

# Improving Quality of Maternity Services in LMIC Settings: An Insight into Facility-based Quality Improvement Projects and Implications for Future Projects

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## ABSTRACT

This narrative review explores the characteristics and outcomes of facility-based quality improvement (QI) projects pertaining to maternal health, conducted over the last decade in low- and middle-income countries (LMICs). The literature on this topic was searched in PubMed, Medline, and Google Scholar, and 33 QI articles were identified.

We used the quality standards proposed by the World Health Organization (WHO) quality of care framework for this review. The QI projects were analyzed based on several themes: the methodology adopted in the projects, interventions and outcomes, and common limitations of QI projects.

In this review, we found that although LMICs have implemented several QI projects, there is still a deficiency in many key areas. The authors also synthesized 12 key steps that can be followed in future QI projects conducted in LMICs. This review highlights the importance of conducting QI projects in LMICs and encourages health administrators to focus on key areas identified by the authors.

**Keywords:** Developing countries, Health facilities, Health facility planning, Maternal health services, Patient safety, Quality improvement, Quality of healthcare.

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## INTRODUCTION

Low- and middle-income countries (LMICs) typically have limited resources and face numerous challenges in providing adequate healthcare services including maternal healthcare.<sup>1</sup> Maternal mortality and morbidity rates are higher in LMICs than in high-income countries (HICs) because of various factors, such as inadequate access to quality healthcare, lack of skilled birth attendants, poor infrastructure, limited availability of essential drugs and supplies, lack of proper counselling and socioeconomic disparities.<sup>2,3</sup> The maternal mortality rate in low-income countries in 2020 was 430 per 1,00,000 live births versus 12 per 1,00,000 in high-income countries. In 2020, almost 95% of all maternal deaths occurred in the LMICs.<sup>4</sup>

In the context of Sustainable Development Goals (SDGs), countries have united behind the target of accelerating the decline in maternal mortality by 2030. The SDG3 includes an ambitious target of reducing the global MMR to less than 70 per 1,00,000 births, with no country having a maternal mortality rate more than twice the global average.<sup>5</sup> The WHO encourages the implementation of quality improvement projects in maternal health facilities to address gaps and challenges, and improve outcomes.<sup>6</sup> In 2016, WHO published a set of standards to provide facilities with a framework for improving the quality of care for mothers and newborns.<sup>7</sup>

Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes. It is based on evidence-based professional knowledge and is critical for achieving universal health coverage. In the health sector, quality is based on six dimensions: Safe, effective, patient-centered, efficient, timely, and equitable. In the context of maternal health, the quality of care encompasses aspects such as skilled attendance during childbirth, timely access to emergency obstetric care, provision of evidence-based interventions, respectful

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and culturally sensitive care, and effective communication. Overall, mothers should not be harmed during maternity care.<sup>8–10</sup>

Quality improvement (QI) is defined as systematic and continuous actions that lead to measurable improvements in healthcare services and the health status of patient groups by analyzing existing systems, identifying areas for improvement, implementing evidence-based practices, and evaluating the impact of these changes. The QI projects can target various aspects of maternal healthcare such as antenatal care, facility-based deliveries, postnatal care (PNC), emergency obstetric care, and community-based interventions.<sup>11,12</sup>

The QI projects in the health sector have a profound history, with advancements occurring over time. The total quality management (TQM) approach and Donabedian framework were developed to assess healthcare quality. These concepts highlight the importance

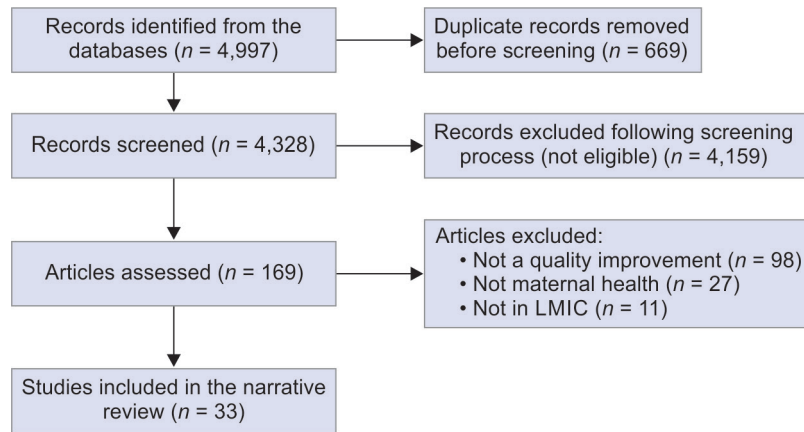


Fig. 1: Study selection process

of improving processes, patient outcomes, and healthcare providers' involvement in quality improvement. Interventions in QI studies are of paramount importance and are considered the cornerstone of efforts to enhance patient safety, mitigate medical errors, and improve overall outcomes. These interventions optimize healthcare processes, thus reducing resource waste and cost and facilitating compliance with regulations and accreditation standards.<sup>13,14</sup>

However, the impact of quality improvement projects on LMICs has not been properly evaluated. Although there are published data regarding various QI projects in LMICs, many areas such as sustainability, cost-effectiveness, and applicability of these initiatives in similar settings have not been thoroughly evaluated.<sup>15</sup> Evidently, by implementing evidence-based interventions, including emergency obstetric response capacity (such as operative delivery, interventions for postpartum hemorrhage, and transport access for those in need of higher levels of care), ensuring skilled attendance at birth, and improving the quality of care throughout the maternal health continuum, QI projects have the potential to save countless lives and improve the well-being of mothers and children in LMICs.<sup>16</sup>

The aim of this review is to identify and summarize the quality improvement projects published in the past decade (2013–2023) pertaining to maternal health conducted in LMICs and to guide future researchers, administrators, clinicians, and policymakers to integrate these lessons for their future initiatives.

## METHODS

A narrative review was conducted to explore the characteristics and outcomes of various QI projects conducted in LMICs and to group them into key themes. We identified eligible publications that described QI interventions aimed primarily at improving maternal health at the facility level. Publications from one or more LMICs, published between 2013 and 2023, were considered. Multiple study designs were eligible if primary data were available, including randomized controlled trials and non-randomized controlled trials, controlled before–after studies, interrupted time-series studies and repeated measured studies, before–after studies, retrospective and prospective cohort studies, and other quasi-experimental designs and program evaluations. Publications in languages other than English were excluded. Systematic reviews, scoping reviews, case studies, protocols, abstracts, conference proceedings, commentaries, and case reports were excluded.

A literature review of qualitative and quantitative studies was conducted using PubMed, Google Scholar, and MEDLINE

databases. Two authors (Mohamed Rishard and Kavinda Rajaratne) developed the keywords for the literature search. The list includes “facility-based,” “quality improvement,” “maternal health,” and “LMIC.” To ensure search effectiveness, the MeSH terms were identified and included as synonyms. All search terms used were obtained from the PubMed, MEDLINE, and Google Scholar databases. The search team then applied filters, including the time frame from 2013 to 2023, restricted the articles to English-language publications only, eliminated duplicate articles, removed irrelevant studies where Mohamed Rishard and Kavinda Rajaratne independently, and jointly screened the articles based on title, topic, setting, and publication type. Figure 1 illustrates the data extraction process. We organized the selected QI projects based on several themes.

## RESULTS

We identified 4,997 records during the initial search. A total of 699 duplicates and 4,159 records were excluded from screening. Of the 169 eligible articles, 98 did not describe a quality improvement project, 27 were unrelated to maternal health, and 11 were not in LMICs. Thus, 33 articles were included in the analysis. The content of the articles was organized into a table to allow for easy comparison of the articles (Table 1). The finalized themes were organized as objectives of the QI projects, methodology adopted in the projects, interventions and outcomes, and common limitations of QI projects.

### Objectives of the QI Projects

The World Health Organization (WHO) formulated eight domains of quality of care that should be systematically evaluated, improved, and monitored within facilities to provide high-quality care around the time of birth (Table 2).<sup>6</sup> This study examined the extent to which the objectives of QI projects conducted in LMICs were aligned with the WHO standards (Table 3).

### The Methods Adopted in QI Projects

The choice of design depends on the study objectives, available resources, and context in which the QI efforts are implemented. Six studies were pre- and post-only,<sup>17–22</sup> and five had quasi-experimental designs.<sup>23–27</sup> There were five cluster randomized trials<sup>28–32</sup> and one step-wedge trial.<sup>33</sup> Three other studies were time-series studies.<sup>34–36</sup> Five studies had unspecified designs.<sup>37–41</sup> All other studies had some form of observational design.

**Table 1:** Facility-level quality improvement projects conducted to enhance the quality of maternity services in LMIC settings

Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Austad et al. 2020	This project was built on an existing collaborative project involving 41 TBAs who serve indigenous Maya villages in Guatemala's Western Highlands and Baseline and then 12-month intervention program - April 2017 to March 2018	To improve maternal and fetal outcomes in rural Guatemala by strengthening the referral chain between home births and public hospitals	Volume and proportion of mothers receiving facility-level obstetric care The success rate of referrals Referred mothers' likelihood of accepting referral in future pregnancies	Existing data collection infrastructure at Maya Health Alliance TBA documented data in electronic health records Calls to the emergency line from TBAs were documented in the patient's electronic health record	An innovative model to provide a formal linkage between TBAs and hospital-level care Home-based care with the aid of the smartphone application	PDSA	Only half of the TBA cohort was reached pre-natally, it is possible that systematic differences in unreached patients were not detected Our study lacks a rigorous control The pilot was conducted among a homogenous ethnic group in one health district which - Limit generalization to other regions of Guatemala and LMIC settings	The OCN accompaniment increased the proportion of births under TBA care that received facility-level obstetric care - It is a feasible, patient-centered intervention to improve maternity care
Singh et al. 2013	The pilot phase of Project Fives Alive! Conducted from July 2008 to December 2009 in 27 facilities in four rural districts in Northern Ghana	To evaluate the influence of selected antenatal, intrapartum, and postnatal interventions on key maternal and child health outcomes	Percent of underweight among infants Facility-level neonatal mortality Facility-level infant mortality	Outcome indicators were obtained from facility health registers. Health-care workers report on a number of indicators directly into this register.	Community stakeholder educational meetings on early identification, registration, and ANC Promotion of four ANC visits Encouraging skilled delivery - Consistent use of partographs, transport for laboring women, provision of midwife's contact details Providing PNC on Day 1-2 and on Day 6-7 of life - Detain postpartum women for 6-48 hour after delivery when PNC is provided, if wards are full do a PNC Day 1 home visit and home PNC visits for home deliveries Encourage mothers to make a follow-up PNC Day 6-7 visit, PNC Day 6-7 home visit, and defaulter tracing	PDSA	Without comparison facilities, it is not possible to control for all potentially confounding factors Only a maximum of 9 months of pre-intervention data were available - Cannot account for the full effects of seasonal variation in health outcomes Facility data inaccuracies due to transcription errors or missing data as information is transcribed from facility registrars	Implementing simple and low-cost locally inspired changes improved health outcomes at scale both in Ghana and other LMICs (ongoing project).

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Singh et al. 2016	Wave 1 (innovation and testing phase), commenced in July 2008 in 27 health facilities in Northern Ghana Wave 2 spanned from September 2009 to March 2013 in over 800 health facilities in Northern Ghana	To determine whether "Project Fives Alive!" influenced maternal and child health outcomes and to present a methodology of using facility-based routine health data for a large-scale impact evaluation	Early antenatal care (ANC - early ANC, four or more ANC visits) Skilled delivery Facility-level under-five mortality Attendance of underweight infants at child welfare clinics	Derived from data measured and reported by the facilities, while independent variables come from facility and program records January 2009 to December 2011 - Facilities used paper-based forms to report on key outcome indicators in a system called DHIMS 1 and entered at the district level and electronically sent to the national level January 2012 to March 2012 - A complete electronic system	Community stakeholder meetings and registration of pregnant women ANC defaulter tracing and visit time reduction for four or more ANC visits Use of partographs and immediate checks of mother and newborn for the skilled delivery/immediate PNC and home visits Health education, targeting/engaging primary providers, training, triage, and task shifting/nurse empowerment	PDSA	Inability to study population-level mortality as only facility death data were available Only studied skilled delivery until December 2011 for a large number of facilities because of the change in reporting Difficult to find comparison groups for the evaluation of a scaleup phase of a project, and the analysis lacked such groups	Findings from the scale-up phase of "Project Fives Alive!" indicate program effects on the key maternal and child health outcomes studied, including reduced under-five mortality
Goyet et al. 2019	A total of 14 African and Asian countries Bangladesh, Burundi, Cambodia, Cameroon, Guinea, Malawi, Nepal, Kenya, Kyrgyzstan, Tanzania, Yemen, Pakistan, Tajikistan, and Vietnam All programs spanned the period from 2004 to 2019	To review the effectiveness of various QI interventions implemented in 14 Asian and African countries, to identify and describe the existing approaches and their results, and disseminate lessons learned from their implementation	Maternal mortality ratio Neonatal mortality rate Children under 5 mortality rate	In 2017 and 2018, all programs' documents shared by the 14 country teams were analyzed by two public health consultants	WHO and research partners developed a comprehensive tool to guide the reporting of sexual, reproductive, maternal, neonatal child, and adolescent health programs Establishment of nation-quality accreditation systems Healthcare workers' pre-service and in-service education, coaching, mentoring and supervision Health institutions' preparation of policy documents guiding health practices Community health education and social marketing of health services Strengthening the health infrastructure	SBM-R	It is difficult to attribute the observed progress in maternal and neonatal health to a particular agency, program or intervention Chronic shortage of skilled health care personnel and inadequate pre-service training for nurses on obstetric service delivery constitute the most pertinent risk to the sustainability of results	

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Hagaman et al. 2020	To evaluate intervention effects over 32-months in four regions of Ethiopia: Oromia, Tigray, Amhara, and Southern Nations, Nationalities, and Peoples' Region (SNNPR)	Do a preliminary assessment on QI health systems intervention such as clinical and QI trainings, the change ideas tested by the QITs, and coaching visits on maternal and neonatal health outcomes in four pilot districts in Ethiopia	Proportion attending skilled delivery The proportion that completed four ANC visits by 36 weeks Proportion tested for syphilis Proportion received PNC within 48 hours Proportion treated for neonatal complications Proportion of LBW infants Mortality outcome – Neonatal, perinatal, and maternal, and fresh stillbirths	Outcome data were extracted from facility registers from May 2016 until at least 6 months following the fourth (and last) learning session Bundle adherence was assessed by monthly retrospective medical record charts of 30 randomly selected births reviewed for documentation, senior program officer's birth observations and assessing the completeness of each of the safety birth checklist (paper)	Coaching included observing clinical care and supporting clinical skill, leadership and communication, motivating QITs and identifying problems, and developing and monitoring testable solutions Improve compliance with three bundles of essential birth practices for safe childbirth	PDSA	No comparison facilities Limited sample of the pilot study Bundle compliance is contingent on the availability of some supplies and thus cannot account for episodic supply shortages Maternal morbidity statistics are not included in the study Improvement in health facility data quality may have resulted in increased reporting of mortality events and decreased false inflation of other outcomes thus making it more difficult to find significant impacts	This study demonstrated the feasibility of complex, low-cost, health-worker-driven improvement interventions that can be adapted in similar settings around the world
Jain et al. 2022	Secondary analysis of program data collected from 202 public facilities across 20 districts of Rajasthan state Baseline assessment from June to August 2015 Late assessment from May to August 2019	To describe the process of implementing the Dakshata initiative in selected public hospitals in Rajasthan state of India	The trend of pre-eclampsia/eclampsia identification and referral out The trend of PPH identification and referral out The trend of newborn asphyxia identification and referral out The trend of stillbirth rate in Dakshata versus non-Dakshata facilities	Data sources included facility assessments (direct observations and interviews with healthcare providers and women), service statistics, monthly progress reports Data from periodic assessments were entered in CS Pro and dashboards were generated	Healthcare providers were trained on clinical skills such as management of normal labor and initial management of maternal and neonatal complications and to differentiate between fresh stillbirth and immediate neonatal death Periodic assessments and refreshment trainings Mentoring and support visits	The Dakshata program succeeded in improving the quality of care provided during labor and immediately after delivery in the state of Rajasthan	Staff shortages and turnover Improper data recording and reporting, the MWMIS developed is suboptimal Some of the essential practices showed poor adherence despite repeated mentorship Despite best efforts, some of the facilities did not show the expected improvement	The Dakshata program succeeded in improving the quality of care provided during labor and immediately after delivery in the state of Rajasthan

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Taneja et al. 2021	Interventions implemented from January 2016 to December 2017 in 141 high-case-load public health facilities across 26 high-priority districts in the six states	To improve the quality, equity, and dignity of care during the intrapartum and immediate postpartum periods	Better resource facilities Competent staff Actionable information systems Improved quality of care	Reviewed through facility-level labor room registers and case sheets with October–December 2015 survey as the reference period While the labor room records were reviewed fully, case sheet-based records were assessed through a random sample of case sheets with 10 sheets for each of the 3 months at district hospitals and 5 at community health centers and other facilities Data systems were set up to ensure data-based decision-making	Drills and checklists were introduced The labor room environment was assessed through a structured checklist based on MOHFW's maternal and newborn health toolkit and competency assessment - Practices in the labor rooms were monitored through on-site mentoring visits and the collection of monthly maternal and newborn health-related datasets	PDSA	Differences in the methodology for the baseline assessment and external evaluation The absence of control districts did not allow for a comparative assessment Both the provision and experience of care were measured only during the endline – Possibly the Hawthorne effect Did not assess maternal mortality and morbidity statistics – Obstetric outcome measures not taken into account	The approach successfully demonstrated an operational design to improve the provision and experience of care during the intrapartum and immediate postpartum periods, thereby augmenting efforts aimed at ending preventable child and maternal deaths
Mengistu et al. 2021	A total of 17 health centers and three primary hospitals in the three districts from November 2016 to January 2019 Baseline assessment in the previous 12 months from July 2015 to June 2016	To describe the development, implementation and results of interventions to improve respectful maternity care	Percentage of births with privacy and birth companion offered	Monthly programmatic data indicating the percentage of births with privacy maintained and birth companions offered were collected Data were sampled from 30 births in the previous month that had been monitored using the FMOH-adopted SCC	FMOH-adopted Safe Childbirth Checklist (SCC) implemented Four learning sessions with intensive coaching Designing of RMC videos Delivery of the RMC training module	PDSA	The videos were made in the initial stage of the project, when necessary, the level of trust with the local communities was not fully built Since the analysis is based on available programmatic data all seven of Bowser and Hill's categories of mistreatment could not be used The SCC showed only if a birth companion was offered but not their actual presence Data collection shortages of the forms in some health facilities led to lower measurement of coverage	This study suggests that integrating RMC training into a QI program is effective in improving RMC

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Filha et al. 2022	From 2017 to 2018 with a convenience sample of 12 private hospitals among the 23 participants of the project	To evaluate, precisely, the association between exposure to an adequate birth project and the assessment by women of the birth experience, according to the type of birth	Increase support for the woman giving vaginal birth Increase informed choice for women Improve the quality of child-birth care Increase the proportion of spontaneous or induced labor Increase the rate of full-term birth and increase birth experience	Face-to-face interviews using structured questionnaires, data from medical records of the women and neonates following their discharge from the hospital, including prenatal cards and ultrasound exams were extracted	Governance – Train the health team according to the best evidence available to conduct birth and improve maternal and childcare Women participation – Participate in antenatal groups, get secure information, do a birth plan, receive information about best labor practices and visit the hospital Reorganization – Encourage to inform the health team on perinatal indicators outcomes such as CS rate, CS rate by Robson group, childbirth care by nurse-midwives, vaginal birth with episiotomy, admission to Neonatal Intensive Care Unit and proportion of early term births Provide a supportive environment for vaginal birth	Not clear	As the interview was conducted in the immediate postpartum period, it is possible the introduction of biases – Gratitude bias	This study highlights the importance of perceived control, support, and relationship with the health team shaping women's experience with labor and deliver

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Smith et al. 2016	A total of 12 high-volume facilities providing EmONC services in Cambodia (6) and the Philippines (6) Baseline data October 2013 followed by a technical update in November 2013 Monthly data audit and feedback from November 2013 to April 2014, with endline in May 2014	To determine whether a simple quality improvement initiative will result in increased use of antenatal corticosteroids among pregnant women at risk of imminent preterm birth delivering at health facilities in the Philippines and Cambodia	The proportion of women at risk of imminent preterm birth who received at least one dose of dexamethasone	Baseline performance data were abstracted from birth registers and medical records	A technical update on preterm birth and use of antenatal corticosteroids, followed by monthly audit and feedback sessions U.S.-based study co-investigators led a 3-day training on the study rationale, design, research protocols and tools and provided a technical update on preterm birth At baseline and end-line, birth attendants at each hospital completed a multiple-choice assessment of ACS knowledge of ACS use and a confidence assessment	PDSA	Completeness of course and dosing was not captured adequately Gestational age was most commonly estimated by LMP Data abstracted from medical records may have been incomplete Unknown whether improvements demonstrated during the intervention were sustained after the audit and feedback cycles ended	A simple quality improvement strategy was feasible and effective in increasing the use of dexamethasone in the management of preterm birth in 12 hospitals in Cambodia and the Philippines

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Das et al. 2022	Taiz-Houban Mother and Child Hospital (MCH) Baseline from February 2020 to March 2021 The project spanned from March 2021 to February 2022	To improve the adherence to established clinical protocols in the management of pregnancy complicated by hemorrhage and hypertensive disorders	Maternal mortality Neonatal mortality Admission rate from the maternity unit to the neonatal unit The transfer rate to intensive care Other outcomes	Data were collected via manual audit, and routinely collected data All measures had to be manually collected as there is no electronic patient record. PPH rates and stock levels of tranexamic acid are routinely collected and reported data were pulled from monthly reporting. Other measures had to be collected via manual auditing	Increase incident reporting Commence a program of multi-professional obstetric emergency drill training Decrease errors in drug prescription Increase the number of women with severe pre-eclampsia with hourly fluid balance recorded and fluid restriction carried out (local protocols) Increase the number of women with severe pre-eclampsia with acute hypertension controlled in a stepwise manner and in a systematic way (local protocols) Increase the number of women with PPH who have treatment in a systematic way (local protocols) Increase PPH identification to enable effective management	PDSA	Patients were not included in the design of this project Only have numerical audit data for the 3 months when the interventions were studied thus long-term sustainment cannot be confirmed Only a team member who had prior experience and a formal background in improvement was present in the project for four months Lack of expertise in education and use of simulation training	We concluded that quality improvement methodology is a valuable tool even in challenged healthcare settings such as this one, in an active conflict zone. Behavior change in team culture and safety culture is harder to sustain and demonstrate without a long-term strategy

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Hynes et al. 2017	A convenience sample of 12 health facilities, where IMC had ongoing programmatic activities, were selected from three of 34 health zones of North Kivu province. Baseline evaluation conducted from 6 November to 22 December 2015. The QI intervention was implemented for 9 months. Endline evaluation was conducted from 22 September to 10 November 2016.	To compare the outcomes focusing on AMTSL and ENC of standard intervention in clinical training vs enhanced intervention in clinical training in a humanitarian country	Active management of the third stage of labor (1) oxytocin (2) uterine massage Essential newborn care (1) weighing of the newborn (2) application of tetracycline to the newborn's eyes (3) clean cord care	Baseline evaluation through interviews with postpartum women and data from matched partographs	URC-trained health-care teams from each enhanced intervention facility in QI Ensuring the availability of equipment and supplies in the delivery room so that care was delivered in a timely manner	PDSA Model of Improvement approach	The convenience sample of health facilities receiving programmatic support by IMC is not representative of other health facilities in the DRC Study indicators were measured using face-to-face interviews and data recorded on partographs thus possibly over or under-reporting Women's ability to recall receipt of the AMTSL components results in estimates that were higher or lower than actual receipt of care The ENC components recorded on the partographs may have been overreported if staff recorded care that was not delivered Some of the improvement in ENC delivery could have been due to improved record-keeping Limited access to health facilities because of remote locations and security issues and limited communication between project staff, health facilities, and study participants	Both the enhanced intervention group and the control group showed improvements over time following clinical training on BEmONC, ENC, and partograph use The enhanced intervention group demonstrated a significantly greater rate of change in the delivery of AMTSL and ENC beyond the improvements from the clinical training and was able to achieve significantly higher rates of completion of ENC

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Larsons et al. 2020	Four districts in rural Tanzania – 24 primary care clinics or dispensaries 12 received a quality improvement intervention, while 12 served as controls The intervention began in June 2012, and by July 2013, the full intervention was underway and continued into the spring of 2016	To test the success of a maternal health-care quality improvement intervention in actually improving quality	Health outcome Patient not anemic Patient not hypertensive Mid-upper arm circumference EQ-5D Overall quality and satisfaction Patient satisfaction with delivery care Patient-perceived quality of delivery care Provider perceived quality of ANC Provider perceived quality of labor care Provider perceived quality of care for obstetric complications	Patient-level data were collected as repeated cross-sections in 2012, 2014, and 2016 - At midline and end line, women were invited to have their hemoglobin and blood pressure tested The job satisfaction survey was offered to all healthcare provider Facility audits and we collected aggregate monthly indicators of use and quality from the facility registers and partographs	In-service training, mentorship, supportive supervision and infrastructure support Continuing medical education – 10-day continuing medical education course on BEmONC Supportive supervision and mentoring Infrastructure support – Minor renovations to ensure basic facility functioning Peer outreach	PDSA	Tested 18 quality outcomes, it is possible that the one significant result (newborn counselling) was a result of statistical noise While definitions of health are often agreed on by international guidelines or norms, measures of process quality are less well-defined and difficult to measure It is possible that small sample sizes for some of the facility-level outcomes could have contributed to the inability to detect a statistically significant result	A multi-faceted quality improvement intervention resulted in no meaningful improvement in quality. Evidence suggests this is due to both failure to sustain a high level of implementation and failure in theory

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
The EQUIP study team et al. 2017	A total of 2 districts in each of Southern Tanzania and Eastern Uganda The intervention districts of Tandahimba and Mayuge mainland and the two comparison districts of Newala and Namayingo in Tanzania and Uganda	To increase the coverage and quality of essential interventions for maternal and newborn care in two high-mortality settings of Tanzania and Uganda	Primary outcomes for both countries were birth in health facilities, breastfeeding within 1 hour after birth, oxytocin administration after birth and knowledge of danger signs for mothers and babies	We implemented continuous household cluster and health facility surveys in the intervention and comparison districts	In intervention districts (1) collaborative QI with (a) district health managers, (b) health facility staff and (c) community health workers and (2) continuous household and health facility surveys Every 3 to 4 months, health facility and community members participate in learning sessions Separate learning sessions were held with the district manager District QI teams worked on improving (1) the human resource situation, (2) the drug supply from the Medical Stores Department to facilities, and (3) the supervision of district managers of primary care facilities and communities	PDSA	QI in only one intervention district in each of the two countries which limits both generalizability and internal validity The survey team collected data that were independent from the QI teams, but they were not masked The methods used to assess changes in knowledge of danger signs and breastfeeding within 1 hour are subject to measurement biases Considered injection of a uterotonic within 1 minute as the most important aspect of AMTSL and omitted two other aspects of controlled cord traction and uterine massage	Association between our QI approach and improved implementation levels for only one of our four main outcomes (women receiving oxytocin within 1 minute after birth) in both countries. In addition, statistically significant associations were seen for the outcomes of the preparation of birth kits and supervision of health facilities by district managers in Tanzania

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Ayalew et al. 2017	Three hospitals and eight health centers and the same number of comparison health facilities A total of six hospitals and 15 health centers Ethiopia	To assess whether MNH providers in facilities that have implemented SBM-R perform better than providers at comparison facilities during routine delivery of ANC, uncomplicated labor and delivery and immediate PNC services within the first 6 hours after delivery	Health provider performance in – ANC services Uncomplicated labor and delivery services Immediate PNC services And then assess the overall composite score	Data were collected from July 7 to August 3, 2014, by 20 experienced assessors Through direct observations and assessing observation tools for completeness and consistency	Health managers and providers received three rounds of SBM-R modular trainings Each facility established a quality improvement team Received essential equipment and supplies, training on BEmONC for providers, and regular follow-up from regional health bureaus and partners, including site mentoring, review meetings and quarterly supportive supervision Observations of service delivery using structured checklists ANC, uncomplicated labor and immediate PNC	SBM-R	Lack of baseline information on provider performance thus cannot compare changes over time Qualitative interview data are lacking The study may have introduced the Hawthorne effect	The SBM-R quality improvement intervention made a significant positive impact on MNH providers' performance during labor and delivery and immediate PNC services, but not during ANC services

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Jayanna et al. 2016	All functional 24/7 PHCs in the two districts were included in the study In a parallel, cluster randomized trial 54 facilities received six onsite mentoring visits, and specially designed case sheets for providers; the control arm received just the initial training update and the case sheets Pre- and post-intervention surveys were administered in April 2012 and August 2013 using facility audits, provider interviews and case sheet audits	To assess the effectiveness of a nurse-led onsite mentoring program in improving the quality of care of institutional births in 24/7 primary health centers of two high-priority districts in Karnataka state, South India	Primary outcomes were improved facility readiness and provider preparedness in managing institutional births and associated complications during childbirth Facility readiness and provider preparedness for most common maternal complications (PPH, GHTN, obstructed labor, maternal sepsis), and the three most common newborn complications (birth asphyxia, LBW and neonatal sepsis). Facility readiness basic infrastructure and staffing, drugs, equipment, and supplies to deal with normal labor and delivery, complications encountered. Provider preparedness was defined as adequate knowledge and practice in alignment with standard guidelines for the prevention, screening and management of complications	The interviewers were blinded to the allocation Case sheet reviews	The onsite mentoring intervention focused on improving systems and staff functioning within each facility. The 54 intervention facilities received six supportive onsite visits Both arms received – Refresher training and case sheet introduction (delivery record and 8 separate complication sheets) Mentoring Visits Facility readiness – Help staff use self-assessment checklists Provider preparedness – Introduce revised case sheets and bedside coaching, case vignettes and 1–1 or 1 to-group teaching at sites	PDSA	Direct observations of provider practices were not logistically feasible Could not ascertain the baseline status of case sheet use Experienced challenges in analyzing complication case sheets due to their poor uptake in the control arm The study does not establish evidence around outcomes related to mortality	The mentoring program successfully improved provider preparedness and facility readiness to deal with institutional births and associated complications

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Creanga et al. 2020	The QI initiative was implemented in all public facilities (550) in Bihar, from first-level delivery points represented by block-level PHCs to district hospitals Intervention spanned from 2012/2014 to 2017	To improve the quality of reproductive, maternal, newborn, and child health and nutrition (RMNCHN) clinical care and outcomes	Basic EmONC Comprehensive EmONC	Direct observation of deliveries by trained nurses as evaluators Direct observation of infrastructure, functionality of equipment, physical counting of drugs and consumables; review of records for completeness Self-reported information by women with live infants 0–2 months old during household interviews	DOACs and QITs established and functional Facility infrastructure improvements made Processes to ensure the availability of supplies and equipment Staff gaps and mismatches identified and addressed Clinical capacity building of facility staff in BEmONC and CEmONC facilities through in-service training and mentoring Clinical reviews of patients with complications Capacity building for staff on FP Real-time identification and tracking of “weak” newborns in the community Modernizing data systems and Continuous Program Monitoring	PDSA	An in-depth evaluation of the QI initiative and new data collection were beyond the scope of the study Did not have statewide information before 2014 Data from household surveys are self-reported thus prone to information bias High turnover of clinical staff as well as GoB leadership Malfunctioning equipment and supply stocks still existed and had an impact on training interventions Finding nurse-mentors and especially doctor-mentors for training was particularly difficult The demographic and geographic variability of the state required addressing contextual factors before QI activities were implemented	Substantial advances were made in improving the quality of RMNCHN services in public facilities in Bihar, and continued improvement that builds on the established QI platform is expected

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Nababan et al. 2017	Conducted at a 100-bedded district-level secondary care hospital (Magura District Hospital (DH)) in Khulna division in Southwestern Bangladesh Baseline data from April to June 2014 Follow-up data from July to November 2014	To examine the effectiveness of the SCC in improving childbirth practices at a district hospital in Bangladesh	Number of essential childbirth practices (SCC items) performed at baseline and end-line Appropriate use of medicines at baseline and end line (maternal infection and eclampsia)	Data were collected via direct observation of birth events to record providers' behavior	SCC implementation There was a series of consultative meetings between study investigators and external experts to reach a consensus on how to adapt the SCC to the local context The key differences between the final checklist used in this study and WHO SCC are the removal of HIV-related and the addition of a question to identify women who had already received oxytocin outside of the hospital	PDSA	A total of 10 complete observations analyzed were falling short of the sample size calculated of 440 observations Direct observation of nurse-midwives practices could introduce bias (Hawthorne effect) The findings from the current study may not be generalizable to providers with less than 10 years of experience It was difficult to measure such as blood loss and management of newborn infection, which involved subjective or otherwise challenging observation	The overall improvement in nurse-midwives practices was significant and strong. It suggests that implementing the SCC may facilitate health workers' compliance with essential childbirth practices. The study has identified areas of practice that should be strengthened in Bangladesh, such as the prevention of prolonged labor using partograph as well as essential newborn care
Sudhinarase et al. 2023	Three government-run health facilities as intervention facilities in Kiambu and Nairobi counties in Kenya and three control facilities The baseline was from August to December 2016 The endline was from October 2018 to April 2019	To assess the effectiveness of a facility-based QIC in improving patient experiences of delivery care in three hospitals in Kiambu and Nairobi counties To assess the indirect impact of the intervention on other health outcomes including clinical quality, provider visits, overall quality rating and satisfaction, experiences of delivery problems, and plans to use a family planning method	Person-centered maternity care score (PCMC) was measured using a PCMC scale The 30-item scale covers three PCMC domains: Dignity and Respect, Communication and Autonomy and Supportive care	PCMC was measured using a PCMC scale, which was developed and validated in Kenya Surveys used to measure the PCMC	Healthcare providers introduced themselves to clients when they first came to see them and referred to clients by name (Dignity and Respect) Doctors and nurses explained to clients why they were doing examinations or procedures on them and when giving medication and asked permission/consent before they conducted a procedure on a client (Communication and Autonomy) Clients were allowed to have a companion of their choice stay with them during labor and delivery (supportive care)	PDSA	Carried out in only six facilities in two counties in Kenya, Nairobi, and Kiambu, The research was undertaken over 33 months when the health service experienced considerable political turbulence and differential investment While we reached an adequate sample size for the endline sample for intervention and control groups, we had slightly lower samples than required for baseline groups based on sample size calculations due to a strike	

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Montagu et al. 2020	Three government facilities (two CHCs and one PHC) were randomly selected for the intervention and three additional facilities were matched as controls based on delivery volume and level of care. Teams supported to brainstorm and test improvements over 12 months	To improve the experiences of mothers and the quality of care through the introduction of patient-centered maternity care	Person-centered maternity care (PCMC) was assessed using a validated scale that measures care received within three domains: dignity and respect; communication and autonomy; and supportive care	Progress was measured through pre-post interviews with new mothers, scored using a validated PCMC scale	Calling patients by their name; improving the cleanliness of the toilets, wash-rooms and post-natal ward; explaining the purpose of giving medication or tests undertaken; and ensuring patients were covered with a blanket of cloth while in the labor area. Beyond this, each facility worked to improve one of three additional topics: giving pain medication when the patient felt they needed it, accompanying the woman to the toilet, or accommodating the patient's preferred position during labor and delivery	PDSA	The intervention was implemented in a small number of facilities (3), which makes a clustering effect likely. The results may be reflective of a Hawthorne effect. It is possible that improvements in the overall and PCMC sub-domain scores may be partially attributed to a halo effect. Response bias among women who delivered may have affected their answers, or anxiety about treatment by providers may have made women unwilling to accurately describe negative experiences	This study has demonstrated the effectiveness of a team-based quality improvement intervention to ameliorate women's childbirth experiences
Takemoto et al. 2023	The analysis included a convenience sample of 12 of the 23 private hospitals that participated in the PPA March to August 2017	To compare safety care measures and adverse outcomes between women exposed to the PPA intervention to those receiving standard care	Besides HBS main outcome (Cesarean section rate), two sets of outcomes were selected to explore the impact of the PPA model: Safety care measures and obstetric or neonatal outcomes	Data collection was performed using multiple sources - Interviews with the hospital director or head, face-to-face interviews with postpartum women, self-reported evaluation of both woman and newborn care during the hospital stay and medical charts	Implementation of the PPA QI projects, such as antenatal classes, visits to the hospital before labor, incentives to prepare a birth plan, intrapartum care in a collaborative model between obstetricians and midwives, and use of best practices during labor and birth	PDSA	The study included a convenience sample with specific eligibility criteria thus, HBS findings may not represent all hospitals that joined the PPA project. In some of the outcomes, the subgroup with available data had a small sample size, which may have impaired our ability to observe differences that larger sample sizes would reveal	The PPA intervention was able to reduce CS rates, late preterm and early term deliveries without increasing the chance of adverse outcomes

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<i>Authors</i>	<i>Setting and duration</i>	<i>Study objectives</i>	<i>Quality of care indicators/key drivers assessed</i>	<i>Data collection method</i>	<i>Interventions implemented</i>	<i>QI approach used</i>	<i>Limitations</i>	<i>Outcomes</i>
Manzi et al. 2018	We include all 21 PIH-supported public health centers, eight in the Southern Kayonza District and 13 in the Kirehe District. Baseline measurements from October 2010 to May 2011. The follow-up measurement from February to November 2012, 12–15 months after the start of the MESH-QI intervention	To assess the impact of the MESH-QI intervention on the completeness of ANC assessment items, with a focus on danger signs	Completeness of ANC assessment items; with a focus on danger signs	Adapted mentor observation checklists used to assess essential ANC assessment items	During visits, MESH-QI mentors delivered provider-centered support including mentorship, bedside teaching and clinical case review to improve knowledge, skills, and effective communication techniques. Health center providers were coached on quality improvement, using the PDSA methodology	PDSA	Pre-post design without a control. Performance measurements were collected during routine mentoring visits by mentors themselves – Introduce bias	This study highlights the importance of post-training mentoring and quality improvement rather than relying solely on didactic trainings and traditional supervision
Kabo et al. 2016	Twenty-three secondary health facilities of Bauchi state, Nigeria. Baseline assessment in 2010. Final assessment from 2013 to 2014	To assess the correlation between compliance with set performance standards and maternal and neonatal deaths in health facilities	The program measured the level of compliance with set SBM-R performance standards to assess areas including focused ANC labor, childbirth and immediate newborn care, postpartum care, management of antenatal, intrapartum and postpartum complications, infection prevention, health facility management and drug supplies management	Data were extracted from existing maternity registers, supplementary facility data collection forms, the national health management information systems and observations	A five- to seven-member team was formed at each facility to lead the SBM-R process. Teams obtained resources to renovate boreholes and staff quarters; purchase water reservoirs and wastebins and benches for women visiting clinics; repair ambulances for some health facilities where this was needed; establish or strengthen drug revolving funds; build incinerators for medical waste and advocated for posting of doctors and midwives	SBM-R	Absence of a control group. Measurement of the achievement of performance standards was based on a relatively small sample of observations. Describes only supply-side interventions, whereas demand-side interventions are also needed in this context. Only presents facility-based data and therefore cannot estimate population-level changes in facility birth or mortality rates	Scaling up SBM-R for quality improvement has the potential to prevent maternal and neonatal deaths in Nigeria and similar settings

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<i>Authors</i>	<i>Setting and duration</i>	<i>Study objectives</i>	<i>Quality of care indicators/key drivers assessed</i>	<i>Data collection method</i>	<i>Interventions implemented</i>	<i>QI approach used</i>	<i>Limitations</i>	<i>Outcomes</i>
Kaplan et al. 2021	A total of 32 hospitals and community health centers in the province of Aceh, Indonesia – 16 in the intervention group and 16 in the control group Baseline data were collected from August to October 2016, and outcomes were measured from March to April 2017 – Intervention was 6 months	To assess whether a Safe Childbirth Checklist (SCC) supplemented by medium-intensity coaching increases the application of essential birth practices to reduce maternal and perinatal mortality	For the primary outcome, clinical observers documented whether 36 essential birth practices were applied at treatment and control facilities at one or more of four pause points during the birthing process	Collected the SCC used at each of the four pause points Collected facility-level mortality and numbers of complications from the facility registries	In collaboration with local midwives, obstetricians, and policymakers, we adapted the SCC to the Acehnese setting in terms of language and local practices Coaches provided motivation and information on correct checklist use during a 2-hour launch event During the 6 months of observation, trained coaches visited each health-care facility 11 times to provide new SCC copies, collect completed SCCs, and provide feedback	PDSA	Because the trial was well-powered for adherence to essential practices but not for mortality outcomes, the mortality results should be interpreted with caution We measured the effects of the intervention for 6 months, whereas long-term effects might increase or decrease over time owing to learning curves or the phasing out of coaching	Health facilities that implemented the SCC with medium-intensity coaching had an increased rate of application for 5–36 essential birth practices compared with the control Medium-intensity coaching may not be sufficient to increase uptake of the SCC to a satisfying extent, but it may be worthwhile to assess a redesigned coaching approach prompting long-term behavioral change and, therefore, effectiveness

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Kumari et al. 2022	Bhagwan Mahavir (BM) hospital Baseline data regarding HRP delivery and complications from the available records in LR. The birth register included records of all deliveries conducted in BM hospital including complications Interventions from January 2019 to July 2019	To assess whether providing quality care to HRP and their triaging will reduce complications during pregnancy, childbirth, and thereafter	Percentage of major life-threatening complications (APH, PPH, severe pre-eclampsia/eclampsia), maternal near-miss, and maternal death to observe any improvement in these indicators following implementation of this QI initiative	Data regarding HRP delivery and complications from the available records in LR – Birth registry	The QI team decided to orient the staff of OPD and LR, especially the JR and SN about HRP, the importance of their pre-identification and their role in the management of an HRP. Also, to identify HRP in OPD during ANC visits, to give them an HRP number on ANC card and to record all HRP in the HRP register Through PDSA cycles 1–3 in OPD, the QI team streamlined the process of identification of HRP in OPD and giving an HRP number. PDSA cycles 4–6 helped the team in triaging the HRP in LR. In PDSA 7, the team redistributed the available human resources and posted one additional SR in LR to support the LR team	POCQ PDSA cycles in the OPD and LR to test the change ideas	Rapid turnover of SFRs and JRs in the LR, reorientation of the new LR team and the newly posted SG and NO about this improvement process remained a challenge The major limitation of this QI initiative is the team did not analyse the effect of the implementation of this intervention process on neonatal morbidity and mortality	Simple intervention improved patient care at different levels
Appel et al. 2023	Implemented in health facilities across six regions (Centre Nord, Centre Ouest, Nord, Sud Ouest, Boucle du Mouhoun, and Centre-Est). In each region, two intervention districts, two additional controls Baseline from October 2013 to March 2014 Endline from April to June 2017	To assess the extent to which this PBF affected the clinical quality of defined ANC components and to understand what clinical aspects of ANC service provision were most responsive to the PBF incentives implemented in Burkina Faso	Our focus here is on clinical quality – Inputs and processes related to effective ANC Five composite measures of ANC quality: Service readiness, screening of first-visit clients, screening of follow-up visit clients, prevention for first-visit clients and prevention for follow-up visit clients	From the facility inventory checklist, the direct observation checklist	Implementation of the performance-based financing scheme	PDSA	Longitudinal data were available for only a subset of study facilities A relatively low number of 24 district clusters, which results in estimating downward-biased standard errors threatening the robustness of the modeled differences in-difference coefficients The study period of three years might have been too short to observe any effects due to maturation	Significant effects resulted only with respect to ANC service readiness. After an implementation period of about 3 years, this scheme has not yet resulted in substantial improvements with respect to the key clinical content of ANC provision

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Dumont et al. 2013	The trial was undertaken in Senegal and Mali from September 1 2007, to October 30 2011. A total of 46 public first-level and second-level referral hospitals – 23 in the intervention group and 23 in the control group. 1-year pre-intervention data collection. Intervention directed for 2 years	To assess whether a multifaceted intervention to promote maternal death reviews and training for emergency obstetric care in referral hospitals would reduce hospital-based mortality. To improve perinatal health, resource availability, and medical practices	The primary outcome was hospital-based maternal death, measured as the vital status of the mother at hospital discharge. Effects of the intervention on three types of secondary outcomes: resource availability in each hospital, medical practice for emergency obstetric care, and perinatal mortality	The data collection and the implementation of the intervention were undertaken by different and independent organizations in each country. Through the clinical database and in-depth interviews	One doctor and one midwife who were responsible for maternity services from each hospital in the intervention arm took part in a 6-day training workshop provided by certified instruction – ALARM international course. 3 days of training in best practices in emergency obstetric care, 1 day of training in maternal death reviews, 1 day of awareness training related to economic, socio-cultural, and ethical barriers and 1 day of training in adult education methods. Just after the initial training, a multi-disciplinary audit committee including physicians, midwives, nurses, and administrators was created in each participating site and trained in the process of undertaking maternal death reviews. Audit cycle and onsite training	PDSA	Data are restricted to hospital-based maternal deaths, therefore, maternal mortality in the population cannot be inferred. The activity related to data collection may also have had an impact on quality improvement and maternal outcomes in participating hospitals. Variation in the implementation of the key components of the multifaceted intervention between participating hospitals of the intervention group could have resulted in an underestimation of the real effectiveness of our multifaceted intervention	This multifaceted intervention was particularly effective at reducing maternal death from direct obstetric causes (ante-partum or postpartum hemorrhage, pre-eclampsia or eclampsia, and puerperal infection). Our educational program facilitated the implementation of these best practices

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Bharthi et al. 2021	Department of Obstetrics and Gynaecology, All India Institute of Medical Sciences, New Delhi The intervention lasted from January 2019 to February 2020	To establish the practice of allowing birth companions in all eligible women in the labor ward from existing 0 to 50% in 6 weeks duration	Percentage of eligible women accompanied by birth companion during labor and delivery	An additional column was added in the birth register for easy recording of data Team meetings were held monthly to review the data on sustainability, and monthly percentages were calculated	The SOP for allowing birth companion during labor and delivery was developed Meetings with the labor ward team PowerPoint presentations on respectful maternity care and birth companion Ensuring partition by curtains for privacy	PDSA	Certain days failed to provide birth companions despite the availability due to space constraints and lack of privacy on busy and overcrowded ward days Not possible to give continuous support in the first stage Lack of antenatal counselling of women regarding the option of choosing a birth companion sometimes led to the unavailability of a suitable birth companion of their choice	The median value of women accompanied by birth companions marginally increased to 25% after the first PDSA cycle. Implementation of further changed ideas led to an increase in the median, which reached 66.6%. Thereafter, there was a decline, but by the end of 6 months, it was possible to attain the goal and sustain it
Brenner et al. 2018	Initiative to four districts (Balaka, Dedza, Mchinji, Ntcheu) Implementation occurred in two phases: an early pilot phase (April 2013 to October 2014) and a later expansion phase (November 2014 onwards)	To improve both quality and access to facility-based obstetric care for women and newborns during birth and up to 48 hours after delivery through a combination of supply and demand-side mechanisms	Effective coverage of pregnant women with facility-based basic obstetric care services as the main outcome variables	A facility inventory, direct case observations, and a household-level surveys were used for data collection	The early implementation phase consisted of 3 to 6-month reward cycles and served as an opportunity for implementers to further fine-tune the intervention in response to unforeseen challenges – Feedback was taken	PDSA cycles	The 2-year study period might have been too short to assess the full impact of the scheme The absence of randomized assignment of facilities to the RBF Only one observation point available before intervention start we failed to test the parallel trend assumption underlying the difference-in-differences method Selection of control facilities had to be limited to the four intervention districts	The RBF4MNH program improved effective coverage of pregnant women by improving service quality and allowing a larger proportion of women to receive more effective care in the context of Malawi

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Haskins et al. 2020	Conducted in one district in KZN comprising five sub-districts – 37 primary health clinics, one community health center, two district hospitals and one regional hospital 3-month intervention - Five waves of data collection were conducted in all participating clinics between December 2016 to February 2017	To improve the integration of maternal and child health and HIV services in a primary health level, in KwaZulu-Natal, South Africa		A self-administered checklist was used in each clinic every 3 months over the 1-year intervention period	Interventions were conducted at the same time in all clinics in each sub-district Six QI mentoring visits, learning sessions with clinic staff to share learnings, and a self-administered checklist aimed to assist health workers in monitoring and implementing an integrated package of health services for mothers and children	PDSA	Data relied on reports from mothers and from recording interventions from the clinical records and were not observed directly No assessment of quality and appropriateness of interventions provided Additional paperwork required by the intervention may have had a negative impact on the quality of care, thus reducing the effect of the intervention	Significant improvements in coverage of some services, but the QI intervention was unable to achieve the substantial changes required to provide a comprehensive package of services to all mothers and children
Bishanga et al. 2018	Started in 52 health facilities (12 hospitals and 40 HCs) in Tanzania in 2010 – Two health centers were dropped due to inadequate staffing, so that only 50 facilities were reassessed in 2012	To improve the efforts to prevent and better manage PPH SL: Availability of drugs and service delivery guidelines	Frequency and quality of provision of AMTSL Facility readiness to provide AMTSL Availability of drugs and service delivery guidelines	Observation of labor and delivery using a structured checklist Facility audit/inventory for the presence of uterotonic drugs – visually confirmed the presence of at least one dose of oxytocin, ergometrine, and/or misoprostol in the uterotonic drugs a maternity ward and checked the drug expiry date	Developed clinical standards and training materials, including PPH prevention job aids and provided support at central and local levels to roll out the guidelines and learning resources Capacity building was a core component which equipped service providers, supervisors and managers with knowledge, attitudes and skills to enable provision of quality maternal care according to established standards Facilities formed QI teams, which received training and ongoing supportive supervision and mentorship	SBM-R And PDSA cycles	As a cross-sectional study, the data collected on the availability of uterotonics did not reflect the history of stock-outs in each facility but rather provided an indication of stock status at a particular moment in time The study was not designed to be nationally representative	Significant improvement in the practice of AMTSL 2 years after the intervention, with low-level facilities showing greater gains than hospitals

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Bitewulign et al. 2021	Implemented in one district improvement collaborative at Tankua Abergele, Dugna Fango, Lemmu Bilbilo and Fogera collaborative located in the regions of Tigray, SNNP, Oromia, and Amhara, respectively The study period in Oromia, Tigray and SNNP was from November 2016 to December 2018 Amhara region was delayed by 7 months due to political instability	To evaluate the effect of integrating the use of the WHO-SCC into a district-wide system improvement collaborative program designed to improve and sustain the delivery of EBPs	Three “clinical bundles” were created from the WHO-SCC: On Admission, Before Pushing, and Soon After Birth bundles The outcome of each the bundle was measured using all- or- none adherence	The data sources included audits of WHO-SCC and medical records in health facilities where the monthly deliveries were greater than 30, a systematic random sampling method was used to retrieve 30 charts to calculate all-or-none bundle adherence	Intensive coaching to support teams to improve systems and skills gaps – Visits, phone calls, engagement of program and supervisory managers, data collation, and interpretation Clinical training like HBS and BEmONC Adequate orientation for the proper use of the WHO-SCC	PDSA	Comparison facilities were not included in this study due to feasibility Due to the small volume of facilities, measuring the impact on neonatal mortality was not feasible Data collection and analysis done by the QI teams themselves, were limited to the use of routinely available data	Using WHO-SCC paired with a system-wide approach improved and sustained quality of EBPs delivery. Further studies should be conducted to evaluate the impact on patient-level outcomes

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Authors	Setting and duration	Study objectives	Quality of care indicators/key drivers assessed	Data collection method	Interventions implemented	QI approach used	Limitations	Outcomes
Larsons et al. 2019	Four rural districts of Pwani Region, Tanzania: Bagamoyo, Kibaha and Mkuranga – 12 primary care clinics and their catchment areas intervention and 12 controls Baseline – 13 February to 28 April 2012 Mid-line – 3 February 2014 to 31 March 2014 Endline – 20 January to 7 April 2016	To assess the impact of a quality improvement project on facility utilization for childbirth	Facility utilization for childbirth ANC quality improves - Content of ANC care - Perceived quality of ANC care Facility – community link Perceived obstetric quality Payment for obstetric care	Trained Tanzanian research assistants conducted the household survey in Swahili using hand-held tablets	The intervention included three components to improve facility quality: infrastructure improvement (facility upgrades and ensuring basic equipment and supplies), provider training and supervision (continuous medical education, supportive supervision and mentoring), and peer outreach to promote facility utilization for childbirth within the official catchment communities	PDSA	With only 12 clusters in each study arm there was potential for imbalance of unmeasured confounders between intervention and control groups Women in the control areas could have delivered in the treatment facilities, thus increasing the facility utilization in control areas The 24 health facilities included in this study were not chosen at random – Most deliveries in the district Potential mechanisms of effect, including the quality of ANC received were measured through maternal report, allowing for potential recall bias	The intervention led to an increase in facility births – The intervention increased facility delivery among women with past home deliveries – Antenatal quality increased in intervention facilities

AMSTL, active management of third stage of labor; BEmONC, basic emergency obstetric and newborn care; EBP, essential birth practice; EmONC, emergency obstetric and newborn care; MWMIS, Maternity Wing Management Information System; OCN, obstetric care navigation; PCOI, point of care quality improvement; PDSA, Plan-Do-Study-Act; SBM-R, Standards-based management and recognition; TBA, traditional birth assistants

**Table 2:** Eight standards for improving quality of maternal and newborn care<sup>4</sup>

Standards	Description
Evidence-based practices for routine care and management of complications	This standard emphasizes the importance of using evidence-based guidelines and practices in routine antenatal, intrapartum, and PNC, as well as in managing complications that may arise during pregnancy and childbirth.
Actionable information systems	This standard highlights the need for reliable and timely information systems to support decision-making, planning, and monitoring of maternal and newborn health services. It includes capturing essential data, ensuring data quality, and using data for performance improvement.
Functioning referral systems	This standard focuses on establishing effective referral systems that facilitate the timely and appropriate transfer of pregnant women and newborns between different levels of care, ensuring access to specialized services when needed.
Effective communication	This standard emphasizes the importance of clear, respectful, and effective communication between healthcare providers and pregnant women, ensuring that women are informed, involved in decision-making, and able to express their preferences and concerns.
Respect and preservation of dignity	This standard underscores the importance of providing care in a manner that respects the dignity, privacy, and cultural preferences of pregnant women and their families, promoting autonomy and ensuring the provision of culturally sensitive care.
Emotional support	This standard recognizes the significance of providing emotional support to pregnant women and their families throughout the maternal and newborn health journey, acknowledging the emotional and psychological aspects of care.
Competent, motivated personnel	This standard highlights the need for a skilled and motivated healthcare workforce, including healthcare providers, managers, and support staff, who possess the necessary competencies and are committed to delivering high-quality maternal and newborn health services.
Availability of essential physical resources	This standard focuses on ensuring that essential physical resources, such as infrastructure, equipment, medications, and supplies, are available and accessible to provide comprehensive and quality maternal and newborn health services.

**Table 3:** Analysis of WHO standards<sup>4</sup> that were covered by various QI projects in the review

WHO standard of care	Quality improvement initiatives that have covered the relevant standards
Evidence-based practices for routine care and management of complications	27 studies <sup>17–21,23–34,36,38,39,42–48</sup>
Actionable information systems	One study <sup>37</sup>
Functioning referral systems	3 studies <sup>36,37,42</sup>
Effective communication	3 studies <sup>22,24,47</sup>
Respect and preservation of dignity	6 studies <sup>22,34,35,44,47,49</sup>
Emotional support	4 studies <sup>22,34,35,49</sup>
Competent, motivated personnel	12 studies <sup>18,23–26,28,35,36,39–41,43</sup>
Availability of essential physical resources	13 studies <sup>17,18,25,29,31,32,34,35,39,41,43,45,46</sup>

The QI projects reviewed were conducted at various levels of the health system (a wide range of scopes and scales). These initiatives vary from those conducted within a single healthcare institution<sup>20,38,40,49</sup> to those implemented across multiple healthcare institutions within a specific geographic location, such as a state or province.<sup>25,30,33,37,42–45</sup> A few have extended their reach to multiple countries simultaneously.<sup>21,27,28,39</sup> The most extensive project spanned 14 impressive countries in Asia and Africa.<sup>39</sup>

Our review revealed that most studies used quantitative data,<sup>17–21,23–27,29,32–37,39–44,46–48</sup> and some studies incorporated both qualitative and quantitative data.<sup>22,27,28,30,38,41,43,45,48</sup>

Most baseline data were collected from existing facility-based registries and records, with the majority being paper-based and few electronic.<sup>26,37</sup> Furthermore, one study began with paper-based records and transitioned to electronic records during the QI project.<sup>26</sup> Case sheet introduction and use for data collection have also been reported in a few studies.<sup>29,41</sup> Few studies have implemented direct observation methods (some using checklists),<sup>17–20,24,42,45,46</sup> in-depth interviews,<sup>22,28,29</sup> or structured questionnaires<sup>23,25,27,31–33,44,48</sup> as means of baseline data collection. The WHO Safe Childbirth Checklist<sup>20,24,30,33,35</sup> and surveys using a validated Person-Centred Maternity Care (PCMC) scale<sup>22,44</sup> were used for data collection. Few studies have implemented clinical auditing tools for this purpose.<sup>21,29,32,38,46</sup> Interestingly, no single study has used patient feedback or perceptions to develop interventions for QI initiatives.

### Interventions and Outcomes

The interventions in the evaluated studies can be broadly categorized into three key areas as per the WHO framework: provision of care, experience of care, and crosscutting. The WHO emphasizes that desired facility outcomes can be achieved by enhancing eight standards that fall under these key areas.

The majority of studies have devised interventions to encourage healthcare staff to adhere to evidence-based practices and locally developed protocols in the management of pregnancy conditions and obstetric emergencies (evidence-based practices for routine care and management of complications).<sup>17–21,23–31,33,34,38,39,42–47</sup>

These interventions included healthcare workers' preservice and in-service education, coaching, mentoring, and supervision of health institutions' preparation of policy documents, supervision of the use of partograms, care of laboring women, promotion of multiple ANC visits, encouragement of skilled delivery, and follow-up postnatal clinic visits. Most QI projects have achieved the desired outcomes following interventions.<sup>17–21,25–31,33,34,36,38,39,42–48</sup> However, some QI initiatives did not achieve the expected outcomes.<sup>23,27</sup>

Respect and preservation of dignity are another key standards that have been the focus of several studies<sup>22,35,44,47,49</sup> and have also been coupled with effective communication.<sup>22,24,47</sup> While most QI projects have achieved the desired outcomes, including improvements in RMC and PCMC scores,<sup>35,44,47,49</sup> a single study conducted in Kenya failed to achieve quality improvement.<sup>22</sup>

The availability of essential physical resources is key area for certain QI projects and is always coupled with other interventions.<sup>17,18,25,29,31–35,39,41,43,45,46</sup> All these projects achieved the desired outcomes.

The implementation of the WHO Safe Childbirth Checklist was a key intervention used in multiple quality improvement projects included in our review.<sup>20,30,34,35</sup> There had been times when this tool had been adapted to the setting in terms of language and local practices after a series of consultative meetings between study investigators and external experts. One study created a smartphone application for use by obstetric care navigators to improve the detection of pregnancy complications and to facilitate emergency facility referrals.<sup>37</sup> This was performed in addition to several other mentoring interventions.

Various interventions were implemented to improve maternity care in LMICs with notable outcomes. In Guatemala, Austad et al. introduced an innovative model linking traditional birth attendants (TBAs) to hospital care via a smartphone application, which increased the proportion of births under TBA care that received facility-level obstetric care, thereby demonstrating the feasibility of patient-centered interventions.<sup>37</sup> In Ghana, Singh et al. initiated the Project Fives Alive!.<sup>36</sup> This included community stakeholder meetings, promotion of ANC visits, skilled delivery, and PNC follow-ups. This led to improved health outcomes at the scale, showcasing the effectiveness of simple, low-cost changes. Scale-up phase of the Project Fives Alive!, further reinforced these outcomes, with significant reductions in under-five mortality achieved through community meetings, ANC defaulter tracing, skilled delivery practices, and health education.<sup>26</sup> Goyet et al. implemented comprehensive reporting tools, accreditation systems, education, and community health education in 14 countries.<sup>39</sup> Although attributing improvements directly was challenging, the study highlighted the risks posed by the chronic shortages of skilled personnel and inadequate training. In Ethiopia, Hagaman et al. focused on coaching visits, compliance with essential birth practices, and supporting the development of clinical skills.<sup>24</sup> This intervention demonstrated the feasibility of complex, low-cost, health worker-driven improvements that can be adapted to similar settings globally.

### Common Limitations in Quality Improvement Projects

The QI projects conducted in LMICs often encounter numerous limitations that compromise their effectiveness and generalizability. A common issue is the absence of rigorous control groups, which make it difficult to compare the outcomes and measure the actual impact of interventions.<sup>19–21,24,26,33–43,45–48</sup> Additionally, one study

was conducted in a homogeneous ethnic group, limiting the generalizability of the findings to other population groups and regions within the country.<sup>37</sup>

Another challenge is the reliance on paper-based facility registers, data collection forms, or medical records for data collection, which increases inaccuracies owing to transcription errors or missing data.<sup>21,23,25,26,29,34–36,42</sup>

Pre-intervention data collection periods have been brief in many studies, failing to capture seasonal variations in outcomes and limiting the understanding of contextual influences on project results.<sup>19–23,25,26,30,31,38,40,41</sup> Long-term sustainability is also a concern, as it is often uncertain whether improvements demonstrated during the intervention phase will be maintained after the project is concluded.<sup>38</sup>

Furthermore, there are issues related to the healthcare workforce, including a chronic shortage of skilled personnel, inadequate pre-service training for nurses in obstetric care, and high clinical staff turnover.<sup>39,40,42,43</sup> These challenges pose risks to the sustainability and scalability of project outcomes.

## DISCUSSION

In the past decade, QI projects pertaining to maternal care have been conducted in a wide range of countries, including LMICs, reflecting global commitment to improving maternal health outcomes. However, it is important to acknowledge that there are still numerous LMICs for which these QI projects have yet to take place. It is crucial that the global community continue to prioritize and support LMICs in their efforts to enhance maternal care. By removing barriers to QI projects, countries can work toward ensuring that every mother, regardless of her geographic location, receives the essential care she deserves during pregnancy and childbirth.

Our narrative review examines the characteristics and outcomes of QI projects in LMICs over the past decade. Many QI projects in LMICs focused on improving a limited number of standards related to care provision and experience to enhance overall care quality.<sup>6</sup> Prioritizing specific standards rather than simultaneously addressing all components allows for effective resource allocation, targeted implementation, and measurable improvements. Improvements in one area may positively affect the other interconnected standards. None of the QI projects reviewed collectively targeted all care standards; all interventions were based on the primary identified gaps. Targeted efforts in specific areas can improve overall care quality if aligned with broader maternal health goals and comprehensive coverage of care standards over time. Additionally, the objectives of QI initiatives vary based on context, feasibility, and problem prioritization. There is a significant need for targeted interventions to improve RMC/PCMC and adherence to evidence-based practices in health facilities to enhance the quality of care in many LMICs.<sup>50,51</sup>

Most studies have utilized data from existing facility-based registries, which involved extracting information from clinical records, checklists, and direct patient observations. Data dictionaries effectively translate QI ideas into consistent formats, enhancing efficiency by minimizing errors. The data-collection process is crucial for maintaining the integrity of QI projects. Baseline data identify gaps and deficiencies, guide decision-making, and post-intervention data track progress and evaluate the effectiveness of initiatives. Additionally, transparent and

accountable data collection fosters stakeholder engagement and validates a project.<sup>52,53</sup>

In LMICs, data collection for quality improvement is complicated by the widespread use of paper-based systems. Hardcopy checklists and physical records pose several challenges; data gathering is laborious and time-consuming, requiring manual extraction from paper stacks, which increases error risk and delays, affecting data accuracy and timeliness. Additionally, inconsistent documentation and lack of standardized formats across healthcare facilities create further issues. The absence of electronic records hinders real-time monitoring and reporting, making it difficult to promptly identify trends, patterns, and gaps in maternal care, thus limiting the ability to address emerging issues and quickly adapt improvement strategies.

To overcome these challenges, substantial investments are necessary to transform health information systems into LMICs. This transformation involves digitizing medical records, standardizing data collection tools, and strengthening the data management infrastructure. While the transition to electronic records demands time, capital, and resources, it is a vital step toward advancing maternal care. Assisting these nations in developing robust health information systems that contribute to the overall improvement of maternal well-being is worthy of effort.

Various quality improvement approaches encompass various methodologies and frameworks with the primary aim of enhancing quality. Some of the most widely used QI frameworks are the model for improvement, the Plan–Do–Study–Act (PDSA) cycle, lean methodology, and six sigma approach. Each framework has strengths, limitations, and applications depending on the context and goals of the project.<sup>54</sup> The standard-based management and recognition model was designed to confront key realities in health systems of many resource-constrained settings. The SBM-R employs systematic change management and facilitates rapid action to correct service gaps and has been shown to be helpful in promoting a culture of standardization, continuous measurement, and recognition of achievements.<sup>55</sup>

Various study designs have been used in QI projects. In randomized controlled studies, the control arm is presumed to experience all conditions of an RCT except the intervention and, therefore, provides a comparison against which intervention effects can be isolated. Therefore, it is necessary to reduce the impact of bias.<sup>56</sup> Using a suboptimal control arm may bias a trial in favor of the experimental arm and reduce the trial's external validity, as in any clinical trial of medications.<sup>57</sup>

Only 13 of the QI projects reviewed incorporated a control arm. Although beneficial, this approach is considered resource-intensive, poses ethical concerns, and may not always be practical, particularly in healthcare. Other concerns may include logistical challenges and attrition bias. The decision to include a control arm should be carefully considered, considering the specific context, ethical considerations, available resources, and research requirements, as alternative study designs may be more appropriate in some cases.

A multitude of interventions was included in the studies analyzed in our review. The development of effective health promotion interventions involves reviewing literature, applying theories, collecting data, and engaging experts, communities, and stakeholders.<sup>58</sup> Dieberger et al. used intervention mapping to create "Baby Steps," a theory-based intervention to promote physical activity among healthcare providers during and after pregnancy.<sup>59</sup> Leerlooijer et al. demonstrated the usefulness of intervention

mapping for planning complex community-based interventions, such as addressing teenage pregnancies.<sup>60</sup> Over the past decade, quality improvement projects have relied on research and expert inputs to determine interventions. However, very few studies have used health-promotion approaches in our review.

In addition, intervention characteristics such as the clarity of intervention concepts and resources, intervention design, adaptability, testability, and strength of evidence are important in facilitating QI projects in LMICs. Key stakeholders need to have a clear understanding of the concept in terms of the methods and tools used to deliver the intervention and the principles and philosophy behind them. The success of QI projects depends on an individual's knowledge, beliefs, and willingness to change.<sup>61</sup>

Furthermore, most of the described interventions targeted healthcare workers and health services rather than clients or the wider health system. The majority involved the education and training of healthcare workers, ranging from doctors to nurses and obstetric care navigators. Only a few projects aimed to improve the experience of labor room care and the birthing process for mothers via the introduction of labor companions and improving the respect and dignity aspect of care. None of the QI projects obtained patients' perceptions regarding their primary problems or their ideas of what interventions can be implemented to improve the quality of maternal care. Project planners in LMICs should be cognizant of the fact that the provision and experience of care are two pillars of the quality of improvement of the WHO framework, and desired outcomes can be achieved when both components, such as the experience and provision of care, can be improved together. The WHO Quality Toolkit supports users in identifying and navigating tools that can be used to improve the quality of health services from the perspectives of healthcare workers, advocates, and experts in the field of quality of care.<sup>62</sup> Facility-level improvements in perinatal and maternal outcomes can be achieved by implementing standardized social support programs and ensuring consistent specialized obstetric care. Stress management training, interdisciplinary meetings, and feedback sessions are effective measures.<sup>63</sup>

Paying for performance (P4P) is an emerging health sector strategy for improving the availability, quality, and utilization of essential healthcare services.<sup>23</sup> Although the majority of these QI projects have proven to be successful and have evidence of attaining at least some desired outcomes, some studies have fallen short of their desired outcomes. This could be due to failure to sustain a high level of implementation.<sup>32</sup>

The other common limitation observed in the analyzed studies was the short pre-intervention data collection period, which may have missed seasonal variations.<sup>19–23,25,30,31,36,38,40,41</sup> Sustainability after project completion was another limitation of this study. Healthcare workforce challenges such as staff shortages and turnover threaten project sustainability and scalability.<sup>39,40,43</sup> Furthermore, one study focused on a single ethnic group, limiting its generalizability.<sup>37</sup>

Future LMIC research should overcome limitations, use randomized controlled trials and appropriate control groups, diversify study populations for broader conclusions, ensure that informed conclusions are validated through training and digitalization, consider long-term data collection, and integrate sustainability efforts. Addressing health workforce challenges requires investment in training and skilled personnel, use of validated measurement tools, ensuring adequate sample sizes, and



**Table 4:** Twelve recommendations to conduct a facility-level QI project in an LMIC setting

<i>Recommendation</i>	<i>Description</i>
Forming a diverse QI team	Strong organizational support, strong team leadership, and high levels of interpersonal team skills. This should be a mixed group of stakeholders including administrators, consultants, middle-grade doctors, nurses, midwives, and support staff
Identify quality gaps and prioritize	Identify the quality-related gaps that exist in the facility and prioritize the desired healthcare outcomes to be achieved. Clearly specify the areas in need of improvement with measurable aims, goals, and objectives
Assess facility-level inputs	Determine the essential inputs for a successful QI project, including: <ul style="list-style-type: none"> <li>• Organizational capacity</li> <li>• Adequate funding</li> <li>• Service infrastructure – Availability of data: Electronic health records/electronic communication/hospital health records</li> <li>• Health workforce-training</li> <li>• Well-performing and motivated workforce</li> <li>• Interpersonal care and social support</li> </ul>
Engage external collaborators	Include external supporters or collaborators including statisticians, to provide expertise and support
Write up a comprehensive proposal and obtain ethical approval*	<ul style="list-style-type: none"> <li>• Define the quality improvement goals and objectives</li> <li>• Outline the study design clearly (before and after study design/randomized control group/prospective cohort/interrupted time series/mixed method)*</li> <li>• Perform sample size calculations*</li> <li>• Describe the data collection methods and various tools that will be used</li> <li>• Describe in detail QI planning, implementation, management, and assessment procedures</li> <li>• Describe training and/or support that will be required (external support/collaborators)</li> <li>• Describe the communication plan for quality improvement activities and processes, including how regular staff updates will be communicated</li> <li>• Describe the evaluation phase that will be used to determine whether the implemented QI activities have produced the desired health outcomes</li> </ul>
Set realistic targets and time frames	Define realistic targets and establish a timeline with phases, including baseline data collection, planning, implementation, and post-intervention evaluation
Effective data collection	Use standard tools/adapted tools or develop audit proformas/checklists. Check the data quality and integrity regularly. Consider retrospective data collection from registries and incorporate qualitative data from focus group discussions or interviews in addition to qualitative data
Plan and decide on appropriate interventions (single/multifaceted) implement, monitor, and evaluate	Engage stakeholders by presenting and discussing the analyzed data. Interventions should be developed through a participatory approach, and map out the implementation plan Implement the interventions until the effect is established and evaluated. Collect data and analyze, evaluate the performance and plan. Develop a work plan to meet QI goals and track the progress regularly
Evaluation phase and repeat data collection	After the implementation phase, repeat data collection to evaluate the impact of interventions
Analyze and report	Analyze the results, write them as per reporting guidelines, and publish the findings to share knowledge and best practices*
Institutionalize and scale up	Integrate the successful QI practices into the facility's standard working methods and consider scaling up to other similar settings.

Steps marked (\*) are important if the QI projects are conducted as research projects

strategies to reduce staff turnover. By adopting these strategies, future LMIC upgrading projects could increase their impact on maternal care.

After a thorough and careful analysis of the reviewed QI projects, the authors synthesized 12 key steps that can be adopted in LMIC settings by researchers, clinicians, and policymakers (Table 4). This guide was developed by the primary author, who has experience in conducting quality improvement initiatives in an LMIC setting, and went through three rounds of modified Delphi techniques to arrive at a final document.

### Limitations

Our narrative review had several limitations. While every effort was made to include all relevant articles on facility-based QI projects pertaining to maternal health in LMICs, there is a possibility that certain studies could have been missed because of limitations in our search strategy. Furthermore, our review was hindered by the exclusion of studies that were presented as reports, conference proceedings, abstracts, or protocols. Additionally, the inclusion of only English-language publications could have resulted in the omission of pertinent non-English studies, thus limiting the scope

of the review. In addition, there may be QI projects that were not published in the literature, as numerous healthcare services undertake QI interventions, yet they may not collect specific project data or seek publication approval, preventing their dissemination. We must acknowledge publication bias, as studies reporting unsuccessful QI projects may be less incentivized for publication, leading to an uneven representation of projects.

## CONCLUSION

This study is among the first to summarize quality improvement projects in LMICs, providing a detailed synthesis of the existing literature and including diverse study designs for a nuanced perspective. It identifies critical gaps and contextualizes the current research. Facility-based QI projects in LMICs aimed at improving maternity care quality vary in terms of their objectives, methodologies, and interventions. Many initiatives focus on enhancing evidence-based practices, while improving “actionable information systems” is less targeted. These varied methods and success rates highlight the need for a guide to conduct facility-based QI initiatives in LMICs.

Many QI projects lack the inclusion of care-experience components. Enhancing care provision alone does not improve the quality of care. The LMICs should adopt comprehensive quality improvement approaches to ensure sustainability. Initiatives should target both the health system and end users, emphasizing the healthcare experience of women and babies. Future QI projects should incorporate patient perspectives to enhance quality. The LMICs should foster a quality improvement culture by educating caregivers, administrators, and policymakers; developing strong leadership within healthcare networks; using approved quality improvement tools; and emphasizing quality in maternity services. Policymakers and administrators should allocate funds to support QI projects. Future studies should integrate these recommendations.

## AUTHORS CONTRIBUTIONS

Mohamed Rishard conceptualized and planned this review. Mohamed Rishard and Kavinda Rajaratne conducted a preliminary literature search and summarized the findings. Mohamed Rishard, Kavinda Rajaratne, and Millawage Supun Dilara Wijesinghe drafted the manuscript. Mohamed Rishard, Kavinda Rajaratne, Upuli Wijemanne, Hemantha Senanayake, and Millawage Supun Dilara Wijesinghe reviewed the manuscript and provided corrections and comments.

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