban settings. We recognize that those in rural settings may have different priorities and barriers. Categorizing indicators as high, medium and low priority based on qualitative interviews also has limitations. These categories are only loosely defined since we do not have quantitative data to support these groupings and are thus subject to interpretation by the co-investigators. Approximately half of the participants refused to allow us to record the

interviews, and in these cases, we relied heavily on the interview notes and the interviewer's recollection of content when recording herself immediately following the interview. Many of those who refused recordings were participants from public government facilities, suggesting that these types of participants may feel discouraged from speaking openly about their experiences working in these facilities. For this reason, direct quotes were less frequently available from interviews with staff at government facilities. Additionally, two potential participants we approached had initially been willing to participate, but refused to provide written consent and asked if oral consent would be sufficient. This may be attributed to an unwillingness for there to be a written record of participation even though we had assured participants that their responses would be kept confidential. This lack of openness for fear of repercussions may be reflective of an overall lack of transparency in government facilities that will need to be addressed if quality of care is to be improved. An effective quality improvement system requires ownership and transparency to be effective. Finally, we could not ask each of our participants about all indicators since many were only available to speak with us for a limited amount of time, so indicators were presented based on the participant's expertise. For example, we focused on indicators related to emergency obstetric care with those working in obstetrics and gynecology at a hospital since that was their area of expertise. In doing so, however, interviews may have lacked breadth in perspective with this restriction on time and indicators reviewed.

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## CONCLUSIONS

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The recent global recognition of the need for high quality of care to facilitate further advancements in improving maternal and neonatal health outcomes has strengthened efforts to provide guidance for LMIC service provision; guidance which will support oft-nascent quality improvement arms. The 2016 WHO Standards for Improving Quality of Maternal and Newborn Care in Health Facilities aims to fill this role and helps to bring the importance of quality measurement to the national discourse. However, the evidence and rationale behind the recommended indicators for quality measurement need to be more clearly documented, and indicators should be prioritized based on their usefulness in leading to improvements. Developed through an additive rather than selective Delphi methodology, the WHO QoC Standards include many

indicators for which there is not strong evidence. Moreover, implementation of the current list of indicators is not feasible in an LMIC context such as Bangladesh, where health facilities already experience a strain on resources and struggle to meet the demand for care. Prioritization of indicators and building a stepwise strategy for implementation of quality measurement based upon local insight is possible. Similar formative work in additional settings may help to identify commonalities in priority indicators to guide further efforts to simplify and standardize maternal and neonatal quality of care measurement. Future work is needed to demonstrate that facility performance as measured by priority quality of care indicators are linked to improved health outcomes of mothers and their newborns.

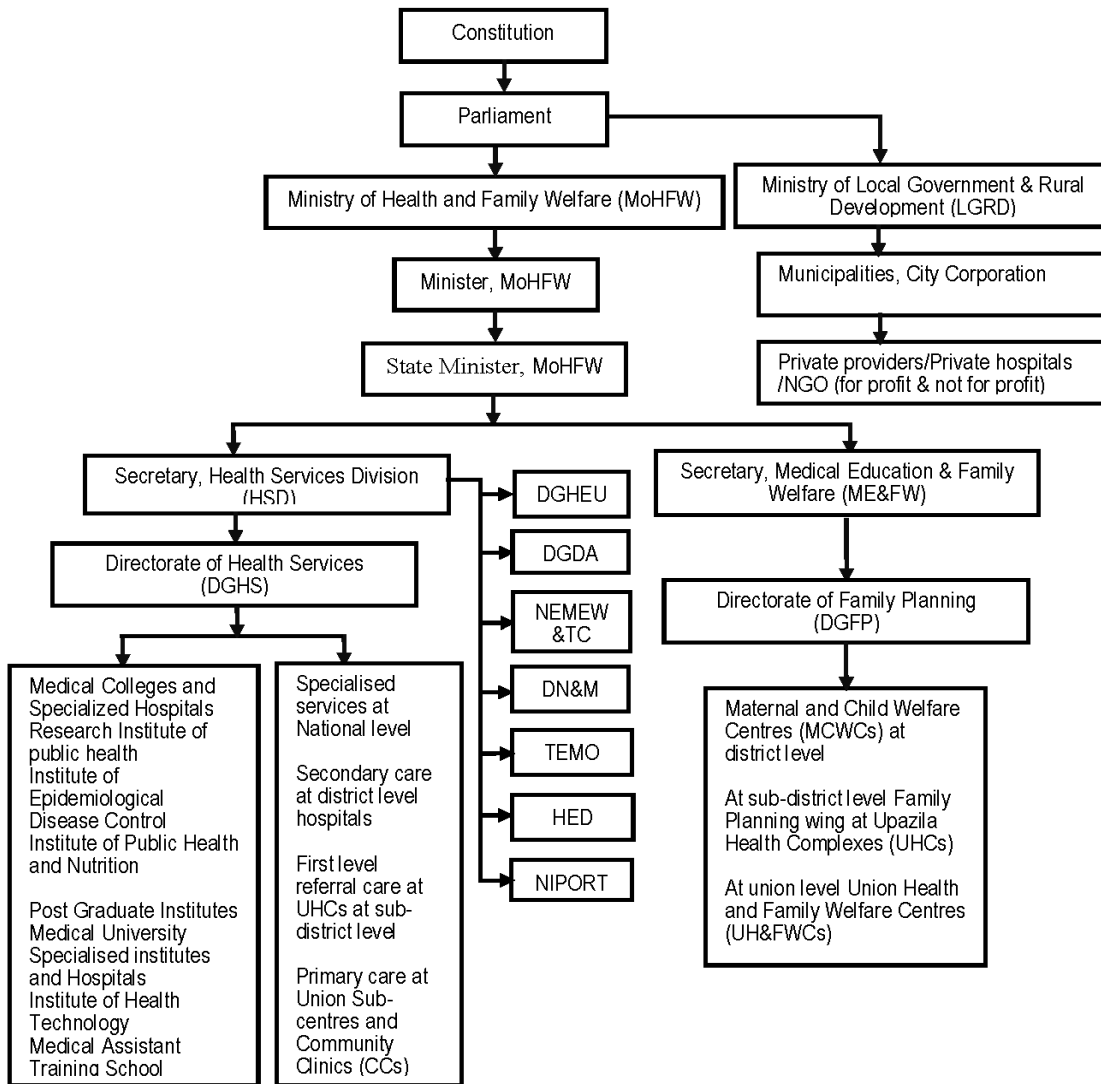
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## APPENDICES

### APPENDIX A: BANGLADESH MINISTRY OF HEALTH AND FAMILY WELFARE ORGANOGRAM



DGHEU: Directorate of Health Economics Unit, DGDA: Directorate of Drug Administration  
 NIPORT: National Institute of Population Research and Training  
 NEMEW & TC: National Electro- Medical Equipment Maintenance Workshop & Training Center  
 DN&M: Directorate Nursing and Midwifery, HED: Health Engineering Department  
 TEMO: Transport & Equipment Maintenance Organization

Source: Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh <http://www.mohfw.gov.bd/>

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## APPENDIX B: INTERVIEW GUIDE

*James P Grant School of Public Health, BRAC University, Bangladesh and  
Metrics for Management, USA*

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### Maternal & Neonatal Healthcare Quality Measurement: Real and Desired – Interview Guide

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#### Introduction

Thank you for agreeing to participate in this interview. You will help us assess how useful and feasible it is to measure maternal and newborn healthcare quality indicators in facilities like yours. There are no right or wrong answers. We are interested in hearing your opinion on this topic. This interview will be recorded using an audio device for research purposes, but all of your information will be kept private. If at any point during the interview you do not feel comfortable answering a question or wish to stop recording, please let us know.

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#### General

[Turn on the recorder.] First, I want to ask you some questions about your experience, and this facility.

1. Please tell me what your role is and how long you have been working both at this location and in this specific role.
2. [For non-providers/non-facility managers]: Please describe how you interact with facilities and providers to support monitoring of quality of maternal and newborn healthcare.
3. [Maternity ward]: Last month, how many deliveries took place in your maternity ward? Is this typical for the number of deliveries per month on average?  
*Probe: Do all deliveries in the facility take place in the maternity ward? If not, where else do women deliver?*
  - a. Please take me through a typical experience of a mother delivering at your [facility/department].  
*Probe: What are the admitting procedures? What are the routine checks at all stages of labor? How many doctors/nurses/midwives are present for a birth? How often does a clinician check a mother during the time she is in labor and immediately following delivery? How long after delivery is she typically kept at the facility?*
4. [Neonatal ward]: Last month, how many newborns were admitted to your ward? Is this typical for the number of newborn admissions per month on average?  
*Probe: Are all newborns delivered at the facility admitted? Are there newborns delivered elsewhere who are admitted?*
  - a. Please take me through a typical experience of admitting a newborn to your [facility/department].  
*Probe: What are the admitting procedures? What are the routine checks*

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*performed for a newborn? Who checks a newborn and how often? When is a newborn separated from the mother and for how long? How long is the newborn typically kept at the facility?*

5. Please describe how your [facility/department/organization] currently monitors the quality of [maternal and/or newborn] healthcare provided.
  - a. As part of your quality monitoring do you use a tool/form/checklist? Can you show it to me?
  - b. What resources are needed for this/these quality checks?

*Probe: Personnel required to complete quality assessments and review results, time to complete, personnel training, frequency, cost*  
*Are these personnel within or outside of the department? Are there ever situations when monitoring is done from someone outside of the facility?*
  - c. Can you describe what happens after any quality monitoring is done?

*Probe: Where is the information recorded? How, and with whom, is it shared?*
  - d. What are some of the challenges you see to ensuring high quality of care in these wards?

*Probe: What has been done to address those challenges?*

### **Specific Indicators**

[Present the list of indicators & list of questions to the respondent.] I am now going to show you lists of quality checks used in some facilities. I would like to understand if these checklist items are useful and feasible for your facility. Please refer to these lists of indicators and this list of questions for this part of our discussion.

6. Do you currently measure this indicator/ have this at your facility or department?

*Probe: Or do you measure part of this indicator?*

  - a. If yes, how is this information recorded, who monitors this, and how frequently?
    - i. How easy or difficult is it to collect this information, and why?
    - ii. How useful is this information, and why?

*Probe: How is this information used?*
  - b. If no, what do you think about monitoring this indicator at your facility or department?
    - i. How easy or difficult would it be to collect this information, and why?
    - ii. How useful do you think this information would be, and why?

*Probe: Would this information be used, and how?*

### **Other Indicators**

7. I see that in your checklist, you assess [other quality measures], which is not on our list. Can you tell me how this information is used and why it is important? Are there other quality measures that you currently monitor that are not on our lists of indicators?
  - a. Please describe how this information is used and why this information is important.
8. If you did not have any constraints on resources (including resources like personnel, fi-

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nances, physical space, or time), are there any quality measures you would like to measure that you currently do not?

- a. If yes, what quality measures would you want to monitor but currently do not?
  - i. Please describe why this information is important and the challenges to collecting this information.

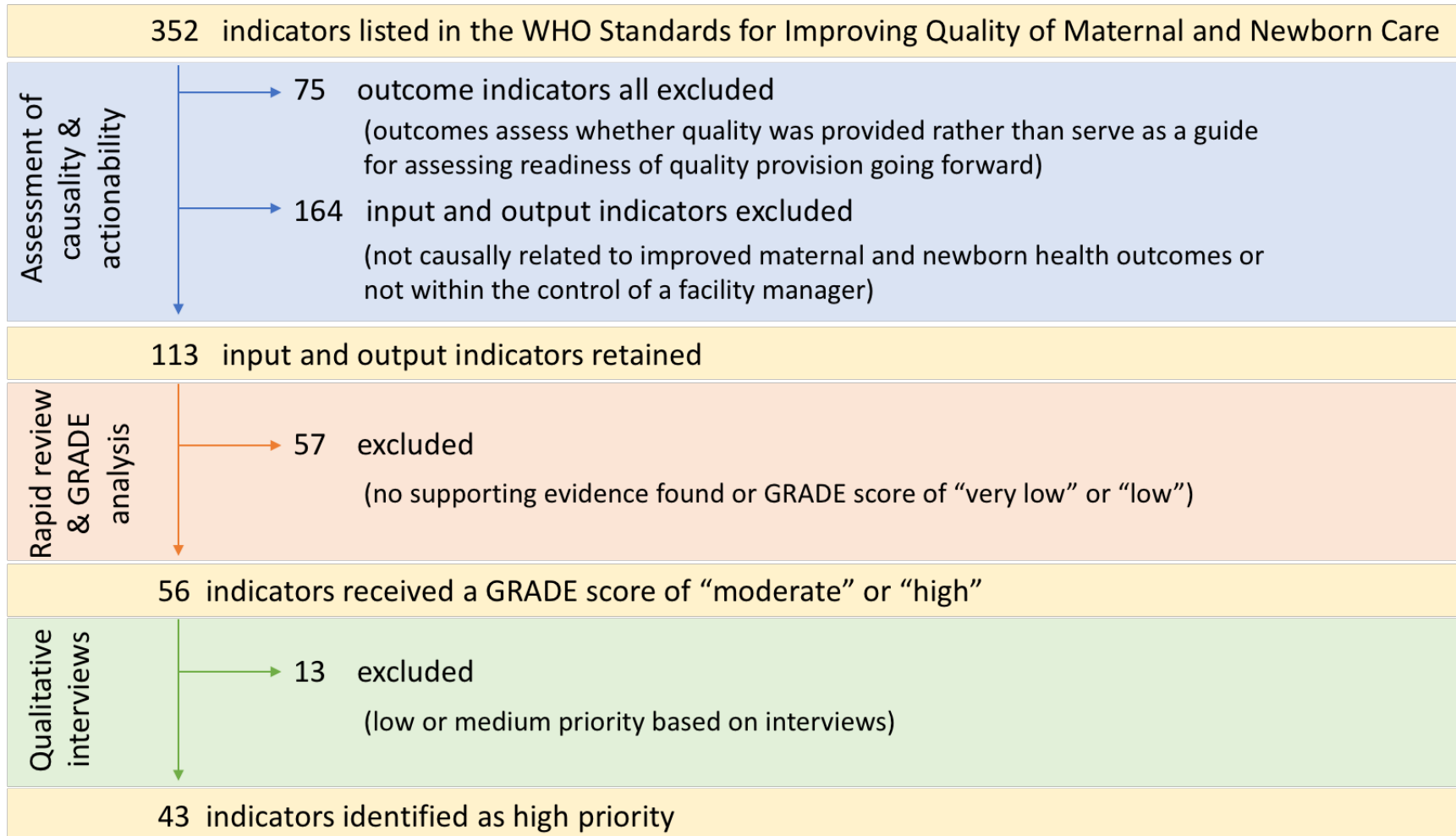
### **Wrap Up**

9. Do you have any further information about [maternal and/or newborn] healthcare quality indicators in your [facility/department] that you would like to share?

This concludes the interview. Thank you for being available to speak with me today. [Turn off the recorder.]



## APPENDIX C: FLOWCHART OF THE INDICATOR EXCLUSION PROCESS ACROSS EACH STAGE



## APPENDIX E: CATEGORIES OF INDICATORS WITH GRADE SCORES OF “MODERATE” AND “HIGH”

Indicators were categorized as below to facilitate discussions with participants during qualitative interviews.

### Emergency Obstetric Care 1

	QS*	#	Indicator
INPUT	1.2	1	The health facility has supplies of oral and intravenous antihypertensive agents and magnesium sulfate available in sufficient quantities at all times in the antenatal, labour and childbirth areas of the maternity unit.
	1.3	1	The health facility has written, up-to-date clinical protocols for post-partum haemorrhage management that are available in the childbirth and postnatal care areas and are consistent with WHO guidelines.
	1.3	2	The health facility has uterotonic drugs and supplies for intravenous fluid and blood administration (syringes, needles, intravenous cannulas, intravenous fluid solutions, blood) available in sufficient quantities at all times in the childbirth and postnatal care areas.
	1.3	3	A functional blood transfusion service is available in the health facility at all times.
OUTPUT	1.2	1	The proportion of all women with severe pre-eclampsia or eclampsia in the health facility who received the full dose of magnesium sulfate.
	1.2	2	The proportion of all women with severe pregnancy-induced hypertension in the health facility who received the recommended antihypertensives.
	1.3	1	The proportion of all women with post-partum haemorrhage in the health facility who received therapeutic uterotonic drugs.
	1.3	2	The proportion of all women in the health facility with post-partum haemorrhage due to a retained placenta for whom manual removal of the placenta was performed by a skilled birth attendant.

### Emergency Obstetric Care 2

	QS*	#	Indicator
INPUT	1.4	2	The health facility has the essential supplies and equipment for vacuum or forceps-assisted delivery, including newborn resuscitation equipment, available in sufficient quantities at all times in the childbirth area of the maternity unit.
	1.7a	1	The health facility has supplies of oral and injectable first- and second-line antibiotics (ampicillin or penicillin and gentamicin, clindamycin, cephalosporin and metronidazole) available in sufficient quantities at all times for the expected case load.
	1.7a	2	The health facility has written, up-to-date clinical protocols for treatment of women with, or at risk for, infections during labour, childbirth and the early postnatal period in the childbirth and postnatal care areas of the maternity unit that are consistent with WHO guidelines.
OUTPUT	1.4	2	The proportion of all women in the health facility with prolonged and/or obstructed labour who gave birth by caesarean section.
	1.4	3	The proportion of all women who gave birth in the health facility who underwent instrumental vaginal birth for delayed second stage of labour.
	1.4	4	The proportion of all women in the health facility with confirmed delay in progress of the first stage of labour who received oxytocin for augmentation.
	1.7a	3	The proportion of all women in the health facility with third- or fourth-degree perineal tears who received antibiotics.
	1.9	1	The proportion of all uncomplicated, spontaneous vaginal births in the health facility in which an episiotomy was performed.
	1.9	2	The proportion of women undergoing caesarean section in the health facility according to Robson classification groups.

## Emergency Newborn Care

	QS*	#	Indicator
INPUT	1.1b	2	The health facility has supplies of sterile cord ties (or clamps) and scissors (or blades), available in sufficient quantities at all times for the expected number of births.
	1.5	1	The health facility has a suction device, at least two sizes of neonatal mask and a self-inflating bag in the child-birth and neonatal areas of the maternity unit.
	1.6a	2	The health facility has supplies of antenatal corticosteroids (dexamethasone or betamethasone), antibiotics and magnesium sulfate available in sufficient quantities at all times to manage preterm birth in accordance with WHO guidelines.
	1.6b	2	The health facility has supplies and materials to provide optimal thermal care to stable and unstable preterm babies, including kangaroo mother care (support binders, baby hats, socks), clean incubators and radiant warmers.
	1.7b	1	The health facility has supplies of injectable antibiotics (at least first- and second-line antibiotics for neonatal sepsis and meningitis) available in sufficient quantities at all times for the expected case load.
	5.2	2	The health facility has a system whereby the mothers of small, sick newborns can be close to and nurse their babies.
	8.2	1	The health facility has a dedicated area in the labour and childbirth area for resuscitation of newborns, which is adequately equipped with a table or resuscitaire, radiant warmer, light and appropriate resuscitation equipment and supplies.
OUTPUT	1.8	2	The proportion of newborns with suspected severe bacterial infection who received appropriate antibiotic therapy.

## Immediate Newborn Care

	QS*	#	Indicator
OUTPUT	1.1b	4	The proportion of all newborns whose umbilical cord was clamped 1–3 min after birth.
	1.1b	5	The proportion of all newborns who were dried immediately and thoroughly at birth.
	1.1b	1	The proportion of all newborns who were breastfed within 1 h of birth.
	1.1b	2	The proportion of all newborns who were kept in skin-to-skin contact (with body and head covered) with their mothers for at least 1 h after birth.
	1.1c	1	The proportion of all newborns on postnatal care wards or areas in the health facility who received vitamin K and full vaccination as per national guidelines.
	1.1c	4	The proportion of all newborns in the health facility who received a full clinical examination before discharge.

## Infection Prevention/Facility Infrastructure

	QS*	#	Indicator
INPUT	1.8	2	The health facility ensures safe handling, storage and final disposal of infectious waste.
	1.8	1	The health facility has a reliable water source on site and soap and towels (preferably disposable) or alcohol-based hand rub for hand hygiene.
	8.1	4	The health facility has energy infrastructure (e.g. solar, generator, grid) that can meet all the electricity demands of the facility and associated infrastructure at all times, with a back-up power source.

## Referrals

	QS*	#	Indicator
INPUT	3.2	1	The health facility has ready access to a functioning ambulance or other vehicle for emergency transport of women and newborns to referral facilities.
	3.2	2	There is an up-to-date list of network facilities in the same geographical area that provide referral care for women and children.
	3.3	2	The health facility has reliable communication methods, including a mobile phone, land line or radio, which is functioning at all times, for referrals and consultation on complicated cases.
OUTPUT	3.2	1	The proportion of all newborns who died before or during transfer to a higher-level facility for further management.
	3.2	2	The proportion of all pregnant or postpartum women who died before or during transfer to a higher level facility for childbirth for further management.

## Data Systems

	QS*	#	Indicator
INPUT	2.1	1	The health facility has registers, data collection forms, clinical and observation charts in place at all time for routine recording and monitoring of all care processes for women and newborns.
	2.2	1	The health facility has conducted reviews of maternal and perinatal deaths and near-misses at least once a month within the past six months and has a mechanism for implementing the recommendations of reviews.
OUTPUT	2.2	1	The proportion of all perinatal deaths occurring in the health facility that were reviewed with standard audit tools.
	2.2	2	The proportion of all maternal deaths and near-misses occurring in the health facility that were reviewed with standard audit tools.

## Staff & Training

	QS*	#	Indicator
INPUT	4.1	2	Health care staff in the maternity unit are oriented and receive in-service training at least once every 12 months to improve their interpersonal communication and counselling skills and cultural competence.
	7.1	1	The health facility has skilled birth attendants available at all times, in sufficient numbers to meet the anticipated work load.
	7.2	1	The health facility has a programme for continuing professional development and skills development for all skilled birth attendants and other support staff and conducts regular training.
	7.3	2	The health facility has a written, up-to-date leadership structure, with defined roles and responsibilities and lines of accountability for reporting.
	7.3	3	The health facility has a designated quality improvement team and responsible personnel.

## Respectful Care & Privacy

	QS*	#	Indicator
INPUT	4.1	1	Easily understood health education materials, in an accessible written or pictorial format, are available in the languages of the communities served by the health facility.
	5.1	1	The physical environment of the health facility allows privacy and the provision of respectful, confidential care, including the availability of curtains, screens, partitions and sufficient bed capacity.
	5.1	2	The health facility has written, up-to-date protocols to ensure privacy and confidentiality for all women and newborns in all aspects of care.
	5.2	1	The health facility has written, up-to-date, zero-tolerance non-discriminatory policies with regard to mistreatment of women and newborns.
	5.2	3	The fee structures for maternity and newborn care are equitable, affordable and clearly displayed.
	6.1	1	The labour and childbirth areas are organized in such a way as to allow a physical private space for the woman and her companion at the time of birth.
OUTPUT	4.1	2	The proportion of all women who gave birth in the health facility who reported that they were given the opportunity to discuss their concerns and preferences.
	6.1	1	The proportion of all women who gave birth in the health facility who had a companion of their choice during labour and childbirth.

\*QS refers to the Quality Standard as listed in the WHO QoC Standards report

## APPENDIX F: PRIORITIZATION OF INDICATORS

Priority level	Category	Type	QS*	#	Indicator	Participant Comments
HIGH	Emergency Obstetric Care 1	Input	1.2	1	The health facility has supplies of oral and intravenous antihypertensive agents and magnesium sulfate available in sufficient quantities at all times in the antenatal, labour and childbirth areas of the maternity unit.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Obstetric Care 1	Input	1.3	2	The health facility has uterotonic drugs and supplies for intravenous fluid and blood administration (syringes, needles, intravenous cannulas, intravenous fluid solutions, blood) available in sufficient quantities at all times in the childbirth and postnatal care areas.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Obstetric Care 1	Input	1.3	3	A functional blood transfusion service is available in the health facility at all times.	Applicable to facilities providing CEmOC
HIGH	Emergency Obstetric Care 1	Output	1.2	1	The proportion of all women with severe pre-eclampsia or eclampsia in the health facility who received the full dose of magnesium sulfate.	
HIGH	Emergency Obstetric Care 1	Output	1.2	2	The proportion of all women with severe pregnancy-induced hypertension in the health facility who received the recommended antihypertensives.	
HIGH	Emergency Obstetric Care 1	Output	1.3	1	The proportion of all women with post-partum haemorrhage in the health facility who received therapeutic uterotonic drugs.	
HIGH	Emergency Obstetric Care 1	Output	1.3	2	The proportion of all women in the health facility with post-partum haemorrhage due to a retained placenta for whom manual removal of the placenta was performed by a skilled birth attendant.	
HIGH	Emergency Obstetric Care 2	Input	1.4	2	The health facility has the essential supplies and equipment for vacuum or forceps-assisted delivery, including newborn resuscitation equipment, available in sufficient quantities at all times in the childbirth area of the maternity unit.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Obstetric Care 2	Input	1.7a	1	The health facility has supplies of oral and injectable first- and second-line antibiotics (ampicillin or penicillin and gentamicin, clindamycin, cephalosporin and metronidazole) available in sufficient quantities at all times for the expected case load.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Obstetric Care 2	Output	1.1a	2	The proportion of all women who gave birth in the health facility who received oxytocin within 1 min of the birth of their baby	Would need observer to collect this time-sensitive data

HIGH	Emergency Obstetric Care 2	Output	1.4	2	The proportion of all women in the health facility with prolonged and/or obstructed labour who gave birth by caesarean section.	
HIGH	Emergency Obstetric Care 2	Output	1.4	3	The proportion of all women who gave birth in the health facility who underwent instrumental vaginal birth for delayed second stage of labour.	
HIGH	Emergency Obstetric Care 2	Output	1.4	5	The proportion of all women in the health facility with confirmed delay in progress of the first stage of labour who received oxytocin for augmentation.	
HIGH	Emergency Obstetric Care 2	Output	1.7a	3	The proportion of all women in the health facility with third- or fourth-degree perineal tears who received antibiotics.	
HIGH	Emergency Obstetric Care 2	Output	1.9	1	The proportion of all uncomplicated, spontaneous vaginal births in the health facility in which an episiotomy was performed.	
HIGH	Emergency Newborn Care	Input	1.1b	2	The health facility has supplies of sterile cord ties (or clamps) and scissors (or blades), available in sufficient quantities at all times for the expected number of births.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Newborn Care	Input	1.5	1	The health facility has a suction device, at least two sizes of neonatal mask and a self-inflating bag in the childbirth and neonatal areas of the maternity unit.	
HIGH	Emergency Newborn Care	Input	1.6a	2	The health facility has supplies of antenatal corticosteroids (dexamethasone or betamethasone), antibiotics and magnesium sulfate available in sufficient quantities at all times to manage preterm birth in accordance with WHO guidelines.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Newborn Care	Input	1.6b	2	The health facility has supplies and materials to provide optimal thermal care to stable and unstable preterm babies, including kangaroo mother care (support binders, baby hats, socks), clean incubators and radiant warmers.	
HIGH	Emergency Newborn Care	Input	1.7b	1	The health facility has supplies of injectable antibiotics (at least first- and second-line antibiotics for neonatal sepsis and meningitis) available in sufficient quantities at all times for the expected case load.	Clear definition of "sufficient quantities" is needed
HIGH	Emergency Newborn Care	Input	5.2	2	The health facility has a system whereby the mothers of small, sick newborns can be close to and nurse their babies.	
HIGH	Emergency Newborn Care	Input	8.2	1	The health facility has a dedicated area in the labour and childbirth area for resuscitation of newborns, which is adequately equipped with a table or resuscitaire, radiant warmer, light and appropriate resuscitation equipment and supplies.	

HIGH	Immediate Newborn Care	Output	1.8	2	The proportion of newborns with suspected severe bacterial infection who received appropriate antibiotic therapy.	
HIGH	Immediate Newborn Care	Output	1.1b	4	The proportion of all newborns whose umbilical cord was clamped 1–3 min after birth.	Would need observer to collect this time-sensitive data
HIGH	Immediate Newborn Care	Output	1.1b	5	The proportion of all newborns who were dried immediately and thoroughly at birth.	
HIGH	Immediate Newborn Care	Output	1.1b	1	The proportion of all newborns who were breastfed within 1 h of birth.	Would need observer to collect this time-sensitive data
HIGH	Immediate Newborn Care	Output	1.1b	2	The proportion of all newborns who were kept in skin-to-skin contact (with body and head covered) with their mothers for at least 1 h after birth.	Would need observer to collect this time-sensitive data
HIGH	Immediate Newborn Care	Output	1.1c	1	The proportion of all newborns on postnatal care wards or areas in the health facility who received vitamin K and full vaccination as per national guidelines.	
HIGH	Immediate Newborn Care	Output	1.1c	4	The proportion of all newborns in the health facility who received a full clinical examination before discharge.	
HIGH	Infection Prevention/Facility Infrastructure	Input	1.8	2	The health facility ensures safe handling, storage and final disposal of infectious waste.	
HIGH	Infection Prevention/Facility Infrastructure	Input	1.8	1	The health facility has a reliable water source on site and soap and towels (preferably disposable) or alcohol-based hand rub for hand hygiene.	
HIGH	Infection Prevention/Facility Infrastructure	Input	8.1	4	The health facility has energy infrastructure (e.g. solar, generator, grid) that can meet all the electricity demands of the facility and associated infrastructure at all times, with a back-up power source.	
HIGH	Referrals	Input	3.2	1	The health facility has ready access to a functioning ambulance or other vehicle for emergency transport of women and newborns to referral facilities.	
HIGH	Referrals	Input	3.3	2	The health facility has reliable communication methods, including a mobile phone, land line or radio, which is functioning at all times, for referrals and consultation on complicated cases.	
HIGH	Referrals	Output	3.2	1	The proportion of all newborns who died before or during transfer to a higher-level facility for further management.	Edit indicator to remove "during transfer"- not measurable



HIGH	Referrals	Output	3.2	2	The proportion of all pregnant or postpartum women who died before or during transfer to a higher level facility for childbirth for further management.	Edit indicator to remove "during transfer"- not measurable
HIGH	Data Systems	Input	2.1	1	The health facility has registers, data collection forms, clinical and observation charts in place at all time for routine recording and monitoring of all care processes for women and newborns.	
HIGH	Data Systems	Input	2.2	1	The health facility has conducted reviews of maternal and perinatal deaths and near-misses at least once a month within the past six months and has a mechanism for implementing the recommendations of reviews.	
HIGH	Staff & Training	Input	4.1	2	Health care staff in the maternity unit are oriented and receive in-service training at least once every 12 months to improve their interpersonal communication and counselling skills and cultural competence.	
HIGH	Staff & Training	Input	7.1	1	The health facility has skilled birth attendants available at all times, in sufficient numbers to meet the anticipated work load.	Clear definition of "sufficient quantities" is needed
HIGH	Staff & Training	Input	7.2	1	The health facility has a programme for continuing professional development and skills development for all skilled birth attendants and other support staff and conducts regular training.	Specify exact type of trainings
HIGH	Staff & Training	Input	7.3	2	The health facility has a written, up-to-date leadership structure, with defined roles and responsibilities and lines of accountability for reporting.	
HIGH	Staff & Training	Input	7.3	3	The health facility has a designated quality improvement team and responsible personnel.	
MEDIUM	Data Systems	Output	2.2	1	The proportion of all perinatal deaths occurring in the health facility that were reviewed with standard audit tools.	Not currently practiced but important for quality monitoring
MEDIUM	Data Systems	Output	2.2	2	The proportion of all maternal deaths and near-misses occurring in the health facility that were reviewed with standard audit tools.	Not currently practiced but important for quality monitoring
MEDIUM	Respectful Care & Privacy	Input	5.1	1	The physical environment of the health facility allows privacy and the provision of respectful, confidential care, including the availability of curtains, screens, partitions and sufficient bed capacity.	Combine with QS 6.1 #1

MEDIUM	Respectful Care & Privacy	Input	5.2	1	The health facility has written, up-to-date, zero-tolerance non-discriminatory policies with regard to mistreatment of women and newborns.	Combine with QS 5.1 #2
MEDIUM	Respectful Care & Privacy	Input	5.2	3	The fee structures for maternity and newborn care are equitable, affordable and clearly displayed.	
MEDIUM	Respectful Care & Privacy	Input	6.1	1	The labour and childbirth areas are organized in such a way as to allow a physical private space for the woman and her companion at the time of birth.	Combine with QS 5.1 #1
MEDIUM	Respectful Care & Privacy	Output	4.1	2	The proportion of all women who gave birth in the health facility who reported that they were given the opportunity to discuss their concerns and preferences.	
MEDIUM	Respectful Care & Privacy	Output	6.1	1	The proportion of all women who gave birth in the health facility who had a companion of their choice during labour and childbirth.	
LOW	Emergency Obstetric Care 2	Input	1.7a	2	The health facility has written, up-to-date clinical protocols for treatment of women with, or at risk for, infections during labour, childbirth and the early postnatal period in the childbirth and postnatal care areas of the maternity unit that are consistent with WHO guidelines.	Adherence more important than presence of protocols
LOW	Emergency Obstetric Care 2	Output	1.9	2	The proportion of women undergoing caesarean section in the health facility according to Robson classification groups.	Robson classification is not currently used in clinical practice in Bangladesh
LOW	Referrals	Input	3.2	2	There is an up-to-date list of network facilities in the same geographical area that provide referral care for women and children.	Physical list is not necessary as long as provider are aware of referral facilities
LOW	Respectful Care & Privacy	Input	4.1	1	Easily understood health education materials, in an accessible written or pictorial format, are available in the languages of the communities served by the health facility.	More important to retain QS 4.1 #2
LOW	Respectful Care & Privacy	Input	5.1	2	The health facility has written, up-to-date protocols to ensure privacy and confidentiality for all women and newborns in all aspects of care.	Combine with QS 5.2 #1

\*QS refers to the Quality Standard as listed in the WHO QoC Standards report