



Measuring and monitoring quality of care to improve maternal, newborn, child and adolescent health services

A practical guide for programme managers



World Health
Organization



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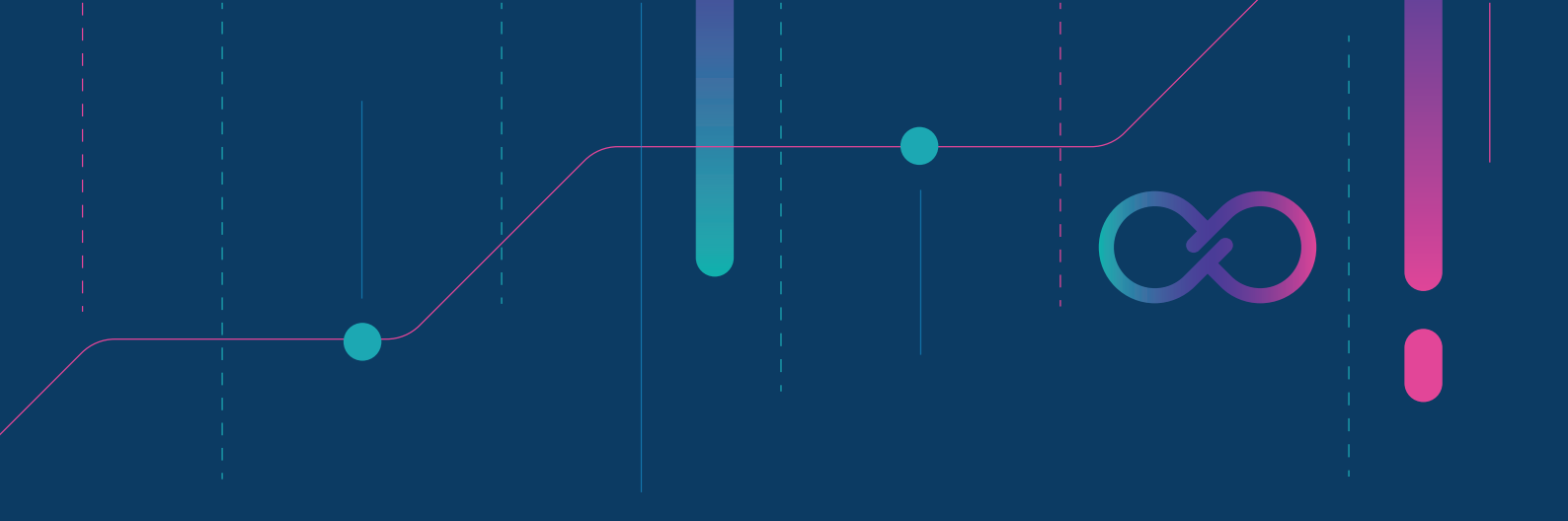
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Assessment and management of conflicts of interest

All external experts involved in the development of this guide, including the lead and contributing writers, submitted a signed declaration of interest to WHO, disclosing any potential conflicts of interest that might influence or could reasonably be perceived to influence their objectivity and independence in relation to the guide's content. WHO thoroughly reviewed each declaration and determined that none posed an actual or reasonably perceived conflict of interest concerning any aspect of the guide.

Abbreviations

DQA	data quality assurance
DQC	data quality control
DQI	data quality improvement
HIS	health information system
HMIS	health management information system
IMNCI	integrated management of newborn and childhood illness
LMICs	low- and middle-income countries
M&E	monitoring and evaluation
MNCH	maternal, newborn and child health
MNCAH	maternal, newborn, child and adolescent health
PDSA	Plan–Do–Study–Act
PPH	postpartum haemorrhage
PSBI	possible serious bacterial infection
QA	quality assurance
QC	quality control
QI	quality improvement
QoC	quality of care
QP	quality planning
RHIS	routine health information system
SAM	severe acute malnutrition
SSNB	small and/or sick newborn
TB	tuberculosis
USAID	United States Agency for International Development
WHO	World Health Organization

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About the guide

1.1 Purpose and focus of the guide

Measurement is a core principle of improving health care. Regular measurement of selected quality of care (QoC) indicators during a time-limited quality improvement (QI) initiative helps managers and health worker teams track progress and guide iterative changes as they work together to improve care. This guide focuses specifically on the measurement of QoC for the purpose of improving care. The various purposes for measuring QoC, and implications for measurement methods, are reviewed in Chapter 2.

The guide has been designed to complement World Health Organization (WHO) implementation guidance for improving quality of facility-based maternal, newborn and child health (MNCH) services (1), emphasizing the subnational health system (e.g. region, district) as a primary unit for implementing and monitoring large-scale initiatives to improve QoC.

The guide offers practical guidance and references to key resources that can be used across countries regardless of the maturity of their health information systems (HIS), highlighting measurement methods and data sources that are likely to be feasible and sustainable on a routine basis and with a modest investment of resources. Despite challenges related to the low availability of QoC data in routine health information systems (RHIS) in many low-resource settings, there are often opportunities to optimize use of existing QoC data in RHIS for the purpose of improvement while simultaneously working to strengthen inclusion of priority QoC data elements in RHIS.

The guide focuses on methods for the regular measurement of QoC indicators for the purpose of improving care. The guide does not address periodic resource-intensive methods for assessing QoC for other purposes, such as the use of health facility assessments for planning or quality assurance (e.g. accreditation). However, it does reference tools such as harmonized health facility assessments and service provision assessments that can be used to periodically assess QoC to guide planning and track progress against global and country targets.

While the focus of the guide is on measurement for improving quality of maternal, newborn, child and adolescent health (MNCAH) care, inclusive of nutrition interventions, the guide can also be applied to other technical areas such as sexual and reproductive health and healthy ageing.

NOTE!

The terms ‘health information system’ (HIS), ‘routine health information system’ (RHIS) and ‘health management information system’ (HMIS) are explained in more detail in Chapter 4.

Fig. 1. The role of measurement in applying quality improvement methods to improve quality of care



For the purpose of this guide, QI is defined as the process by which health workers – as part of multi-cadre QI teams – analyse the root causes for poor QoC, develop changes to address those causes, and iteratively test and adapt changes while regularly monitoring selected QoC indicators.

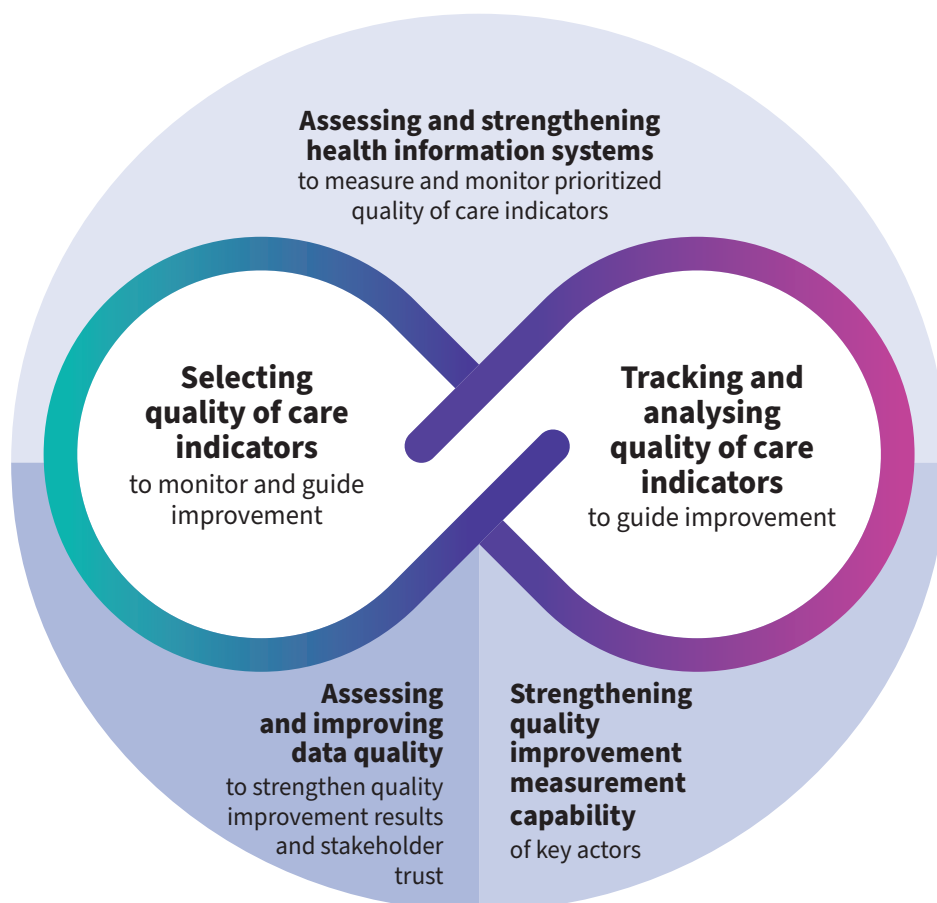
An outline of steps that are commonly involved in the application of QI methods to improve care is shown in Fig. 1. Although the sequence of steps may differ across various settings, most QI initiatives will include many of these steps.

This guide focuses on the measurement steps in Fig.1: Selection of QoC indicators (step 4) and the use of results to track improvement and guide changes (step 7), which are essential in a broader QI process to improve care.

In addition to QI processes, many health system interventions contribute to improving and sustaining quality care (e.g. interventions to strengthen health governance, policy, financing, HIS, health infrastructure, commodities and health workforce). Similarly, the measurement and use of QoC data to improve care requires enabling system interventions, including interventions to build QI capability of health workers (inclusive of QoC measurement) and interventions to strengthen the HIS to measure priority QoC indicators and ensure the quality of data.

As highlighted in Fig. 2, this guide focuses on the selection and use of QoC indicators to improve care (inner areas) and on the necessary enabling system interventions that make this measurement possible (outer areas).

Fig. 2. Strengthening quality of care measurement to support care improvements for women, newborns and children



This guide consists of seven linked chapters. **Chapter 1** describes the purpose and structure of the guide, how it was developed, its primary audiences, and how it can be used as part of micro- (health facility), meso- (subnational), and macro-level (national) QI initiatives. **Chapter 2** introduces the concept of QoC measurement and the different purposes of measuring QoC at the country level. **Chapters 3 to 7** constitute the main body of the guide and address the selection and use of QoC indicators to improve care as part of a broader QI process, and the enabling system interventions to support effective measurement. **Chapter 3** provides guidance on how to select QoC indicators linked to measurable improvement aims. **Chapter 4** describes key steps involved in assessing the readiness of the local HIS to monitor and guide selection of indicators, and steps that can be taken to introduce MNCAH QoC indicators that are important for sustained monitoring in the HIS. **Chapter 5** reviews key steps and guidance for regularly calculating, plotting and interpreting QoC indicators over time to guide the iterative changes required to improve care – emphasizing that regular measurement is essential but insufficient to improve care if not embedded in a broader QI process. **Chapter 6** outlines a systematic approach to assessing and improving the quality of data as part of QI interventions. **Chapter 7** provides guidance on how to define and build essential health worker QI capabilities, including the QoC measurement knowledge and skills needed by specific actors in a given health system.

Chapters 3–7 share a standard format comprising six components: key messages; a brief chapter overview; definitions of key terms and concepts used; practical guidance including a table of key actions at national, subnational and health facility levels; and a country example to illustrate the application of the guidance in a real-life context.

1.2 How the guide was developed

1.2.1 The main content

The main content of the guide was developed through a systematic process, incorporating inputs from global and country-level stakeholders, as well as current scientific evidence. The process included five phases to ensure responsiveness to users' needs.

Phase 1. Global survey

An initial survey was conducted with key stakeholders to identify needs, challenges and expectations regarding QoC measurement for the purpose of improving care for women, newborn, children and adolescents. WHO designed the survey with input from a small group of experts who supported the conceptualization of the guide. The survey assessed respondents' perspectives on important QoC measurement themes and evidence to include in the guide, as well as their recommendations for the target audiences, structure and length of the guide.

Examples of survey questions included:

- For whom should the guide be developed, in your view (target audience)?
- What are the top three to five QoC measurement topics that should be included in the guide?
- What is your recommendation for how best to structure the guide?
- How long should the guide be?

The survey was administered digitally (using Survey Monkey) and shared with WHO regional offices for distribution to their constituent countries to ensure broad reach across WHO Member States. Responses were analysed to identify key themes, and the results were used to inform the initial conceptualization and development of the guide.

Phase 2. Global workshop

In March 2023, WHO organized a three-day global stakeholder meeting of the Network for Improving Quality of Care for Maternal, Newborn and Child Health – hereafter referred to as “the network” – to engage QoC champions from government, implementing partners and other stakeholders to reflect on the previous five years’ efforts to integrate and systematize QoC in health systems and MNCAH programmes in ten participating countries (2). The meeting also explored challenges and lessons learned during implementation of the network in participating countries, examined the findings of two independent evaluations of the network, and recommended actions on how the network should evolve to respond to the unfinished and emerging QoC agenda. The meeting included a 90-minute QoC measurement deep-dive session, during which stakeholders identified gaps and opportunities around QoC measurement in the network and beyond and made specific recommendations to address them. One of the recommendations was to develop a practical guide on how to measure and monitor QoC for the purpose of improving MNCAH services. Participants recommended the inclusion of the following topics: capacity building for QoC measurement; HIS strengthening to measure QoC; linking measurement to improvement; and selecting indicators as part of the design of QI initiatives. Insights from the session were used to shape the scope and structure of the guide and to ensure its responsiveness to the priority needs and operational challenges faced by country programme managers.

Phase 3. Literature review

To ensure the guide is grounded in the current and relevant evidence, the technical writers reviewed existing technical resources, global guidance, and peer-reviewed literature in the topic area of each chapter. This review along, with a phased peer review, helped to identify important resources and literature, many of which are cited in the guide. The aim was to identify best practices, methodologies and practical resources in QoC measurement for the purpose of improving MNCAH services. The insights from the literature review were used to develop practical content for the guide and to identify useful supporting resources, as well as ensuring alignment with WHO MNCAH strategic priorities and existing technical frameworks.

Phase 4. Ongoing peer review

To ensure that the guide is technically robust, practical and harmonized with the broader WHO QoC measurement efforts, the lead writers engaged with selected members of the WHO Life Stages QoC Metrics Technical Working Group (TWG) and other experts to provide periodic peer review at key stages of the guide’s development. This strengthened overall clarity and coherence of the guide, ensured practical and technically sound guidance for country-level implementation, and helped ensure that the guide reflects the latest evidence and best practices in QoC measurement.

Phase 5. Final review

To ensure that the guide meets the highest technical standards and is aligned with the WHO global MNCAH measurement agenda, the final draft of the guide underwent a review

by the leadership of two additional technical advisory groups: the Mother and Newborn Information for Tracking Outcomes and Results (MoNITOR) (3) and the Child Health Accountability Tracking (CHAT) (4).

1.2.2 Health information system landscape assessment tool

The *Health information system landscape assessment (HISLA): a tool for assessing the feasibility of collecting, reporting, and using quality of care indicators* (5) – hereafter referred to as the “HISLA tool” – was designed to assess the feasibility of collecting, reporting and using QoC indicators to measure the quality of selected services across life stages and across various contexts, and has been shaped through rigorous testing and adaptation in multiple settings as described below. The draft HISLA tool was first pilot tested in 2023 in Sierra Leone, which WHO identified as one of the front-runner QoC Network countries on the basis of their progressive interest in QoC measurement. The first version of the piloted HISLA tool assessed the readiness of the country’s HIS to collect, report and use 25 paediatric and young adolescent QoC indicators developed by WHO (see Chapter 2 and Chapter 4). The pilot testing of the HISLA tool also embedded implementation research (WHO Research ethics clearance ref: 0003963) to evaluate the feasibility and acceptability of the tool in real-world settings, and to identify context-specific adaptations needed for broader application in other settings.

Learning from the pilot test in Sierra Leone informed a revision of the HISLA tool and an approach for its use. The refined tool and process of its application was subsequently applied in Malawi and further iteratively refined and validated in Kenya and Uganda, with a final validation phase in the Lao People’s Democratic Republic in the WHO Western Pacific Region. During the final validation phase in Lao People’s Democratic Republic, the tool was used to assess local HIS readiness to measure, report and use an expanded set of MNCAH QoC indicators. The insights gained from testing and validating the HISLA tool in Sierra Leone, Malawi, Kenya, Uganda and Lao People’s Democratic Republic informed the version of the HISLA tool. Additional findings from the research also informed the development of an implementation blueprint for other countries, which is detailed in Chapter 4.

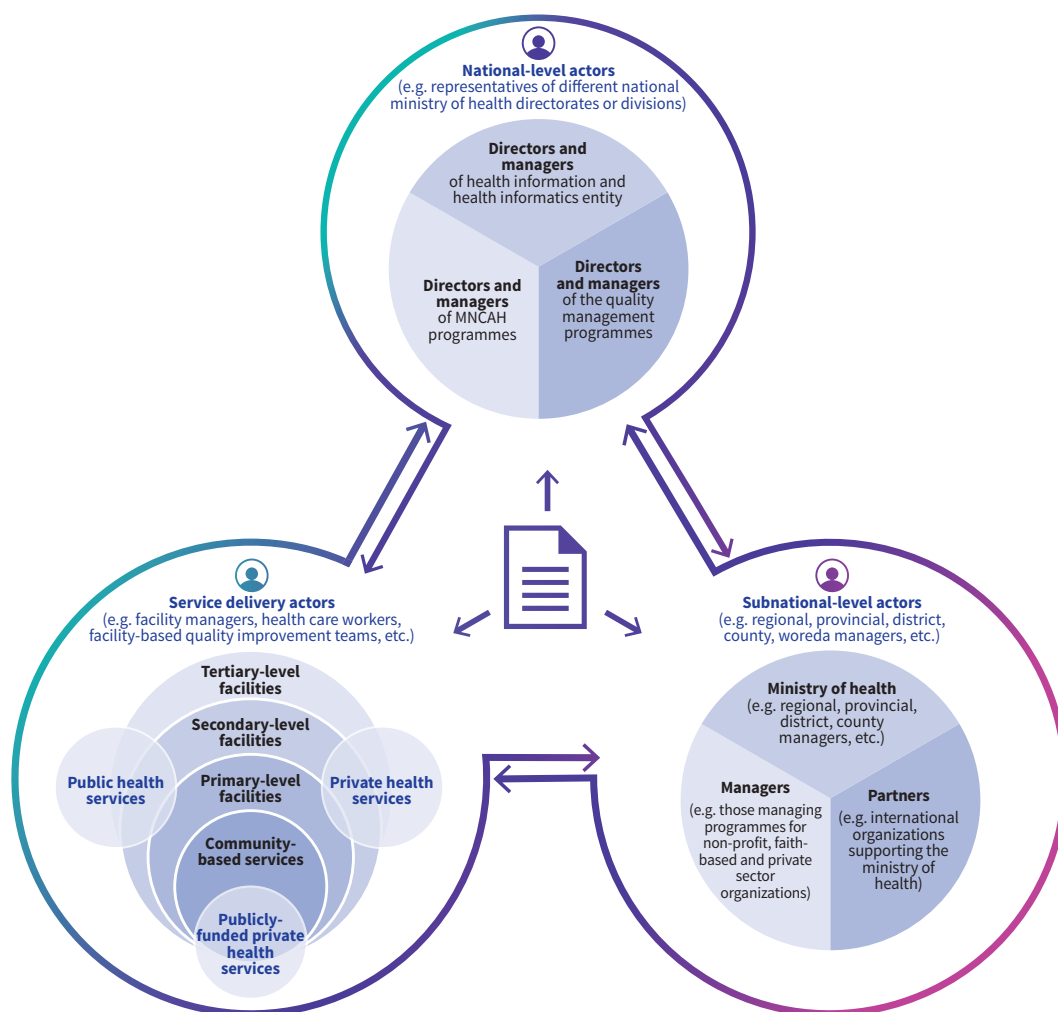
1.3 How to use the guide

The chapters in this guide are designed to be read in any order. However, some sections expand on concepts introduced in earlier chapters. Occasional cross-references are provided to help users identify connected sections and gain a clearer understanding of concepts. A key tenet of this guide is to: “**Start where you are, using the resources you have**”. Since managers and stakeholders work in a wide range of contexts and will be starting from different points along a QoC measurement journey, this guide is not intended as a step-by-step manual. Rather, it offers a practical overview of considerations, along with references to additional resources in key areas that are foundational to achieving effective QoC measurement and monitoring for the purpose of improving MNCAH care.

1.4 Audiences for the guide

This guide was informed by, and developed for MNCAH, QI and HIS managers and stakeholders at national, subnational and service delivery levels in low- and middle-income countries (LMICs). Examples of key users are provided in Fig. 3.

Fig. 3. Target audiences for the guide



(Note: Health system and stakeholder terminology may vary in different settings).

At the national level, the guide can be used by representatives of the ministry of health responsible for MNCAH programmes, HIS, quality management, and other relevant programmes. At subnational level, HIS managers, MNCAH programme managers and QoC programme managers can use the guide to strengthen measurement in programmes to improve QoC. Indeed, these managers are encouraged to work together closely due to the importance of combined measurement, QI and clinical expertise for the robust design, implementation and monitoring of initiatives to improve QoC. At the facility level, health facility managers, health care workers, members of facility QI teams including community members, and other relevant actors can all use the guide to strengthen measurement as one core foundation of their improvement work. Other users of the guide may include managers of private health care networks (e.g. faith-based health care networks), managers of public and private health care facilities, community health managers, as well as local organizations and implementing partners supporting the ministry of health with QI work.

2

Understanding quality of care measurement

2.1 What is quality of care?

The quality of health services is one of the most important determinants of health outcomes amenable to health care for individuals and populations, in addition to socioeconomic and other determinants of health. In many low-income settings, poor-quality care leads to a greater number of preventable deaths than non-utilization of health care (6). Recent estimates indicate that in such settings, about eight million individuals die annually from conditions amenable to health care and that 60% of these deaths are due to poor quality care, while the remaining deaths are due to lack of access or under-utilization of health care services. In other words, poor quality care is a greater contributor to mortality than inadequate access to care.

WHO defines QoC as: “...the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (7). Quality health care services should be effective, safe, people-centred, timely, equitable, integrated and efficient (Box 1).

Box 1. Definitions of the seven dimensions of quality of care

- **Effective:** Providing services based on scientific knowledge and evidence-based guidelines.
- **Safe:** Delivering health care that minimizes risks and harm to service users, including avoiding preventable injuries and reducing medical errors.
- **People-centred:** Respecting and responding to individuals’ preferences, needs and values within health services that are organized around the needs of people.
- **Timely:** Reducing delays in providing and receiving health care.
- **Equitable:** Providing health care that does not differ in quality according to personal characteristics such as gender, race, ethnicity, caste, geographical location or socioeconomic status.
- **Integrated:** Coordinating health care across levels and providers of health services and across sectors and making available the full range of health services throughout the life course.
- **Efficient:** Providing health care in a manner that maximizes resource use and avoids waste.

Source: Adapted from (8).

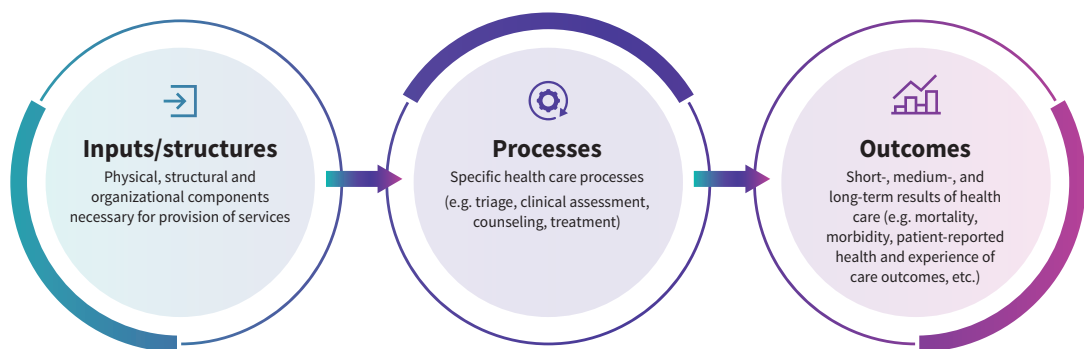
2.2 Measuring quality of care

2.2.1 The Donabedian framework

Measurement of QoC has gained increasing attention in recent decades as recognition of the importance of QoC for health outcomes and people's experience of care has increased. However, there are much earlier examples of measuring quality. For example, Florence Nightingale was a pioneer for measurement and use of statistics for improving health care quality during the Crimean War in the 1850s. She hired data collection teams to record causes of death among soldiers, convinced leading statisticians to help her interpret her data to demonstrate that poor sanitation and hygiene standards for wounded soldiers were a greater cause of mortality than the injuries themselves, and designed a new data visualization method to convince policy-makers of the importance of her findings (9).

In 1966, Avedis Donabedian proposed a framework for measuring QoC that remains widely used today (10) and is applied in several of the country examples in this guide.

Fig. 4. Donabedian's quality of care framework



Source: Adapted from (11).

The Donabedian framework (Fig. 4) proposes three components of QoC assessment: inputs/structures, processes and outcomes (11).

- **Inputs/structures** are defined as the physical and organizational attributes of care settings such as health facilities, equipment, qualified health care personnel, technology platforms, clinical guidelines and protocols, essential commodities, etc. Measurement of inputs assesses the *readiness* of a health system or service to offer quality health care.
- **Processes** focus on what is *actually done* during the provision of health care (e.g. flow of patients in a specific service, triage of clients in an emergency department, clinical assessment and diagnosis of individual patients, treatment of specific conditions in individuals, counselling, integration, and coordination of health care processes etc.). Measurement of care processes may assess the effectiveness, safety, people-centredness, efficiency, timeliness and equity of such processes.
- **Outcomes** are the status of the health, well-being or experience of care of an individual or population, which are influenced by inputs and care processes in the health care setting as well as by other determinants of health. In the Donabedian framework, it is the combination of inputs/structures and care processes that influences the most important measure of quality of health care: health *outcomes* that are amenable to health care.

Although the relationship between inputs/structures, processes and outcomes is not always straightforward, essential inputs or structures are pre-conditions for delivering quality services that, combined with health care processes, influence the likelihood of better health outcomes. Inputs must be used correctly and consistently as part of health care processes to influence the health outcomes for which they are required. An important proposition in the 2018 Lancet Quality Commission is that availability of inputs alone has little to no effect on outcomes (6). Similarly, processes of care that utilize inappropriate inputs (e.g. inappropriate medication, non-sterile surgical instruments, unskilled health personnel, etc.) will be less likely to improve health outcomes or in some cases may cause harm.

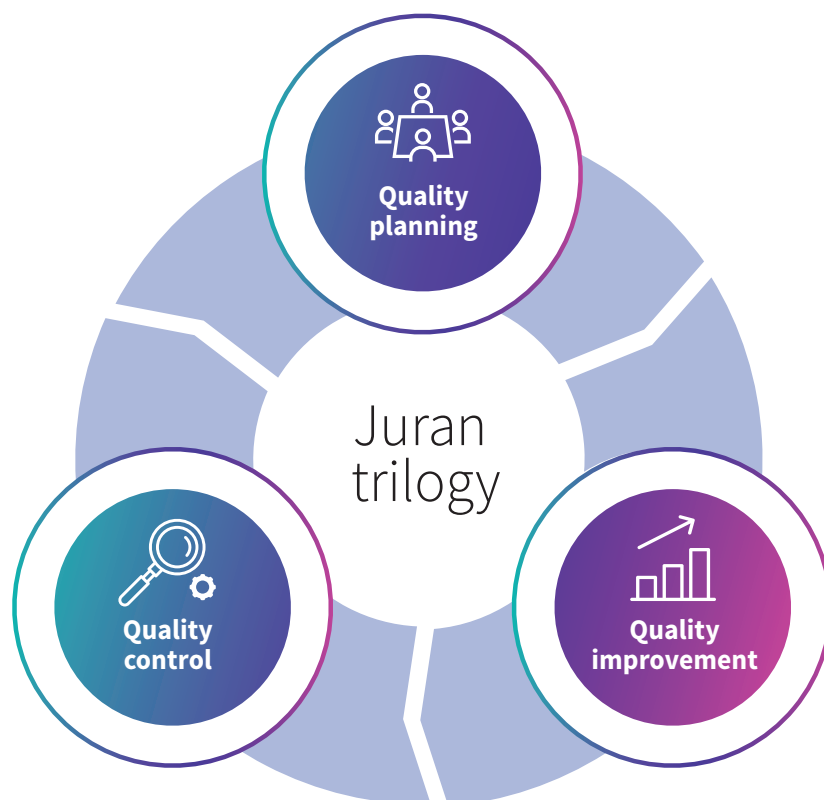
2.2.2 Different purposes of measuring quality of care

Measurement of QoC may serve different purposes in a health system. Two complementary frameworks are presented below. One framework considers QoC management functions within a health system and the measurement needs to support each function (the Juran Trilogy). The other framework considers the QoC measurement needs of key actors at distinct levels of a health system based on the roles they play.

a. The Juran trilogy framework

One useful framework for conceptualizing different purposes for measuring QoC is the 'Juran trilogy' (12), which proposes three important QoC management functions in any organization or health system: quality planning (QP), quality improvement (QI) and quality control (QC) (Fig. 5).

Fig. 5. Three components of the Juran trilogy



Source: Adapted from (12).

Working definitions of QP, QI and QC vary according to different organizations, specific documents, and even within individual organizations, including United Nations agencies. This guide proposes the following definitions, which are adapted from a variety of sources.

- **Quality planning (QP):** Process of defining goals for quality health care and defining structures, strategies and activities required to achieve those goals (e.g. governance structures, national strategies, subnational costed operational plans, etc.)
- **Quality improvement (QI):** Process by which local multi-cadre teams analyse the root causes for poor QoC, develop proposed changes to address those causes, and iteratively test and adapt changes while regularly monitoring selected QoC indicators. It should be noted that multiple interventions, in addition to QI, contribute simultaneously to improving QoC (e.g. policy development, clinical capacity strengthening, distribution of skilled providers.)
- **Quality control (QC):** Internal process of assessing quality of care within a local system (e.g. district, facility) to verify that performance meets standards and remains stable (e.g. accuracy of laboratory testing, quality of care provided in a specific service, etc.).

Another term commonly used alongside QP, QI and QC is quality assurance (QA).

- **Quality assurance (QA):** Process of assessing whether specified health system/service standards have been met (i.e. including those related to QP, QI and QC), usually for the purpose of regulation by an external authority. Examples of QA include certification and accreditation.

The common purposes of measuring QoC can be mapped to the Juran trilogy components and QA, with implications for different measurement approaches (Table 1).

Table 1. Common purposes of measuring QoC mapped to the three components of the Juran trilogy plus quality assurance and implications for measurement methods

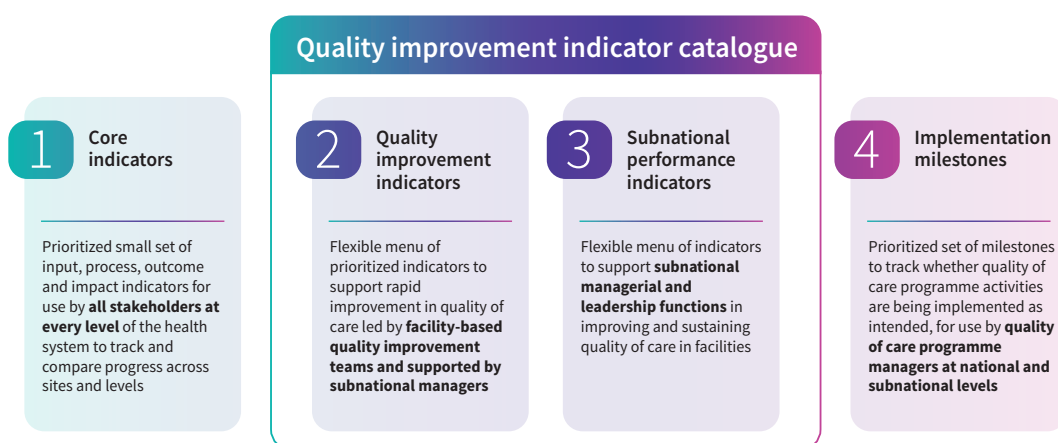
Common purposes for measuring QoC	Component of the Juran trilogy (QP, QI, QC) plus quality assurance (QA)	Measurement approach
Periodically measure QoC to guide <i>planning</i> (e.g. QoC policy, strategy, operational plans, improvement aims) Track progress against country and global targets	QP	Typically, measurement is infrequent and may use resource-intensive methods (e.g. health facility assessment, household survey)
Regularly monitor QoC for the purpose of <i>improving care</i> during a specific improvement time period, using selected QoC indicators	QI	Typically, measurement is very regular (at least monthly) and is led by on-the-ground improvement actors (e.g. district managers, facility QI teams) using routine health information sources, as feasible

Common purposes for measuring QoC	Component of the Juran trilogy (QP, QI, QC) plus quality assurance (QA)	Measurement approach
Periodically measure QoC to assess adherence with standards and to verify that quality is being <i>maintained</i> once improved	QC	Typically, measurement is periodic (e.g. 2–4 times per year) and is led internally (e.g. by district or facility managers) using routine health information sources, as feasible
Periodically measure QoC for the purpose of <i>regulation</i> or <i>accreditation</i>	QA	Typically, measurement is infrequent and is led externally (e.g. by accreditation body) using more resource-intensive methods

b. QoC measurement from the perspective of different actors

Different actors have varying needs for QoC measurement based on the roles they play in supporting QoC in a health system. Most large-scale quality programmes target interventions and actors at multiple system levels. WHO implementation guidance for improving quality of facility-based maternal, newborn and child health services outlines key actions and actors at national, subnational and facility levels (2). As part of a multi-country network for improving QoC for MNCH, a QoC monitoring framework consisting of four measurement components (13) was developed to support the monitoring needs of actors operating at specific system levels in participating countries (14). The four measurement components and their purposes and key users are described in Fig. 6.

Fig. 6. The four components of the quality of care network monitoring framework



Source: Adapted from (14).

For additional discussion of the QoC measurement needs of different actors, see section 3.4.7, which reviews the needs of different data users in a subnational QI initiative.

Table 2 presents a core set of MNCH indicators (i.e. the first component in Fig. 6), which were developed based on the WHO standards for improving quality of maternal and newborn care in health facilities (15) and the WHO standards for improving QoC for children and young adolescents in health facilities (16). The Network monitoring framework also includes an expanded catalogue of QoC indicators to support measurement components 2 and 3 in Fig. 6. The core indicators were recommended for adoption as part of a national HIS, to track priority MNCH inputs, processes and outcomes and to facilitate learning within and across countries in the network. The availability of data to support calculation of the core indicators varied across countries in the Network based on the maturity of the local HIS. Some indicators were designed to measure domains of QoC that were relatively new to mainstream QoC measurement in LMICs at the time, such as client-reported experience of care indicators. The detailed metadata for these indicators are presented in the Annex.

Table 2. WHO recommended core indicators for monitoring QoC for maternal, newborn and child health in health facilities based on the WHO quality of care standards

Core maternal and newborn QoC indicators mapped to the QoC standards (15)

1. Institutional maternal mortality ratio (disaggregated by cause)
2. Institutional obstetric case fatality rate
3. Pre-discharge neonatal mortality rate (disaggregated by cause)
4. Institutional stillbirth rate
5. Immediate administration of a uterotonic after birth for postpartum haemorrhage prevention
6. Breastfeeding initiation within one hour of birth
7. Newborns with birthweight documented
8. Kangaroo mother care for newborns weighing 2000 g or less
9. Postpartum counselling for mother and baby
10. Companion of choice during labour and childbirth
11. Physical abuse during labour, or childbirth or postpartum period
12. Verbal abuse during labour, or childbirth or postpartum period
13. Basic hygiene provision
14. Basic sanitation for women and their family

Core paediatric and young adolescent QoC indicators mapped to the QoC standards (16)

1. Institutional child mortality rate (disaggregated by cause)
2. In-hospital paediatric case fatality rate by common paediatric conditions
3. Assessment for the sick children < 5 years old based on the integrated management of newborn and childhood illness criteria
4. Treatment of possible severe bacterial infection at outpatient level
5. Kangaroo mother care for newborns weighing 2000 g or less
6. Pneumonia treatment with 1st choice antibiotic for children aged between 7 days and 5 years
7. Management of acute watery diarrhoea among children <5 years old
8. Children and young adolescents with documented malaria test results
9. Treatment of uncomplicated severe acute malnutrition

Core paediatric and young adolescent QoC indicators mapped to the QoC standards (16)

10. Management of anaemia in children and young adolescents
 11. Children < 2 years of age with known HIV status for either the mother and/or the child
 12. Tuberculosis (TB) evaluation for children and young adolescents with presumptive TB
 13. Catch up immunization for children < 2 years old
 14. Inappropriate use of antibiotics for cough or cold in children and young adolescents
 15. Completion of medical documentation for children and young adolescents
 16. Quality of care data reviews for children and young adolescents
 17. Knowledge and understanding of the condition and treatment plan among children and young adolescents or their caregivers
 18. Satisfaction with decision-making process for care
 19. Pre-discharge counselling on danger signs and feeding for children < 5 years old
 20. Awareness of child rights during health care
 21. Disrespectful care for the child or caregiver
 22. Accompaniment during care
 23. Access to play and educational material during hospitalization
 24. Clinical mentorship or training for childcare providers
 25. Stock out of essential child health medicines
-

Development of WHO recommended core QoC indicators for antenatal care, postnatal care, care of small and sick newborns, care of women with obstetric complications, care of adolescents, and care of ageing adults, is still ongoing; thus, these indicators are not included in this guide.

Chapter

3

Selecting quality of care indicators to monitor and guide improvement

3. Selecting quality of care indicators to monitor and guide improvement



3.1 Key messages

- Within the context of a QI initiative, QoC indicators should be selected based on the improvement aims that are defined for the initiative.
- QoC indicators should include the targeted care outcome(s), care processes and essential inputs to be improved as well as possible unintended consequences.
- There is no one-size-fits-all approach to selecting MNCAH QoC indicators, but there are many useful resources to help guide selection of QoC indicators.
- Collection and monitoring of QoC indicators should be feasible in a given programme setting, using existing data sources whenever possible.



3.2 Chapter overview

Fig. 1 outlines the common steps for selecting and monitoring QoC indicators to guide iterative changes in a time-bound QI initiative. This chapter offers practical guidance on how to select QoC indicators based on the improvement aim(s) identified in a QI initiative, providing illustrative examples of MNCAH input, process and outcome QoC indicators, as related to specific improvement aims. The chapter also examines the information needs and key users of QoC indicator data in a multi-site QI initiative (e.g. a district-wide QI initiative).



3.3 Key terms and concepts

3.3.1 Types of QoC indicators

The terms ‘measures’, ‘metrics’ and ‘indicators’ are often used interchangeably to describe parameters that can be used to show changes or progress. Their definitions vary across different organizations and materials. The term ‘indicators’ is used throughout the current guide because it is more readily understood by many programme managers supporting improvement work. However, readers should be aware that some of the referenced resources use alternative terms.

Many programmes seeking to improve QoC monitor four types of QoC indicators – sometimes called a ‘family of indicators’ – drawing on the well-established Donabedian framework (10,11). See chapter 2 for a definition of the first three types of indicators (i.e. input, process and outcome indicators) based on the Donabedian framework. A fourth

type, ‘balancing indicators’, measures potential unintended consequences in one part of a system associated with improving care in another part of the system. Balancing indicators can be input, process or outcome indicators. Table 3 provides an example of QoC indicators, categorized by indicator type, for an illustrative paediatric health care improvement initiative.

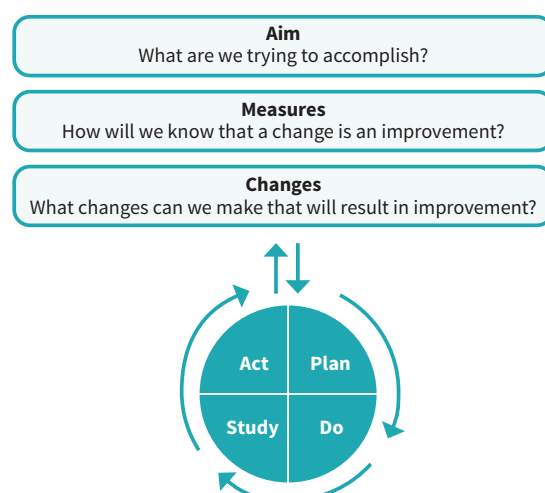
Table 3. Examples of QoC indicators in a paediatric health care improvement initiative to improve quality of care for children with pneumonia

Improvement aim	QoC indicators	QoC indicator type
Reduce paediatric pneumonia case fatality rate from 7% to 1% within 6 months in X health care facilities by improving quality of assessment, diagnosis and treatment of children with pneumonia	Proportion of children <5 years presenting with cough/difficulty breathing that are assessed for fast breathing and chest in-drawing (per integrated management of childhood illness protocol)	Process
	Proportion of children < 5 years with pneumonia (fast breathing or chest in-drawing) treated with amoxicillin	Process
	Proportion of days with stock-outs of amoxicillin	Input
	Paediatric pneumonia case fatality rate	Outcome
	Paediatric malaria case fatality rate	Balancing (outcome)

3.3.2 Relationship between improvement aims and quality of care indicators in a quality improvement initiative

Within the context of a QI initiative, QoC indicators are developed based on the improvement aims that are selected during the design of the initiative. One framework, among several, to guide selection of aims and quality of care indicators is the model for improvement (18) (Fig. 7). The model for improvement poses three questions: What are we trying to accomplish (the aim)? How will we know that a change is an improvement (QoC indicators)? And what change can we make that will result in improvement?

Fig. 7. Model for improvement



Source: (18).

The first component of the model, the three questions, guides planning for improvement. The answer to the first question – What are we trying to accomplish? – helps set an improvement aim. The second question – How will we know that a change is an improvement? – guides selection of QoC indicators. Changes identified through the third question – What changes can we make that will result in improvement? – are tested via iterative cycles of the second ‘Plan–Do–Study–Act’ (PDSA) component of the model. The ‘study’ element of the PDSA cycle may use qualitative and quantitative data to assess the effect of a specific change cycle. The model for improvement is one among several frameworks used for planning, implementing and monitoring interventions to improve care by applying a QI process.

Box 2 provides examples of strong and weak improvement aim statements for selected quality domains, based on the first question of the model (i.e. What are we trying to accomplish?). Improvement aim statements should be specific, measurable, attainable, relevant and time-bound. A strong improvement aim answers the questions: a) What? The process or outcome to improve; b) Who? The patients affected and/or involved health workers; c) How much? The magnitude/size of the change you hope to achieve; and d) By when? The timeframe for improvement.

Box 2. Illustrative strong and weak improvement aim statements for various quality domains

Safety of care (*cross-cutting*)

- **Weak aim statement:** In Zululand District Municipality, we aim to improve handwashing practices in all our facilities.
- **Strong aim statement:** Between 1 and 31 December 2022, we aim to improve staff handwashing practices before and after patient interactions from a baseline of 27% to 75% in four health facilities in Zululand District Municipality.

Effectiveness of care (*child health*)

- **Weak aim statement:** In Zululand District Municipality, we aim to improve diagnosis and treatment of pneumonia in children by improving antibiotic use.
- **Strong aim statement:** Between 15 Jan and 15 July 2024, we aim to reduce pneumonia deaths by 30% in children hospitalized for pneumonia in four hospitals in Zululand District Municipality.

Person-centred care (*maternal health*)

- **Weak aim statement:** We aim to improve women’s experience of childbirth services.
- **Strong aim statement:** Between 1 January and 30 June 2024 we aim to increase the proportion of interviewed women reporting that they were treated with respect during childbirth in Bamba Maternity Home from 62% to 86%.

Person-centredness and effectiveness of care (*adolescent health*)

- **Weak aim statement:** We aim to improve the quality of adolescent health services in our facilities.
- **Strong aim statement:** Between 1 January and 31 December 2024, we aim to increase the proportion of adolescents receiving comprehensive sexual and reproductive health counselling during facility visits, from a baseline of 40% to 85% in five primary health facilities in the Western Region.



3.4 Practical guidance

Although there is no one-size-fits-all approach to select QoC indicators for use in a QI initiative to improve MNCAH care, the considerations below are an important starting point. The development of well-defined QoC indicators and associated measurement methods and data sources should be supported by managers and stakeholders with a combination of subject matter (e.g. clinical), QI and measurement expertise.

3.4.1 Identify potential (candidate) QoC indicators

Once the area of health care to improve has been identified and a measurable improvement aim(s) has been agreed by QI stakeholders, the next step is to identify a list of potential QoC indicators that will be monitored during the QI initiative to assess progress and guide change cycles.

- First and foremost, it is important to reflect on what is most important to measure to track progress and guide iterative changes to achieve the improvement aim. Typically, the most important indicators are those that monitor the processes and outcomes that have been targeted for improvement in the improvement aim (see Table 3).
- If stakeholders can identify meaningful indicators based on the improvement aim, a next step is to check whether these or similar indicators are currently available in the health information system (e.g. in facility registers, in reporting forms that feed into the national HIS). Sometimes, an indicator of interest may be available in a facility register but is not reported up into the national HIS, in which case stakeholders will need to decide whether it is worth the effort to manually review a sample of registers each week or month to extract data to calculate the indicator. For QI initiatives operating at large scale it is generally preferable to select indicators that are available in the national HIS and can be quickly calculated from facility reporting forms and across multiple sites without the need for manual review of primary data sources.
- If stakeholders are not able to identify meaningful indicators based on the improvement aim, then it is recommended that stakeholders check if there are appropriate MNCAH QoC indicators in existing national or subnational monitoring and evaluation (M&E) frameworks (e.g. as part of regional QoC operational plans). Most national or subnational M&E frameworks have associated indicator reference documents/sheets with details on indicator metadata, including indicator definitions and data sources.
- If the in-country M&E framework(s) or recommendations do not include relevant QoC indicators, stakeholders are encouraged to review other resources such as global MNCAH monitoring frameworks, WHO-recommended QoC indicators (see Table 2 and the Annex), peer-reviewed publications, or other technical reports to identify appropriate indicators. WHO has, for example, developed a *Maternal, newborn, child, adolescent health and ageing (MNCAHA) and QoC indicator metadata toolkit* that provides a searchable database of indicators across life stages, including their metadata (19).

Illustrative actors



A blended team of programme managers, QI stakeholders and health workers representing a range of technical expertise (e.g. QI focal point, HIS officers, MNCAH programme managers, clinical providers etc.).

3.4.2 Develop specific QoC indicators, including new indicators if necessary

It is not unusual for stakeholders to define an improvement aim for which no established indicators already exist. In this case, new indicators should be developed by stakeholders with a combination of subject matter (e.g. clinical), QI and measurement expertise (sometimes one person may possess expertise in all three areas). In general, QoC indicators should be as simple as possible, should be feasible to collect without significant added effort, and should be closely aligned with the improvement aim (i.e. measure the most important care processes and outcomes that are targeted in the improvement aim).

Important considerations and criteria for selection of strong QoC indicators are listed below. Sometimes it may not be possible to satisfy all such criteria. However, over time, as managers and stakeholders acquire increasing expertise and experience, they will usually find it easier to meet these indicator selection criteria.

- *Relevance to the QI aim:* The indicator must be closely aligned with the specific QI aim, ensuring it measures what is intended to be improved.
- *Measurability:* The indicator must be measurable with clearly defined metrics or standards, allowing for objective assessment of improvement (or decline). Data collection for the indicator should be feasible within the health care setting using available resources and technology.
- *Validity:* The indicator should validly reflect the QoC construct it is intended to measure. To the extent possible, it must be based on established evidence or best practices in health care.
- *Reliability:* In the context of a multi-site QI initiative the indicator should consistently produce reliable data across different settings, providers and patient populations. The results should also be reproducible under similar conditions.
- *Sensitivity to change:* The indicator should be sensitive to changes in care processes or outcomes, allowing organizations to detect improvements (or declines) associated with interventions.
- *Actionability:* The indicator should provide actionable information that helps health workers improve care. Data for the indicator should be available promptly enough to drive real-time improvements.
- *Patient-centred:* Indicators of patient-centred care should focus on aspects of care that matter most to patients, aligning with patient values, priorities and needs.
- *Comparability:* In a multi-site QI initiative, the indicator should use standardized definitions to facilitate comparison and benchmarking across sites and to motivate improvement and friendly competition.
- *Equity-focused:* Where relevant, the indicator should account for variations in care among different patient groups and highlight disparities in quality of care (including care processes and outcomes). Often QoC indicators can be disaggregated by equity 'stratifiers' to identify populations receiving poorer quality of care, and to inform and monitor interventions to reduce disparities in quality of care.
- *Feasibility of collection and reporting:* The process of collecting, analysing and reporting on the indicator should not place an undue burden on health care providers. The indicator should be straightforward to collect without requiring complex or expensive infrastructure.

3.4.3 Balance indicator types

Once a list of candidate indicators has been established, determine the appropriate balance between process indicators (e.g. adherence to clinical protocols) and outcome indicators (e.g. change in health status) needed to track progress toward and guide iterative changes to achieve the improvement aim (see Chapter 2 on indicator types). Also consider the inclusion of input indicators, as appropriate, and the inclusion of balancing indicator(s) (see Table 3). A balancing QoC indicator typically measures a process or outcome that is not targeted in a QI initiative, to verify that changes to improve a specific health care process do not cause an unintended deterioration or worsening of other care processes and outcomes that are not the focus of the improvement effort. It is important to ensure that stakeholders provide input on the balance of indicators they believe can best measure and guide progress toward the QI aim and identify unintended worsening of quality of care in areas that are not a focus of the QI initiative.

3.4.4 Consider measurement feasibility in the local context

Indicators should be feasible to monitor in the programme setting. In many settings, health facility registers include a limited number of QoC data elements and individual standardized patient records may not exist. As part of the selection of QoC indicators, it is important for stakeholders to consider what QoC indicators currently exist in their RHIS and will be feasible to monitor on a regular basis (see Chapter 4 on assessing the readiness of HIS to measure priority indicators).

If a new measurement method or data source is proposed, stakeholders should carefully consider the extra effort involved in collecting these data to determine whether this effort is justified. As a general rule, stakeholders should try to use and strengthen existing data systems rather than introducing parallel data collection processes, and should align the selection of indicators with national, regional or district-level recommendations.

3.4.5 Define a measurement method for every selected QoC indicator

It is important to clearly define and specify a measurement method for every QoC indicator selected in a QI initiative. Table 4 outlines key information that should be defined for every QoC indicator that is selected for use in a QI initiative. It can be adapted based on the needs in a specific context. It is important that all QI team members and managers have a solid understanding of the QoC indicators and associated measurement methods that will be used to monitor progress and guide iterative changes during a QI initiative.

NOTE!

Chapter 4 provides guidance for developing more comprehensive metadata fields for QoC indicators that are adopted as part of national and subnational HIS.

3.4.6 Defining data sources for QoC indicators that do not exist in the HMIS and considerations for their incorporation

In some instances, QoC indicators that are important to measure temporarily during a time-limited QI initiative may not be appropriate to monitor over the longer term in a

national HIS. This is especially relevant for settings in which the HMIS does not include individual patient notes that document more complex processes of care. In these instances, it may be appropriate to define a temporary data source (measurement method) for selected QoC indicator(s) during the QI initiative. For example, stakeholders may decide to: temporarily add a column to an HMIS register; introduce a temporary one-page data collection tool to complement existing HMIS data elements; or introduce a simple standardized patient chart targeting the process of care they seek to improve. Chart audits may be a temporary method to measure more complex process indicators (e.g. the proportion of women with severe pre-eclampsia treated appropriately). However, unless patient charts include essential information in a standardized format, it can be difficult to extract the necessary data to calculate standardized QoC indicators for more complex care processes.

NOTE!

Chapter 4 includes recommendations for assessing and adapting facility HMIS data sources to identify relevant QoC indicators that may be available at the facility level but not aggregated at national and subnational level (e.g. service registers, patient charts) and to guide temporary local adaptation of existing data sources to permit calculation and measurement of QoC indicators that are not available in existing HMIS data sources.

Indicators of patient experience of care are important measures of the person-centredness of care that are not available in the HMIS in most settings. There is increasing work to define important domains of patient experience of care in MNCAH services and several patient questionnaires capturing priority domains have been validated in low-resource settings in the past decade. These questionnaires may be adapted and used in a QI initiative to regularly measure patients' experience of care and guide interventions to improve patients' experience of care (see section 5.5). Qualitative methods are also important for understanding patients' experience, needs and priorities. The use of qualitative methods for assessing and improving quality of care, including patients' experience, is discussed in section 5.4.3.

In some instances, QoC indicators selected for monitoring in a time-limited QI initiative will be highly relevant for incorporation into the HIS for sustained monitoring for the purpose of QP, QI and QC. For example, in some settings the cause of a maternal, newborn or child death is not captured as a standardized data element in the national HIS. However, this is vital information to inform QP, QI and QC processes. Chapter 4 reviews considerations for incorporating QoC indicators into a HIS.

3.4.7 Additional considerations

a. Include people with different expertise

- When selecting QoC indicators for the purpose of improving MNCAH care, it is important to include stakeholders with essential areas of expertise and to consider the maturity of the HIS in the local context.
- The selection of QoC indicators, measurement methods and data sources should be guided by a team that combines expertise in MNCAH technical subject matter, measurement and QI. The team should include individuals with deep knowledge of the HIS, including data elements in the existing HMIS (e.g. health care facility registers, patient records, facility monthly summary reports, aggregate data from the district health information system (DHIS2) and other data sources).

Table 4. Example of essential information to be defined for each selected QoC indicator

Indicator	Indicator definition	Numerator	Denominator	Measurement method	Frequency	Responsible person(s)
Birth companion of choice	% of women who wanted and had a companion of choice supporting them during childbirth in the health facility	# of women who wanted and had a companion of choice supporting them during childbirth in the health facility	# of recently delivered women who completed exit survey	Exit survey	Monthly	Maternity QI team
Immediate administration of a uterotonic after birth	% of women who gave birth in a health facility who received a prophylactic uterotonic immediately after birth for prevention of PPH	# of women who gave birth in a health facility who received a prophylactic uterotonic immediately after birth for prevention of PPH	# of women who gave birth in the facility	Facility labour and delivery register	Monthly	Maternity QI team
Contraceptive counselling and offer of a modern contraceptive method to adolescents	% of adolescent clients (15–19 years) counselled and offered a modern contraceptive method during their health facility visit	# of adolescent clients (15–19 years) who were counselled and offered a modern contraceptive method during their visit	# of adolescent clients (15–19 years) attending the health facility during the reporting period	Review of facility registers and client records	Monthly	Family planning nurse or adolescent health QI team

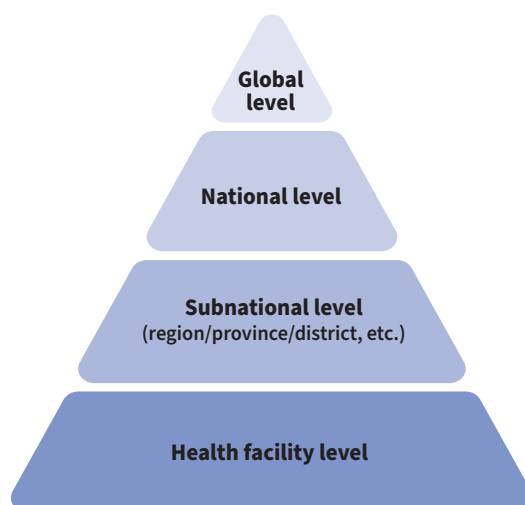
Note: PPH: postpartum haemorrhage.

b. Consider the needs of specific data users

- Increasingly and in many countries, subnational managers are supporting the design and management of large-scale QI initiatives to increase the pace and reach of health care improvement beyond ‘point-of-care’ QI efforts. These efforts are consistent with global guidance that outlines key actions and actors at different system levels (1). Fig. 8 shows the system levels at which different actors support QoC activities in most health systems. The pyramid shape also depicts the decreasing number of QoC data elements that are monitored at each higher level of the health system: most at the front-line facility or community health worker level and least at the national policy-maker or MNCH programme manager level.
- As discussed in sections 2.2.2 and 7.3.1, and shown in Fig. 8, different actors supporting QI initiatives in a health system may use QoC data for different purposes. It is important to consider the needs of these actors when selecting QoC indicators for use in a QI initiative.
 - The members of a facility QI team will usually monitor important QoC outcome indicators and a greater number of process indicators based on the specific processes they are trying to improve at any point in time.
 - A district manager leading a district-wide improvement effort across many facilities may monitor the same QoC outcome indicators, but monitor a smaller number of sentinel QoC process indicators across sites as well as district management functions (e.g. commodities and human resources management) and QI programme output measures such as the mentoring of facility QI teams to guide effective management of the district QI programme (21) (referred to as implementation milestones in the Network monitoring framework; see Fig. 6) (13).
 - Policy-makers and managers at the national level will usually monitor an even smaller number of QoC indicators in any single technical area, to track high-level progress across multiple technical areas and achievement of broader health system goals.
- The key users of QoC data in a subnational multi-site QI initiative are the front-line QI teams and the managers or other expert stakeholders who support these QI teams and oversee the multi-site QI initiative. For example, a subnational manager will need to regularly monitor and analyse QoC indicator results across facilities to guide effective management of a district-wide QI initiative (e.g. provision of tailored support to lower-performing facilities, spreading learning from high-performing facilities).

c. Less is more

The primary objective of measurement in QI efforts is for learning and improving care. It is important to strike the balance between “ideal” versus “good enough” QoC indicators. There is no hard science on the number of indicators needed but often 4–6 carefully selected QoC indicators are sufficient for monitoring and informing interventions to achieve a single improvement aim. This is usually preferable to collecting ‘nice to know’ data that will increase the measurement burden for front-line teams and are not likely to be used or to add much value for QI teams and managers supporting these teams.

Fig. 8. Pyramid of data collection and use

Source: Adapted from (21).

Table 5 outlines key actions and considerations at the national, subnational and facility levels to support the selection of meaningful indicators for the purpose of improving care.

Table 5. Summary of key actions for national, subnational and facility levels

National	Subnational (regional/district)	Facility
• Select a small set of priority QoC indicators for monitoring by national managers and stakeholders based on national and global targets and national priorities for improvement (e.g. as part of national QoC MNCAH strategies and quality planning) • Develop a national MNCAH QoC costing monitoring plan including roles and responsibilities at all levels of the health system	• Guide selection of regional/district-wide improvement aims and quality of care indicators based on subnational priorities and information on local quality of care gaps and health outcomes (e.g. mortality, morbidity) • Consider all domains of quality (i.e. safe, effective, timely, efficient, equitable, person-centred) when selecting improvement aims and QoC indicators • Select QoC indicators based on improvement aims, measurement feasibility and the needs of managers and QI teams • Define measurement methods for all selected QoC indicators	• Analyse local data on QoC and review subnational improvement aims to prioritize areas for improvement (e.g. retrospective review of QoC data in a child health register) • Select a small number of QoC indicators drawing on subnational QoC indicators and facility-specific priorities • Establish and support QI teams that include health information officers and regularly monitor and act on QoC indicator results to improve care

3.5 Country example

The country example illustrates the process of selecting QoC indicators for a multi-facility QI initiative in Kogi and Ebonyi states, Nigeria.



Improving care for women and newborns in Kogi and Ebonyi States, Nigeria

In 2016, the State Ministry of Health in Kogi and Ebonyi States of Nigeria, with support from partners including the USAID Maternal and Child Survival Program, launched a QI initiative in selected local government areas to improve care for mothers and newborns. State-level data demonstrated persistently high rates of institutional maternal and neonatal mortality and morbidity, with the majority of deaths occurring on the day of birth. HMIS and other sources of data demonstrated many gaps in quality of childbirth and postpartum health care services for women and newborns.

In each state, the State Ministry of Health convened a consultation with key stakeholders, including local government area and facility representatives, to prioritize areas for improvement (aims) based on the WHO standards for improving quality of maternal and newborn care published in 2016 (15).

Stakeholders selected two improvement aims focused on improving adherence with evidence-based high-impact care processes for pregnant women and newborns on the day of birth, to try to reduce maternal and perinatal mortality and morbidity. Based on the selected improvement aims, stakeholders identified a small number of QoC indicators (process and outcome) for monitoring by QI teams and local government area managers.

To inform selection of QoC indicators that were feasible for monitoring in the programme setting, the State Ministry of Health health information officers mapped existing QoC data elements in the standardized facility labour and delivery and postnatal care registers, and facility monthly health information reporting forms. MNH programme managers, health information officers and QI experts worked together to select a small number of QoC indicators (process and outcome) based on existing data availability and the processes and outcomes prioritized to achieve the two programme aims.

Although most selected QoC indicators could be measured via existing data in facility registers, stakeholders elected to measure a small number of QoC indicators that they considered vitally important but for which there was no existing data. They recommended that these indicators be monitored by adding a column to the labour and delivery and postnatal care register. These indicators are noted (*) below.

Childbirth and early postnatal care for pregnant women

Improvement aim (tailored in each facility to include a target based on baseline performance): Improve adherence with evidence-based best practices for routine labour and delivery and early postnatal care from X% (baseline) to Y% within 10 months among pregnant women giving birth in 91 facilities in Ebonyi and Kogi states (this improvement aim was selected to contribute to a broader set of interventions to reduce preventable maternal complications and stillbirths)

Priority clinical processes	Quality of care indicators (indicators in italics required addition of a column in the facility register)
Labour and delivery care - Document fetal heart rate (FHR) on admission to maternity - Document blood pressure of pregnant woman on admission to maternity (early detection of pre-eclampsia) - Monitor progress of labour and maternal/fetal well-being during labour to guide care and detect early signs of complications - Facilitate presence of birth companion of choice if desired - Administer uterotonic immediately after birth to prevent PPH	Process indicators % women with fetal heart rate documented on admission* % women with blood pressure documented* % deliveries monitored with partograph* % women delivered with companion of choice* % women receiving prophylactic uterotonic in third stage of labour Health outcome indicator - Stillbirth rate (intrapartum)

Postnatal newborn care

Improvement aim (tailored by each facility to include a target based on baseline performance): To improve adherence with evidence-based best practices for early postnatal care for newborns from X% (baseline) to Y% for every newborn within 9–12 months (this aim was selected to contribute to a broader set of interventions to reduce pre-discharge newborn mortality)

Priority clinical processes	Quality of care indicators (indicators in italics required addition of a column in the facility register)
Postnatal care - Essential newborn care (cord care, keep warm/skin-to-skin, breastfeeding) - Initiate breastfeeding within one hour of birth - Chlorhexidine to umbilical cord per Nigeria protocol - Counsel and administer newborn immunization (BCG, IPV/OPV) - Keep women and newborn in facility after birth until at least 24 hours	Process indicators % newborns placed skin-to-skin with mother* % newborns initiating breastfeeding within first hour* % newborns provided chlorhexidine cord care per protocol* % newborns immunized before discharge per national protocol (BCG, OPV/IPV) Outcome Indicators - Pre-discharge neonatal mortality rate

Note: BCG: Bacillus Calmette-Guérin vaccine for TB; IPV: inactivated polio vaccine; OPV: oral polio vaccine; PPH: postpartum haemorrhage.

Chapter

4

**Assessing and
strengthening health
information systems to
measure and monitor
prioritized quality of care
indicators**

4. Assessing and strengthening health information systems to measure and monitor prioritized quality of care indicators



4.1 Key messages

- A fit-for-purpose HIS is important for regularly measuring and monitoring QoC to improve care.
- Routine health information systems (RHIS) are usually the most important data sources for regularly monitoring changes in QoC. However, drawing on both routine and non-routine data sources, and qualitative and quantitative data, enables a more complete understanding of QoC.
- Some QoC indicators that are important for monitoring quality in a specific technical area for the purpose of QI (or QP and QC), may not exist in a local HIS. Assessing the readiness of the HIS to measure such indicators helps identify gaps and opportunities for integrating these indicators.
- Integrating new indicators in the local HIS requires careful planning, close review of existing HIS tools and broad stakeholder consultations to align with programmatic priorities, HIS review cycles and national health sector plans.
- Where possible, QI initiatives should avoid developing parallel HIS for the purpose of measuring QoC, and should instead strengthen and build on existing data systems and QoC monitoring strategies.
- A decision to introduce new indicators in the local HIS should be informed by whether the indicators are needed for long-term monitoring. Indicators needed for time-limited QI initiatives do not warrant the extra efforts needed to adapt the HIS; addition of such indicators also risks overburdening the HIS.



4.2 Chapter overview

A fit-for-purpose HIS can provide both qualitative and quantitative data at the reporting frequencies needed to identify problems and to track the effect of changes implemented at various levels of the health system to improve MNCAH care.

This chapter reviews the different components of a comprehensive HIS, including the data sources for monitoring and improving QoC across system levels for women, newborns, children and adolescents. The chapter provides practical guidance on how stakeholders can assess the availability of data for selected QI indicators in the existing HIS. Finally, the chapter reviews considerations and key actions for identifying and incorporating QoC indicators and data elements into the HIS for long-term monitoring (beyond the life of a specific QI initiative).



4.3 Key terms and concepts

The terms HIS, RHIS, and HMIS are sometimes used interchangeably in mainstream health information literature and practice (Box 3).

4.3.1 Definition of key terms

Box 3. Definitions of common health information terminologies used in the guide

- **Health information system (HIS).** A general term used to refer to the total information system, comprising all systems that generate, capture, store, manage, analyse, synthesise and communicate data related to the health of individuals and the activities of organizations within the health system, for use by a variety of stakeholders and for different purposes (23). A fully developed HIS includes a range of subsystems – such as community health information systems, home-based records, electronic medical records, health management information systems, registries, laboratory information systems, pharmacy information systems, logistics management systems, finance and insurance systems, human resource information systems, household or population surveys, health facility assessments, and other related data systems – which may differ between countries.
- **Health management information system (HMIS).** A data system designed to support planning, management and decision-making in health facilities and organizations (23). The term HMIS is often used interchangeably with RHIS (23–25) “though an HMIS may not include data on disease or health outcomes” (23). The system of regular recording, reporting, analysis and presentation of health facility data is known as the routine health information system (RHIS) (24). “These systems generate data collected at public and private health facilities and institutions, and at community-level health care posts and clinics – at regular intervals of a year, at minimum. Most of the data are gathered by health care providers, by supervisors, and through routine health facility surveys. The sources of those data are generally individual health records, records of services delivered, and resource health records including financial, commodity, or laboratory records” (23).

- **Health facility data recording and recording forms:** In this guide, used to refer to case notes, individual patient records, individual reporting forms (e.g. surveillance forms) and home-based records, or their equivalents, which can be used for patient care to collect or record patient-level information in a RHIS, whether paper-based or digital. They also include **health facility registers**, which consist of a list or file containing uniform information about individuals, collected in a systematic and comprehensive way, in order to serve a predetermined purpose (26). Registers are typically used to collect or record socioeconomic and demographic information from the client or patient; their clinical history and diagnosis; as well as treatment/care plan and outcomes. The health facility register can be used as the basis for tracking individual patient health care processes and outcomes, especially when they exist as electronic medical records. Information from health facility registers is often summarized and sometimes tallied across other health facility registers to create **summary registers** or **tally sheets** or **reporting forms**, for the purpose of reporting aggregated patient/client data. **Patient registries**, on the other hand, are a collection of information about individuals, usually focused on a specific diagnosis or conditions. Registry data is stored in a database and can provide health care providers and researchers with first-hand information about people with specific conditions, both individually and as a group, and over time. Patient registries are different from health facility registers in that the former collect patient information that is disease- or condition-specific whereas the latter collect information about the patient regardless of their condition or disease (27).
- **Data element.** The smallest named item of data that has a unique meaning and can assume a distinct value (28). With respect to an HMIS, data elements might include client name, gender/sex, diagnosis, etc. Data elements are associated with “data types that define their form”. These can include simple data types such as date, time, numeric value, or complex data types, such as addresses.
- **Data.** A collection of data elements, that convey specific information (e.g. % of women who received antenatal care services during pregnancy in facility x). Data may include any form of text, sound, visual or audio-visual recording (29).
- **Data point.** A piece of data representing one observation taken at a given point in time (e.g. one cell in a data table showing antenatal care coverage in facility x in a given month)
- **Metadata.** A structured reference data set that provides information about other data (e.g. numerator and denominator of a specific indicator, or indicator rationale, or indicator data source). They are the information needed to explain and understand the data or values being presented (30).
- **Dataset:** A structured collection of related data on a given subject usually presented in a data table, where rows typically represent individual records or observations, and columns represent variables or features related to those observations (ISO, 2014).
- **Database.** Structured system that allows data to be easily stored, accessed, manipulated and updated (31).
- **Information.** Classified, organized and/or processed data that has some meaningful value for the user (usually a result of data analysis) (32).

4.3.2 Components of a typical HIS with MNCAH data

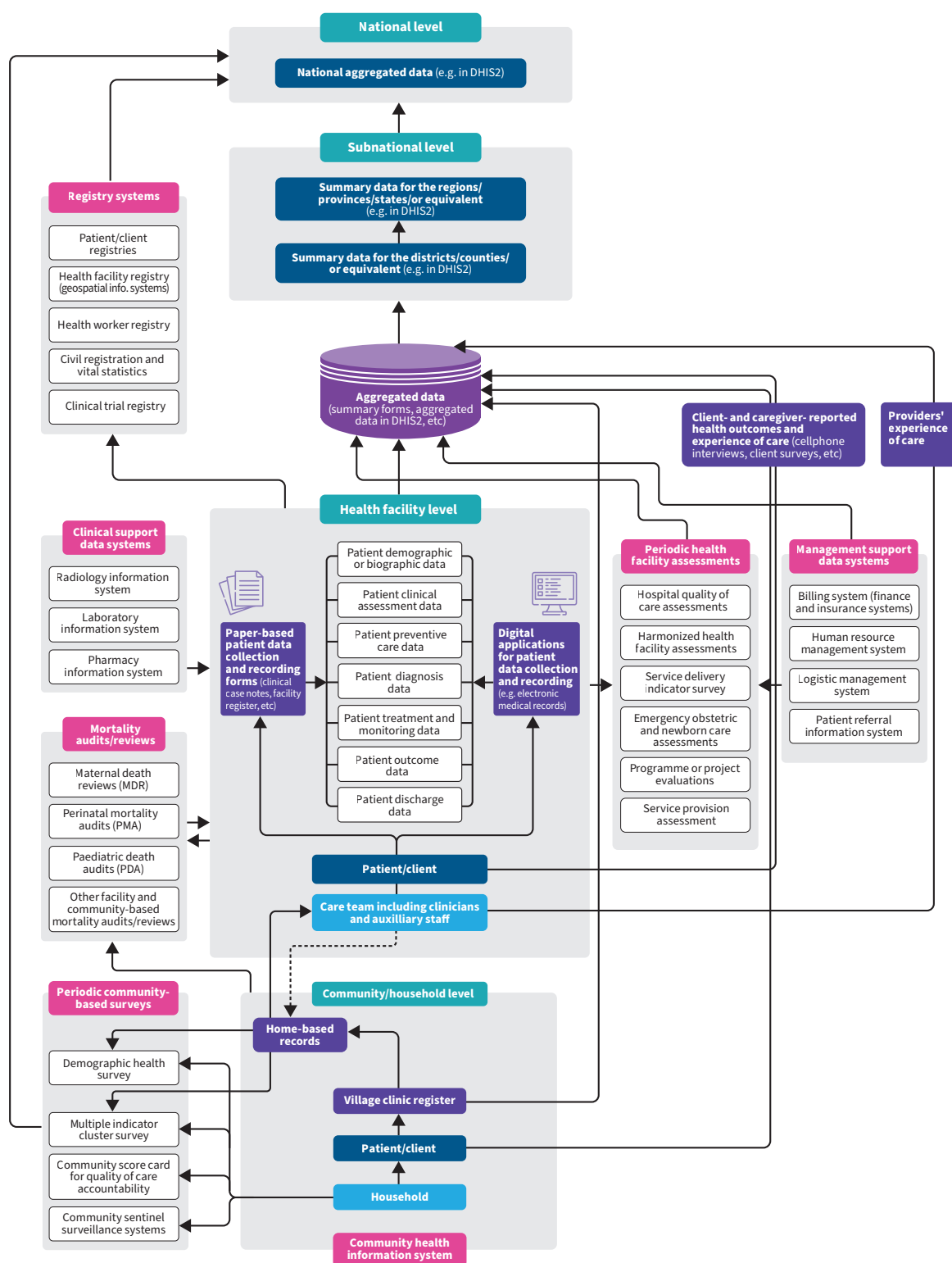
Fig. 9 shows an illustrative example of an HIS and its subsidiary data systems that constitute important data sources for QoC measurement and monitoring for the purpose of improving MNCAH care. Stakeholders, including QI teams at national, subnational and service delivery levels, can use a variety of data sources to identify and examine QoC problems, define improvement aims and monitor QoC over time as they make changes. The WHO framework and standards for country HIS (33) provides a detailed explanation of some of these data sources.

Table 6 provides an illustrative example of the types of HIS data sources that a QI team could use to plan and monitor a QI initiative to improve care for diarrhoea in children in a setting of high diarrhoea mortality.

Table 6. Example of data sources from various components of the HIS to monitor quality of care for children with diarrhoea

Improvement aim	Indicator classification	Indicator name	Data source in the HIS
Reduce morbidity and mortality from diarrhoea in children under 5 years old	• Input indicators	• Stockouts of oral rehydration solution/zinc	• Logistics management information system and inventory monitoring sheet
		• % health workers trained in diagnosis and management of diarrhoea	• Human resources information system and training registers
	• Process indicators	• % children with diarrhoea treated with oral rehydration solution and zinc	• HMIS data (e.g. case notes, health facility registers)
		• % children with diarrhoea assessed for severe dehydration	
	• Outcome indicator	• Institutional case fatality rate related to diarrhoea	• HMIS data (e.g. case notes, health facility registers, or civil registration and vital statistics system)

Fig. 9. An illustrative example of a typical HIS with different subsidiary data systems that can act as potential data sources to support quality improvement, quality planning and quality control





4.4 Practical guidance

Different actions are required at national, subnational and health facility levels to assess the readiness of the local HIS to provide data needed to monitor priority QoC indicators at each level. QI stakeholders who are setting up new QI initiatives at each level will need to track a set of priority QoC indicators that may vary by number, purpose of measurement, and the need for their institutionalization in the local HIS. The guidance in this chapter is therefore organized to account for these peculiarities across the health system hierarchy. However, there are some key principles that should underpin the process of HIS assessment and adaptation for QoC monitoring.

Leveraging the existing HIS to support QoC monitoring activities is usually a more sustainable solution to improving the availability of QoC data than introducing short-lived parallel data systems. This is true for QoC indicators prioritized for long-term monitoring by national and subnational actors, as well as the indicators that are specific to a short-term QI initiative that does not require that the indicators be institutionalized in the local HIS for long-term monitoring.

Strengthening the existing data system can also decrease the reporting burden for health facility teams and minimize data redundancies and reporting inefficiencies.

4.4.1 Key actions at national or subnational level

National and subnational actors may prioritize QoC indicators used in a QI initiative for long-term monitoring and recommend incorporation into the HIS. However, the process of incorporating newly prioritized QoC indicators into a local HIS varies depending on the local context. Therefore, the guidance provided here is general and should be adapted to fit specific local conditions.

a. Conduct a comprehensive HIS landscape assessment

Once a set of priority MNCH QoC indicators for long-term measurement and monitoring by national and subnational QI stakeholders has been identified and agreed upon, it is crucial to conduct a comprehensive HIS landscape assessment. This will help determine whether the indicators and/or the data elements required to calculate them already exist within the local HIS. Although there is no standardized approach to conducting this assessment, a series of guiding steps can be followed to gather the necessary data. This will allow stakeholders to determine which prioritized indicators can be collected and monitored immediately, and which ones will require further work on the HIS for institutionalization.

b. Define the metadata for priority QoC indicators

As noted in Box 3, *indicator metadata* provide additional information about the indicator's attributes such as its numerator and denominator, data source, data collection frequency, etc.

Illustrative actors



A team of HIS and/or M&E managers and/or technicians (or their equivalent) at national or subnational level depending on local policies and governance structures.

Ensuring that there are clearly defined metadata for all priority QoC indicators is necessary before conducting a HIS landscape analysis. This step is essential to ensure the primary data recording, indicator calculation, reporting and analysis are standard across levels (e.g. health facilities, districts, etc).

For some priority QoC indicators, especially those already established in the existing M&E framework for regular collection and reporting, the metadata may already exist although it may be necessary to review and align them with emerging MNCH QoC measurement guidance and frameworks at the global level.

Indicators may have more than 30 metadata fields. This guide recommends completion of a minimum set of 10 metadata fields for each QoC indicator prioritized for national or subnational level monitoring. These fields are explained in Table 7 and one illustrative indicator (i.e. pre-discharge neonatal mortality rate by cause) is used as a running example across the metadata fields.

Table 7. Recommended minimum set of metadata fields

Field name	Definition and rationale
Indicator name	- This is usually a short name attributed to an indicator e.g. <i>Pre-discharge neonatal mortality rate by cause</i>. - The name should distinguish the indicator from other indicators in the same domain to avoid any confusion. For example, by definition, <i>pre-discharge neonatal mortality rate by cause</i> is not necessarily the same as <i>neonatal mortality rate</i> even though they are applied to the same population group. The former is a subset of the latter.
Definition	- This is where different measurement and technical attributes of the indicator are defined for standard measurement and reporting. - In the example, the definition of the indicator is: <i>The proportion of neonates up to 28 days of completed life who were born live in the facility and died from specific causes prior to discharge from the facility (excluding re-admissions for illness)</i>. - A poorly defined indicator will be difficult to map in the local HIS. The definition should be specific enough to help identify what is being measured, in which population, the timeframe, and where, etc. The definition should also clarify the technical terms included in the definition. However, in some cases, detailed information about the indicator is included in the numerator and denominator which are explained further below.
Data type	The data type describes how the indicator value should be or is usually reported in the HIS. In the example, the data type is a <i>Rate</i> as the indicator name implies.
Technical area	When conducting the HIS landscape assessment it is recommended to define the service line in which the indicator is usually measured and reported. For example, sick child vs well child services. In the example, the technical area would be <i>Newborn health care after birth in a facility</i>.

Field name	Definition and rationale
User and purpose of use	- Once the technical area is defined, it is recommended to establish consensus on who will use the data generated by this indicator and to what end. If the user and the purpose of using the indicator cannot be determined, the inclusion of the indicator in the HIS landscape assessment would not be justified. - In the example, maternity health workers and members of the maternity QI team would use the indicator to understand leading causes of newborn deaths in their facility to inform planning and monitoring of a QI initiative to reduce newborn deaths.
Disaggregation	- This defines how the indicator can be disaggregated according to specific profiles that may be of interest to different stakeholders, (i.e. by geographical location, age group, sex, rural/urban, among others). - In the example, the indicator data can be disaggregated by <i>small and/or sick newborns</i>, or by the <i>level of facility care (i.e. level 2 or 3)</i>.
Numerator	- The numerator is usually the actual number of people that experience an event or items/objects that exhibit a particular trait or characteristics in a specified population and period. - In the example, the numerator is: <i># neonates up to 28 days of completed life who were born live in a facility and died from specific causes prior to discharge from the facility (excluding re-admissions for illness)</i>.
Denominator	- The denominator is the total number of the population or items/objects of interest from which the numerator was drawn. - In the example, the denominator is: <i>Total # live births</i>
Individual data elements	- This is where the individual data elements of the numerator and denominator are specified. This is critical for comprehensive mapping, which requires the examination of individual data elements and their availability in different data sources, and to identify opportunities for HIS adaptation to include missing or partially available indicators. - In the example indicator, the individual data elements are: <i># neonates up to 27 days of completed life who were born live in a facility and died prior to discharge from the facility, due to prematurity (excluding re-admissions for illness).</i> <i># neonates up to 27 days of completed life who were born live in a facility and died prior to discharge from the facility, due to sepsis (excluding re-admissions for illness).</i> <i># neonates up to 27 days of completed life who were born live in a facility and died prior to discharge from the facility, due to asphyxia (excluding re-admissions for illness).</i> <i># neonates up to 27 days of completed life who were born live in a facility and died prior to discharge from the facility, due to other causes (excluding re-admissions for illness).</i> <i>Total # live births.</i>
Frequency of data reporting	This refers to how often data is reported to track the progress and performance of time-bound QI initiatives or for routine monitoring for QC purposes. The reporting frequency will depend on several factors, including the purpose of measuring the indicator (e.g. QI or QC), the urgency of the indicator data for making decisions, the available resources, and the data source (i.e. RHIS, periodic survey, etc).

c. Develop, adopt or adapt an HIS landscape assessment tool

Once the metadata fields for all priority indicators have been completed, a standardized instrument can be used to collect different pieces of information from the local HIS. This helps determine whether provision has already been made for these indicators or their constituent data elements to be collected, and whether they are already being collected and reported, routinely or periodically.

The following four scenarios are possible:

- An indicator and all its data elements are **available, as defined**, in the local HIS (i.e. provision has been made in the HIS for these indicators and their metadata to be collected either routinely or periodically, using the same or different data sources (see Fig. 9).
- An indicator **with a name similar to what is being assessed** already exists in the local HIS, but the constituent data elements are different by definition. This is possible, for example, where indicators recommended globally are being adopted for use at country level but the standard of care they seek to measure has not been fully adapted to the local context. For example, *early initiation of breastfeeding* can be defined as the % *babies born alive in a facility who are breastfed within one hour (60 minutes) of birth*, but a country that uses 90 minutes as the standard for timing of breastfeeding may have the same indicator name in the local HIS but defined slightly differently as % *babies born alive in a facility who are breastfed within 90 minutes of birth*.
- An indicator for which **only a portion of the constituent data elements** can be found in the local HIS. Numerators are typically more difficult to find than denominators, especially when the former consists of more than one data element. This is often the case for process indicators that tend to measure a process of care involving more than one activity or care pathway.
- The indicator being assessed **is completely new** and neither the numerator nor denominator – including all individual data elements – exist anywhere in the local HIS. This is typical for indicators that have been recently introduced as part of new QI initiatives or indicators developed for emerging QoC measurement areas, such as experience of care indicators.

Whether an existing HIS landscape assessment tool is adopted/adapted or a new one is developed, it is vital to be cognisant of these possible scenarios and use a tool that will help with judgements about the extent to which the indicators and their data elements are available in the local HIS, and if available, the potential data sources that can be leveraged for future monitoring of these indicators.

This being the case, the starting point should be to check if there is already an HIS landscape assessment tool that has been developed locally for the same or similar purpose. There are also some programme-oriented tools that have been developed globally such as the *Every newborn-measurement improvement for newborn and stillbirth indicators (EN-MINI) tools for routine health information systems* (34), and the *Maternal, newborn, child and adolescent health RHIS country mapping template* (35).

This guide describes how to use a new HIS landscape assessment tool developed by WHO specifically to map QoC indicators and their constituent data elements in the local HIS using either routine or non-routine data sources. This tool is entitled: *Health information*

system landscape assessment (HISLA): a tool for assessing the feasibility of collecting, reporting, and using quality of care indicators, or the ‘HISLA tool’ for short. As described in section 1.2.2, the HISLA tool was iteratively tested and refined in five countries. It is presented in the HISLA tool, which also contains some instructions on how to use it. In summary, the tool consists of four sections:

1. *Introduction*: outlining the purpose of the HISLA tool and its components.
2. *User instructions*: providing step by step instructions on how to use the tool
3. *Indicator mapping form*: to be used to map each priority QoC indicator against the local HIS based on a suite of metadata.
4. *HIS tools and linkage form*: an adaptable form that can help capture information about different data recording, reporting and visualization tools being used for a specific technical area (e.g. child health).

The country example included at the end of this chapter provides an example of the analytical output that was generated from the HISLA tool based on the assessment conducted in Uganda.

d. Conduct the HIS landscape assessment

Decide which assessment method to use

The health information system landscape assessment can either be done through a desk review or may involve physical visits to health facilities. In some instances, both approaches may be necessary.

- **A desk review** is recommended when there are limited resources to support site visits to health facilities and the local HIS is well developed. In such settings, all or at least most health facilities in the country will be using the same standardized data recording and reporting tools, and the health facilities are reporting aggregated data using the same platforms and procedure. A desk review will also usually require the most up to date indicator reference sheets and protocols describing which indicators should be collected in different types of health facilities. In the absence of such information, a desk review could yield inaccurate information to inform HIS adaptation.
- **Site visits** to health facilities have several benefits relative to desk reviews. Visiting health facilities offers an opportunity to better understand: how services are organized for the technical areas of interest (e.g. maternal health) and at different service levels; whether the organization of services mirrors the flow of health data; how data recording/collection, aggregation and upward reporting are done; the format of the tools used for these operations and any differences across health facilities; and an initial glance at the possibility of measuring, reporting and using the MNCAH QoC indicators of interest. Therefore, if resources are available, the most objective approach to assessing the availability of QoC indicators and their metadata in the local HIS is through site visits.

Plan for site visits

Before conducting site visits, a number of preparatory steps should be considered.

- **Consider selecting a sample of health facilities with different characteristics.** This is important as assessing all health facilities will often not be feasible in resource-limited

settings. Furthermore, it is common for health facilities operating at different levels of the health system (i.e. primary, secondary, tertiary health facilities), or health sector (i.e. private and public health facilities) to collect and report data for different indicators depending on the scope of services they offer. For example:

- Health centres will usually not collect data on indicators related to inpatient care as they often do not offer inpatient services. Similarly, such services have fewer service points compared to their higher-level counterparts and correspondingly, they use fewer health facility registers and collect the least amount of data related to MNCAH QoC.
- Also, depending on how the services are organized, some health facilities are not mandated to report mortality data as they experience fewer deaths and/or refer critically ill patients to health facilities at a higher level.
- Health facilities in the private sector may also collect specific data not collected by their public sector counterparts or use different reporting mechanisms. Local HIS are typically designed using a tiered approach to data collection and reporting.

Having a good mix of health facilities helps with understanding which data are collected and reported by which type of health facility, and whether the tools being used are the same/standardized.

- **Consider informing health facility managers about planned site visits.** The modalities for this process will vary depending on the local protocols and procedures. Sometimes, when the assessment is organized and/or supported directly by the national ministry of health, direct communication to subnational authorities informing them about the planned activities and the criteria for health facilities to be assessed will trigger further communication to the leadership of the concerned health facilities requesting permission for the activities to be carried out. The goal is to ensure that all the leaders and managers at the relevant levels of the health system are aware of the scope and nature of the HIS landscape assessment and are in support.
- **Select and orient a team of assessors.** The team of assessors can consist of HIS, M&E and programme focal points representing the ministry of health. Where possible, representatives from partner organizations can be invited to support the assessment. The goal is to ensure that the team has a good balance of technical expertise related to the programme of interest and HIS/M&E for complementarity during the assessment.
 - Several teams may be required to carry out the assessment depending on the number of health facilities to be visited and the distance between them. However, each team should consist of no more than six people so that on the day of the assessment, the movement in the health facility from one service point to the next is less disruptive.
 - All the members of the team should be oriented on the MNCAH QoC indicators to be assessed, the methodology and purpose of the assessment, and how the site visits are to be conducted. It is important for each team member to be familiar with the indicators being assessed prior to the site visits as this knowledge will help them ask the right questions and visit the most relevant service points in the health facility. For example, knowing that there is an indicator that measures access to play and educational material during hospitalization for children prior to the health facility visit will prompt team members to ask if and how such an indicator is measured and how the data is recorded and reported, if collected. A desk review might therefore be an important step of the preparatory activities.

Conduct site visits

Ideally, the assessment should start with a courtesy visit to the management of the sampled health facility being visited.

- Here, the manager can be briefed on the purpose of the visit and the process that will be followed, including the expected level of service disruption and duration.
- The manager can be requested to assign a staff member, as available, to take the team of assessors through the various service points that patients seen at the health facility come into contact with until they have been discharged, either dead or alive/cured. This includes both inpatient and outpatient services.

As described earlier, this process offers an opportunity to examine which data are collected where, how, and using which tools. Box 4 provides a summary of a generic process that can be followed to conduct health facility assessments using child health services as an example.

Box 4. Mapping data flow in child health services

- Identify the first point of contact for the sick child visiting the health facility (e.g. registration area).
- While at this service point, introduce the assessment team and explain the purpose of their visit.
- Continue by asking the health care worker:
 - To describe the scope of services they provide there, the kind of information they collect about the child, and where they record the information.
 - To provide a copy of each data collection or recording tool used at that service point to capture information about the child. If there are no extra copies for the assessment team to take away, request to take a photograph of the front page of the tool and blank pages of the tool with all the data elements/variables. For electronic tools, request a soft copy if available.
 - Whether the tool was standardized by the government and when it was last updated, or if the tool is developed by the health facility, or if the tool was developed for research purposes or through a special partner-supported project.
 - Whether there are sporadic shortages of supply for the tools and whether sometimes improvised tools are developed. If makeshift tools are currently in use, request a sample and take a copy or photographs, whichever is appropriate or possible.
 - The next service delivery point where the child is sent for further care.
 - Where the information collected at the current service point is sent, if at all? Some data are kept at the service point or sent directly to the records office for tallying and reporting upwards.
- Move to the next service points and repeat items 2–3 until you have gone through all service points.
- Continue to the well child service line and repeat steps 1–4 as applicable.

When moving from one service point to the next, it is important to write down some notes regarding the services offered in that health facility, key observations made, and the names of the data collection and reporting tools used. This information can be used during a debriefing meeting which the teams should attempt to have before the actual indicator mapping process begins. The debriefing meeting allows teams to compare notes and determine whether there are any differences in observations that must be considered when indicators and their data elements are eventually mapped. A sample template for field observations is provided in Table 8.

Table 8. Field observation template

Name of the health facility:		
Service level:		
Team members:		
Service point	Data collection and reporting tools	Comments
• ...	• ...	• ...
• ...	• ...	• ...
• ...	• ...	• ...
• ...	• ...	• ...
• ...	• ...	• ...

Populate the HISLA tool

It is at this stage where the HISLA tool described earlier is populated. Populating the tool during site visits would be cumbersome and potentially disrupt services as the mapping process requires time.

- **It is ideal to convene the same teams of assessors in a centralized location led by the process owner.** The entire indicator mapping process might require several days to complete depending on whether the team is large enough to allow for smaller teams to focus on specific technical areas, and upon the number of indicators and metadata to be mapped. Indicators with complex numerators and/or denominators (and hence multiple data elements) require much longer to map against the HIS. Conversely, indicators with fewer data elements will be quicker to evaluate, as will be those that are generally known to be new to the HIS.
- **In principle, teams should aim to evaluate a small number of indicators in one session.** Experience shows that the mapping process often involves insightful discussions between the programme and HIS/M&E teams, and that decisions on which indicators/data elements are available/where in the HIS is not a clearcut process. Such decisions should not be rushed, as recording accurate information and actionable recommendations for each indicator in the tool, agreed through group consensus, is important for the next steps of implementation.
- **Populate the HISLA tool:** Detailed instructions on how to complete the HISLA tool are included in the tool. The aim is to ensure that all the necessary information needed to make a judgment as to whether each prioritized indicator can be used in the short or long term are captured in the tool.

Analyse the HIS landscape assessment data

Summary results can be organized to show two important categories of indicators:

- **Indicators immediately available for adoption and use:** These include indicators found to already exist in the HIS as defined, or those for which 100% of the data elements required to calculate them are provided for in the HIS. Therefore, zero to minimal effort would be required to start using them in the short term to drive QI. For example, an indicator may not be currently reported in the HMIS as a percentage or rate, but if the data elements to calculate this indicator as a rate are routinely collected, efforts to adopt the indicator in the immediate term might include extracting data directly from different (or the same) sources to calculate the indicator as a rate.
- *Indicators requiring extra effort to adopt and use:* These would be indicators whose data elements could not be found in the HIS (either in part or as a whole) and requiring considerable effort to integrate in the HIS.

e. Plan for and implement HIS adaptations

The insights and comments from the HIS landscape assessment and data analysis workshop should be used to derive and implement a plan for how to adapt the HIS to collect and report the indicators not currently or only partially being collected that merit long-term monitoring. However, the process of adapting the HIS to incorporate these indicators or their data elements can differ across settings. This guide therefore only highlights important considerations that can be adapted or expanded upon as needed. To illustrate some of these considerations, Box 5 presents an example of standard operating procedures in Kenya to review and adapt the HIS to meet evolving data needs.

Box 5. Kenya approach to adapting and strengthening the HIS

The Kenyan Ministry of Health's approach to adapting the national HIS to meet new data demands and align with evolving health sector plans has been methodical and comprehensive. The goal has been to standardize data collection, streamline reporting tools, and ensure that health facility registers capture only the most relevant and necessary data. These efforts are critical in addressing the country's key health priorities, including MNCH, HIV/AIDS, malaria, and TB.

One of the central elements of the Kenya approach has been the integration of the district health information system (DHIS2) in their national HIS. This centralized platform has transformed how health data are tracked, collected and reported at all levels of the health system. By integrating DHIS2, Kenya has enabled real-time data entry and reporting, which facilitates better decision-making and accountability. The introduction of unique patient identifiers within the DHIS2 framework has also been significant, as it helps reduce duplicate patient records across facilities, particularly in the management of MNCH, HIV/AIDS, malaria and TB services. Kenya has implemented a master patient index (MPI), which ensures that each patient has a unique identifier, eliminating issues related to duplicated records and enabling better longitudinal tracking of patient outcomes at the individual level. This system has proven essential for monitoring outcomes in MNCH and other critical health services, where comprehensive and accurate data are crucial.

Another major initiative undertaken has been the revision and streamlining of health facility registers. Previously, many registers used at health facilities were redundant or did not capture essential data. By revising these registers and reducing their number, the Kenya Ministry of Health has been able to streamline data collection and ensure that only the most relevant data are captured. This revision process not only improves the quality of the data collected but also reduces the administrative burden on health workers.

Kenya has also prioritized data harmonization through a series of workshops designed to align health programme indicators and standardize the forms used for data collection. These workshops bring together stakeholders from various health programmes, ensuring that indicators are fully aligned, which promotes data consistency and reduces redundancies. This alignment is critical for making national-level reporting more efficient and improving the overall quality of health data in the country.

A key component of Kenya's health data standardization efforts is the periodic review of the *Health sector indicator manual*. This review process is triggered by changes in health policies, the National Health Sector Strategic Plan, or new data needs identified by health programmes. The HIS Unit in the Ministry of Health is responsible for initiating this review process by inviting various health departments, divisions and units to submit proposals for new or redefined health indicators. Once these proposals are received, a technical working group is convened to review, refine and revise the indicators. The updated indicators are then incorporated into the manual.

Following the revision of the indicators, Kenya moved to the design and review of data collection tools. A task force is convened to design the registers and reporting tools based on the periodically updated manual, ensuring that the tools capture all relevant data elements and are user-friendly. To further support health workers in using these tools, instruction manuals are created to guide them through the data collection process. Before these tools are rolled out nationwide, they undergo pre-testing in selected settings to ensure they are practical and user-friendly in real-world contexts. Feedback from these pre-tests is then used to make final adjustments to the tools before their full national implementation.

Once finalized, the revised tools are printed and distributed to health facilities across the country. To ensure a smooth transition, health workers are trained on the use of the new tools, and a clear transition plan is developed and disseminated. This plan helps guide health workers as they switch from the old data collection systems to the new standardized ones.

The tools are then customized into DHIS2 to allow for seamless data entry and reporting. This ensures that all the health data collected at facility and sub-national levels can be efficiently integrated into the national HIS. By integrating these revised tools into DHIS2, Kenya has improved the timeliness and accuracy of health data reporting, which has strengthened decision-making at all levels of the health system.

The process of reviewing and updating Kenya's HIS tools is not a one-time effort but is instead part of an ongoing process. Every two years, the health sector indicator manual and associated data collection tools undergo further reviews as guided by the country's Health Information Policy. These periodic reviews ensure that the health data collection systems remain aligned with emerging health priorities, policy shifts and changing data needs.

Source: (36).

Technical considerations

The responsible team should explore how the HIS infrastructure, design and interoperability need to evolve to accommodate new data points and functions. Key actions may include the following.

- Ensure that the HIS can be scaled up effectively to handle new indicators. This may require enhancing its capacity for data recording, indicator calculation, reporting and processing. This includes verifying, for example, that HMIS tools, such as case notes and facility registers, can accommodate the additional data volume without compromising the integrity of the tool. Adding missing indicators or metadata to the HMIS may involve adding new columns to existing tables or creating entirely new tables, ensuring that each field is assigned the appropriate data types and lengths.
- Identify any performance bottlenecks in the HIS that could be exacerbated by adding new indicators, such as low-quality recording of patient information or delays in reporting summary data.
- Implement version control of adapted tools to ensure that changes are well-documented and reversible if needed.
- Align new indicators with existing data standards, such as the international classification of diseases (ICD-11) codes, to ensure consistency and comparability across datasets.
- Develop validation rules to enforce correct data entry for the new indicators. This could include defining acceptable value ranges, required fields or validation checks for certain data types (e.g. numeric vs text).
- Ensure that the new indicators and their data elements are integrated in a way that maintains compatibility with other systems, such as electronic medical records, laboratory information systems, supply chain management systems, or national health databases. This includes ensuring consistent data formats and reporting protocols.
- If data related to the new indicators needs to be transferred between different systems (e.g. HMIS summary/reporting forms to DHIS2), data mapping and transformation rules must be developed. This ensures that data is accurately transferred and correctly understood across systems.
- In cases where data for new indicators are derived from multiple data sources and the calculation of these indicators is rather complex, consider automating the calculations (to minimize errors).

Operational considerations

Operational considerations focus on the practical implementation of an effort to introduce new indicators in the HIS.

- A large-scale training or capacity strengthening programme may be required to orient health facility teams on how to collect, input, manage and analyse data for newly introduced indicators, include how to use the data as part of QI planning, implementation and reviews. Tailoring training materials to different user groups is important to account for their specific roles in the HIS. For example, frontline health workers need a clear understanding of how to collect and report the required data, while M&E staff require skills in data analysis and interpretation.
- Establish support systems to assist health workers and data clerks who face challenges with the new indicators. Such support can be provided during supervisory visits or

onsite support visits by QI teams operating at national or subnational levels, and troubleshooting technical issues or providing clarification on indicator definitions. These programmes can be a good opportunity to reinforce the skills learned during training and provide ongoing guidance, particularly in the early stages of adapting to the new indicators.

- Insights from the HIS landscape assessment related to data collection, entry and reporting workflows can help identify where the new indicators can be integrated smoothly and where adjustments are needed. Where necessary, workflows can be adapted to incorporate new indicators without disrupting existing data management processes.
- Consider implementing the new indicators in phases, starting with a pilot phase in select facilities or regions. This allows you to test the changes in a controlled environment and make necessary adjustments before rolling them out system-wide.
- Ensure that the introduction of new MNCAH QoC indicators is coordinated with other linked vertical health programmes (e.g. HIV, TB, immunization) to avoid overburdening health workers with multiple reporting requirements. Where possible, streamline data collection across programmes.
- If the local HIS uses electronic health records or mobile health systems for collecting non-routine data such as patient experiences of care, consider updating the application to include fields for the new indicators. This may also involve modifying data entry interfaces to ensure they remain user-friendly and efficient.
- Be mindful of the workload impact of the newly introduced indicators on frontline health workers. If the new indicators add a significant data collection burden, simplify where possible, or provide additional support, such as data clerks or digital tools to streamline the process.
- Consider the reporting frequency of any new indicators (e.g. monthly, quarterly). The frequency should be feasible given the resources available and the other data reporting requirements already in place. For example, data collected through exit interview may not be feasible to collect every month and consequently, the reporting frequency may be quarterly at a minimum.
- Integrate new indicators into existing reporting cycles to avoid creating additional timelines or deadlines that could confuse or overburden staff.
- Ensure that the data generated from the new indicators can be accessed at least in near-real-time by relevant QI stakeholders and decision-makers.
- Consider creating feedback loops so that health facilities and data collectors receive regular updates on how the data they are collecting for new indicators is being used. This helps to foster a culture of data-driven decision-making and motivates continued high-quality data collection.
- The initial HIS adaptation for newly developed indicators is a great opportunity to ensure that the system remains adaptable to future changes in QI priorities or indicators. Therefore, consider establishing processes and protocols for regularly reviewing and updating the HIS as new QI priorities or QoC measurement requirements emerge.

Strategic considerations

Strategic considerations are critical for ensuring that the integration of new indicators aligns with broader HIS goals, policies and long-term sustainability.

- In many LMICs, HIS adaptations – also known as HIS reviews – are carried out in three- to five-year cycles. Where the cycles are infrequent, the integration process might not be timely to support QI programmes. It may therefore be important to adjust QI plans and strategies at national and subnational level to include prioritized indicators that are only feasible to measure and monitor *immediately*, and then include the missing indicators in the next HIS review cycle.
- Consider the long-term financial implications of adding new indicators. This includes not only the costs of initial implementation (e.g. HMIS adaptation, training) but also ongoing costs related to data collection, system maintenance, staff support and related upgrades. Identifying sustainable funding sources, whether through government budgets, donor support, or partnerships with nongovernmental actors, is essential to avoid disruptions.
- For sustainability, the new indicators should be prioritized for long-term monitoring and fully integrated into the national HIS architecture rather than in a temporary or parallel system. This ensures they become part of routine data collection and reporting to inform ongoing improvement work at national and subnational levels.
- Consider setting up collaborations across different health programmes and departments to prevent siloed data systems. For example, coordination between the immunization, nutrition, early child health development, HIV and TB programmes with the child health programme ensures that new QoC indicators are complementary and do not duplicate efforts.
- When adding new indicators, ensure the collection, reporting and use are also in compliance with national data privacy regulations, such as laws on patient confidentiality, data security, and informed consent. Where prioritized indicators have ethical implications, data collection processes should be designed to protect patient privacy and dignity, and appropriate consent should be obtained before collecting personal health data.
- Consider making sure that the new indicators are integrated in a way that allows for data collection and disaggregation to include different population groups (e.g. gender, age, socioeconomic status, geographic location) to help ensure equity in health service delivery and outcomes.
- If time and resources permit, consider incorporating an iterative process where the performance of the new indicators is periodically reviewed, and adjustments are made based on the lessons learned. This could involve modifying indicator definitions, improving data collection processes, or updating training and support for HIS users.

4.4.2 Key actions at the health facility level

QI initiatives are often led by facility managers or QI teams embedded within a health facility. When these efforts are independent of broader multi-site QI programmes managed by subnational or national health authorities, they may require temporary, ‘project-specific’ indicators that may not be immediately feasible to monitor routinely through the local HIS. These QI initiatives are typically focused on addressing localized quality issues within a single health facility and are often short-term in nature. As a result, the specific QI focus can vary across different facilities, requiring distinct sets of indicators tailored to each facility’s needs at any given time.

Illustrative actors



Health information officers, in consultation with the rest of the facility-based QI team and subnational HIS and/or M&E managers as needed.

In resource-limited settings, adding extensive sets of indicators to the local HIS for routine measurement and monitoring can be costly and burdensome, especially if there is no plan for their long-term use.

This section offers practical guidance on how to assess and leverage the existing HIS to improve the availability of QoC data for supporting *health facility-based QI initiatives*. This process is relatively less complex and resource-intensive compared to what has been described for national and subnational level activities.

a. Define the indicator metadata fields

At health facility level, detailed metadata for each indicator may not be required especially considering that some indicators might not be needed for long-term monitoring or institutionalization in the local HIS. Defining the numerator, denominator, frequency of reporting (i.e. to health facility-based QI teams) and data type (see Table 6 for definitions) is often enough at this level of QI planning and implementation. If there is suboptimal capacity at health facility level to define these metadata fields for the indicators of interest, support can be requested at subnational level (e.g. a district or region, province or equivalent), or from implementing partners supporting the health facility. The aim is also to ensure that the indicators are well developed to provide useful insights that can guide improvement at health facility level.

b. Review HMIS to determine measurement feasibility

The process of verifying whether QoC indicators prioritized at health facility-level monitoring are feasible to monitor immediately is relatively less complex compared to national or subnational level processes. Once the indicator metadata have been defined, facility-based health information officers can check which of the indicator data elements are already being collected and reported routinely in RHIS, and if the HMIS data sources – such as case notes, health facility registers, tally sheets and summary reports – contain the data elements needed to calculate the indicators of interest.

c. Adapt HMIS to accommodate missing indicators and/or metadata

If some data elements are missing in HMIS, they can be added to the relevant tools using locally available resources. For example, health information officers can create a layout for the additional data elements within the existing paper-based health facility registers or case notes (e.g. by adding a column to a register, adding a standard clinical assessment criterion to a patient case note, etc). It is important to decide on the placement and size of new fields added to the forms to ensure that they fit seamlessly without overcrowding the page. Consider using standardized formats for consistency.

d. Train facility-based staff around data entry

The addition of new data fields and elements to the already existing data collection and recording forms will necessitate training staff members responsible for data entry on the new data elements and how to accurately record, including clear instructions and guidelines to maintain data quality. It is therefore important to regularly monitor the quality and accuracy of data entered into the adapted tools.

Table 9. Summary of key actions for national, subnational and facility levels

National	Subnational (regional/district)	Facility (including primary care levels)
- Promote and support the use of the national HIS by QI managers across health system levels to assess the availability of the data they need for their QI initiatives. This will minimize efforts to resort to parallel systems - Provide governance and leadership to help strengthen the national HIS to accommodate indicators needed to monitor priority MNCAH QoC indicators on an ongoing basis - Develop and disseminate national standard operating procedures and protocols on how to collect, collate, aggregate, report, analyse, and use MNCAH QoC data to support QI across health system levels	- Support health facilities to select MNCAH QoC indicators in line with health facility-specific or multi-site subnational QI initiatives - Support health facilities to complete relevant metadata fields for their priority MNCAH QoC indicators as part of their QI work - Support health facilities to analyse and make decisions about which indicators they need to measure and monitor locally and those they can monitor based on the existing HIS, and for how long - Provide any additional resources needed by health facility managers	- Assess the data collection, recording and reporting forms available in the health facility to identify opportunities for measuring and monitoring indicators prioritized as part of the QI effort at health facility level - In cases of limited capacity, request technical support from subnational health authorities to support QoC measurement and monitoring efforts for the purpose of improvement, including developing or selecting appropriate indicators and analysing data as part of QI implementation

4.5 Country example

The country example included in this chapter describes the process that Uganda followed to assess the readiness of the HIS to measure WHO-recommended priority QoC indicators for measuring QoC standards for children and young adolescents in health facilities (see Table 2). The assessment was part of a broader effort to strengthen the national HIS to measure priority QoC indicators for children and young adolescents.



Assessing Uganda's HIS readiness to collect and report on paediatric and young adolescent QoC indicators

Context

In 2022, WHO developed a set of priority paediatric and young adolescent QoC indicators (PQoC) for measuring QoC standards for children and young adolescent in health facilities (see detailed metadata in Accompanying material 1). Through funding provided by USAID, WHO worked with five countries (Kenya, Laos, Malawi, Sierra Leone and Uganda) to support the uptake and integration of the 25 PQoC indicators within their national HIS. This case study describes the process that was followed in Uganda to assess the readiness of the national HIS to measure these indicators, and how the indicators were prioritized for incorporation into the national HIS based on the assessment results and national and subnational priorities.

Step 1: Assessing HIS readiness to measure prioritized QoC indicators

The assessment of HIS readiness to measure the 25 PQoC indicators began with site visits to a diverse sample of 10 health facilities in and around Kampala. These facilities represented varying levels of service delivery, and the range of services provided, including two referral hospitals, two general hospitals, three level IV health centres, and three level III health centres. Two teams were formed, each consisting of WHO and Ministry of Health staff, who were oriented on the 25 PQoC indicators and briefed on the site visit process. In each facility, the assessment started with a courtesy call to the management of the health facility. A dedicated health facility staff member was assigned to take the assessment team through the various service points where patients receive care (e.g. outpatient department, emergency unit, inpatient unit). The assessment team was able to collect or take photos of all the blank tools used to record data about the patient at each service point.

Step 2: Multi-stakeholder indicator mapping process

After the health facility assessment, the teams that visited the health facilities reconvened for three days in a centralized place to map the 25 indicators and their metadata against the recording and reporting tools that were reviewed and collected during the health facility assessment. The mapping team included technical focal points for child and adolescent health and HIS in the Ministry of Health, senior and mid-level leadership from selected health facilities that were visited, and delegations from USAID and WHO.

The HISLA tool (5) was used to assess whether specific indicators and their data elements can be collected, reported and used in the national HIS. The data sources for each indicator and/or the data elements were also noted for later use during ensuing consultations regarding indicator adoption. The determination as to whether an indicator could be adopted and measured in a specific timeframe was based primarily on the availability of the indicator data elements in the HIS.

- Indicators recommended for immediate-term adoption were those for which 100% of the data elements required to calculate the indicator were collected in the national HIS. These would typically require minimum effort to adopt and use as part of ongoing quality control or time-limited QI initiatives.
- Indicators recommended for adoption in the medium to long term were those for which less than 100% of the data elements required to calculate the indicator were available in the national HIS. These indicators would require moderate to considerable effort to integrate in the national HIS either by adding the missing data elements or by developing other tools and mechanisms to collect the indicators.

During the mapping process, the teams were able to map PQoC indicators and the corresponding data elements to 54 HMIS registers and 10 additional complementary routine data recording forms. Data from these tools are aggregated and captured in five reporting forms at health facility level, and the summary data are eventually uploaded onto DHIS2. Fig. 10 provides a summary of information flow for child health data within the Uganda HIS based on the mapping results. In summary, 11 (44%) of mapped indicators were recommended for adoption and use in the short term, 11 indicators (44%) in the long term, and three indicators (12%) could not be assigned to

any timeframe as the mapping team could not agree on the utility of these indicators in the local context. Fig. 11 shows the number of indicators for which 100% and <100% data elements required to calculate them are available in the Uganda national HIS.

Fig. 10. Overview of the Uganda HIS landscape in relation to child health QoC data

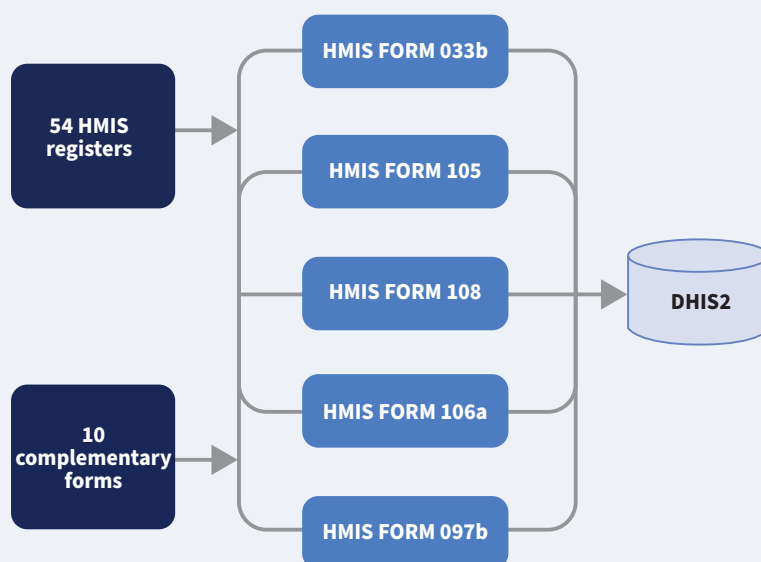
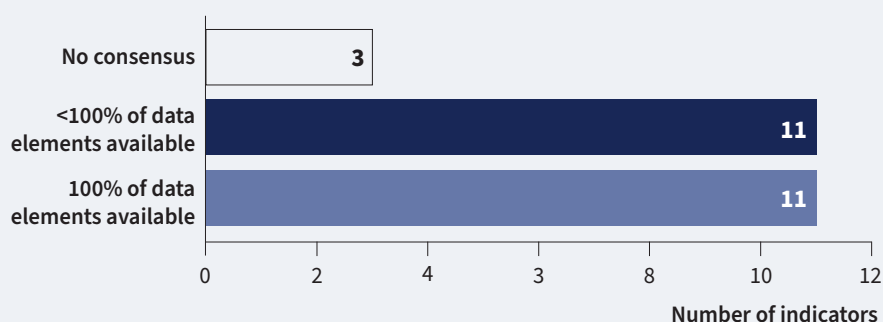


Fig. 11. Availability of data elements for WHO-recommended PQoC indicators in the Uganda HIS



Step 3: Multistakeholder briefing and planning meeting

After the indicator mapping process, multiple stakeholders – including decision-makers from the Ministry of Health, senior technical officials from partner organizations, and WHO across its three levels – met to review the findings from the mapping exercise and agree on next steps. The mapping team presented the findings and preliminary recommendations on indicators the country could adopt in the short, medium and long term, as well as possible mechanisms to achieve this. This was followed by reflections from stakeholders and a way forward from the Ministry of Health officials.

Chapter

5

Tracking and analysing quality of care indicators to guide improvement

5. Tracking and analysing quality of care indicators to guide improvement



5.1 Key messages

- Regular measurement of selected QoC indicators by QI teams is essential for tracking progress against improvement aims and for guiding iterative changes to improve care.
- A 'run chart' is a simple graphic tool to help QI teams plot and analyse QoC indicator results over time to guide their improvement efforts.
- Managers of a multi-site QI initiative (e.g. a subnational health manager) can use small multiple data visualizations to assess differences across multiple sites working to achieve a common improvement aim.
- In addition to monitoring whether QoC indicator results are improving as they make changes, QI teams can use qualitative information to assess whether the specific changes they are testing are feasible, acceptable and sustainable in the local setting.
- By segmenting data with an equity lens (e.g. ethnicity, age) actors can monitor and guide changes to reduce disparities in QoC.



- Both quantitative and qualitative information is important for improvement and learning.

5.2 Chapter overview

To determine whether (or not) the changes they are making are associated with improvements in care, QI teams must regularly monitor and analyse results for selected QoC indicators. Qualitative information is also important to help teams understand whether the changes they test (based on their analysis of the causes of quality problems), are feasible, acceptable and sustainable in the local setting. This information helps teams decide whether to abandon, adopt or refine and re-test specific changes as part of rapid improvement cycles (e.g. plan, do, *study*, act). This chapter offers practical guidance and resources to support the regular measurement, visualization, and analysis of QoC



indicator results over time by QI teams and by managers supporting a multi-site QI initiative.

5.3 Key terms and concepts

Improvement teams often track QoC indicators using a 'run chart' to analyse the effects of the changes they are making at specific points in time, assess whether care is improving over time and guide iterative cycles of change to improve care.

5.3.1 Why use a run chart to monitor improvement?

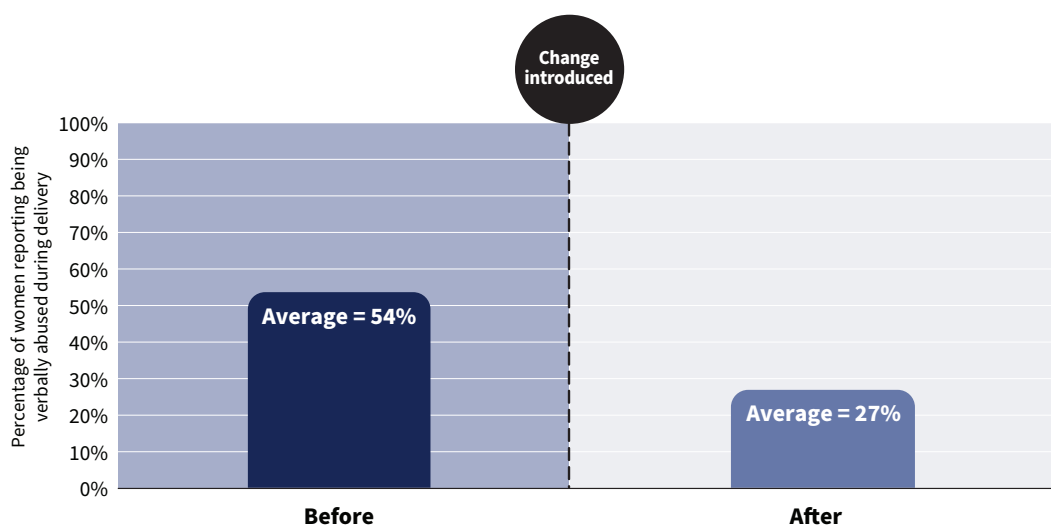
A run chart is a graphical representation of data displayed in chronological order. It is a useful tool for visualizing the results of QoC indicators over time, to identify which changes are contributing to improvements in care at specific points in time and to track progress toward an improvement aim. Regularly plotting the results of QoC indicators on a run chart helps QI teams understand whether the changes they are making are associated with improvement.

A run chart is not the only way to display data graphically over time. For example, sometimes health workers use bar charts to display QoC indicator results at discrete points in time. However, because a bar chart typically displays data aggregated over multiple time points – such as combining several data points to visualize a baseline time period and a subsequent time period for comparison – it can be challenging to assess whether changes implemented at a specific moment in time were associated with improved QoC indicator results, a key goal of measurement in a QI process.

5.3.2 Practical illustration

Consider a hypothetical scenario involving an improvement initiative at district hospital X, aimed at reducing the percentage of women who report experiencing verbal abuse around the time of birth. The same dataset, spanning 21 months (January 2020 to September 2021), is illustrated in Fig. 12 using a bar graph and in three hypothetical run chart scenarios in Fig. 13 for comparison. Each figure marks the same point in time when a specific intervention (or change) was introduced to improve care.

Fig. 12. Bar graph comparing aggregated data before and after a change was introduced to reduce verbal abuse reported by women during delivery



Note that:

- The bar graph in Fig. 12 suggests that the care improved over the 21-month period after the introduction of the intervention. It appears that, on average, the percentage of women reporting verbal abuse during delivery decreased from 54% before the change was introduced to 27% afterward. However, this interpretation does not tell the full story.
- Fig. 13 presents three hypothetical run chart scenarios (**a**, **b**, and **c**) in the same district hospital as shown in Fig. 12, with the same data set distributed differently over time in each run chart scenario. Note that on average, the datasets in all three scenarios are the same for the periods *before* and *after* the change was introduced. In the hypothetical run chart in scenario (**a**) the hospital was already measuring a decline in the % of women reporting verbal abuse in delivery *before* introduction of the change (thus the decline is probably not due to the change). Additionally, although the percentage of women reporting verbal abuse remains lower in the first four months after the change, it can be seen that the indicator soon begins to increase again confirming that the change is not associated with sustained improvement. The hypothetical run chart in scenario (**b**) shows a consistent and continuous decline in the % of women reporting verbal abuse after introduction of the change. The hypothetical run chart in scenario (**c**) shows continuing variation in the indicator after the change was introduced. Among the three hypothetical run charts (**a**, **b**, and **c**) in Fig. 13, it is only scenario (**b**) that demonstrates improvement.

The key message here is that the same dataset can yield very different insights depending on how the data are distributed and visualized over time. Closer examination of the data displayed in Fig. 12 using a run chart format leads to a different interpretation of results. Because an important purpose of measurement in improvement is to assess the effect of iterative changes (interventions) on QoC in close to real-time, a run chart that displays continuous data over time allows QI teams to analyse the effect of the changes as they are introduced. Teams use this information to decide which changes should be adopted, adapted or discontinued, and to monitor cumulative progress toward achieving specific aim(s).

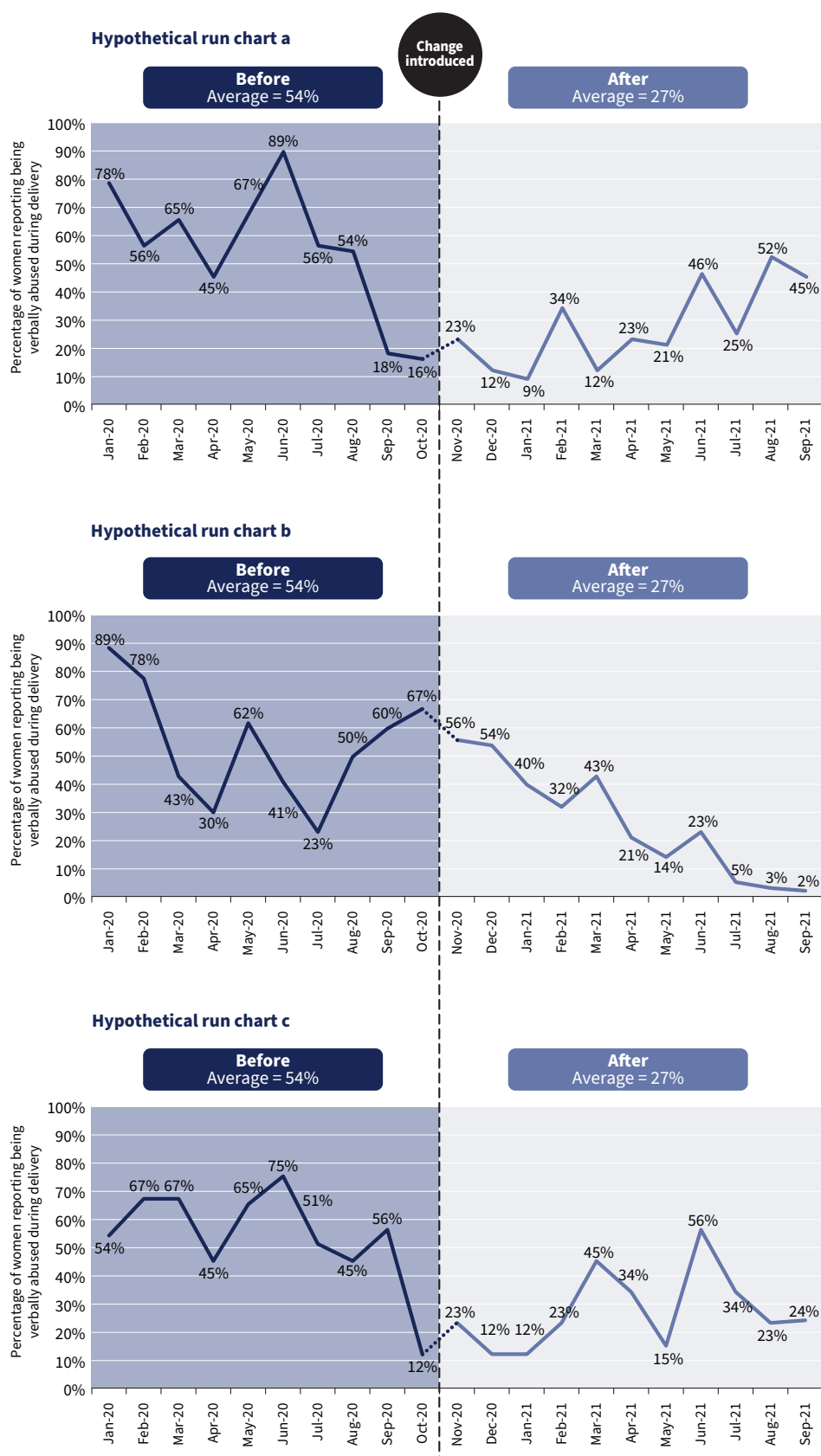
In essence, charting results of QoC indicators very regularly (e.g. by the hour, day, week or month) is essential to understand variation over time within a QoC dataset in a QI initiative.

The frequency of charting and analysing the data may vary by level of the health system at which changes are being introduced. For example, facility-based QI teams that are testing iterative changes will need to analyse data more frequently to guide their improvements than the subnational and national managers supporting these teams. The key responsibility of QI teams is to identify patterns of variation in data over time and to explore their underlying causes (37).

NOTE!

There are other more complex methods of displaying and analysing QI datasets that are not covered in this guide. Users interested in learning more about these methods and additional materials on the use and interpretation of run charts are encouraged to explore additional resources (37–41).

Fig. 13. Illustrative run chart scenarios (a, b, c) with trend data for the period before and after a change idea was introduced to reduce verbal abuse reported by women during delivery





5.4 Practical guidance

The following section provides practical guidance on how to create a run chart using simple tools and resources typically available in low-resource environments, and how to apply basic rules to interpret QoC indicator results over time to guide improvement efforts.

5.4.1 Display data in a run chart in a single site

While there are several interactive and automated software options to create run charts that may be available for purchase through one-time fees or subscription plans, a run chart can be created on a computer using Microsoft Excel or can be drawn by hand. The essential steps for creating a run chart are outlined below using an example from a QI initiative to reduce hypothermia (low body temperature) in newborns. Hypothermia is associated with increased morbidity and mortality in newborns. Many of the most common causes of hypothermia are preventable by implementing simple interventions as part of the care of newborns including: placing a baby skin-to-skin with the mother immediately after birth; placing a cap and wrapping a baby in a dry cloth; maintaining a recommended ambient temperature in the delivery and postnatal area of a maternity unit.

The same steps and principles from the example below are applicable for generating a run chart in Microsoft Excel without inbuilt automation.

a. Prepare the chart on paper

Fig. 14 provides an example of the basic run chart format. To produce such a chart on paper, the following steps should be taken.

- Draw vertical and horizontal lines of almost equal length to form an “L” shaped graph, making sure to leave enough space on either side of the lines for the title and labels of the run-chart graph.
- Label the horizontal line with the unit of time or sequence in which the indicator data was collected (e.g. April, May, June, etc.; or Week 1, Week 2, Week 3 etc.; or Day 1, Day2, Day3, etc.). In this illustrative example focused on reducing hypothermia in newborns, the QI team decided to measure the *percentage of newborns with hypothermia at one hour of birth (temperature < 36.5 centigrade)* on a weekly basis.
- Label the vertical line with the name of the QoC indicator or indicators being plotted and mark the line with a scale at equal intervals. For example, for an indicator measured as percentages, a sensible interval for a scale can be 10% between two consecutive numbers (i.e. 0%–10%, 10%–20%, 20%–30%, 30%–40%, ...90%–100%). In this illustrative example, the QI team decided to use a vertical scale of 10% as shown in Fig. 14.

Illustrative actors

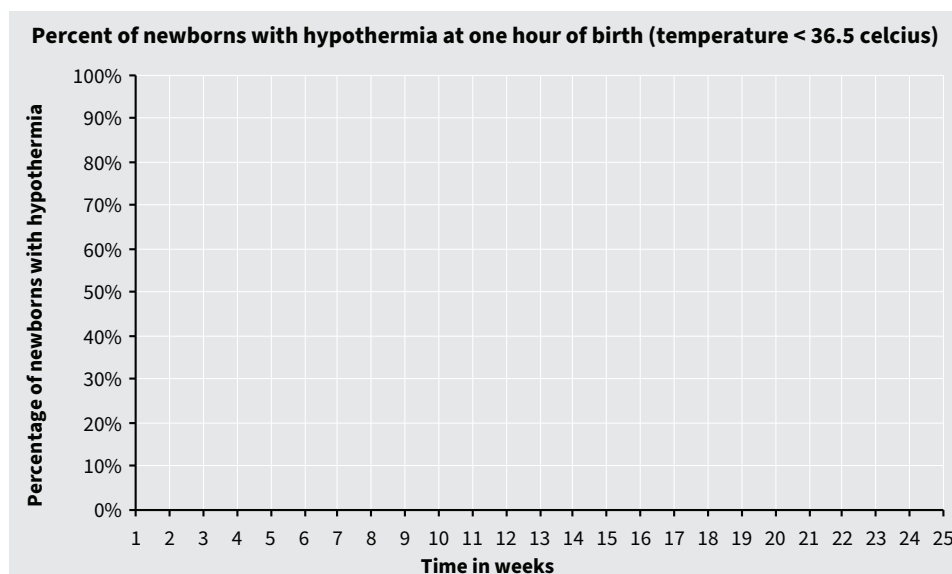


An interdisciplinary facility-based QI team including representatives of all health worker cadres who support newborn care processes (directly or indirectly) in the facility (e.g. nurses/midwives, physician, allied health professionals, pharmacist, laboratory technician, health facility manager, health information officer, patient representative or advocate, community health worker, etc.).

NOTE!

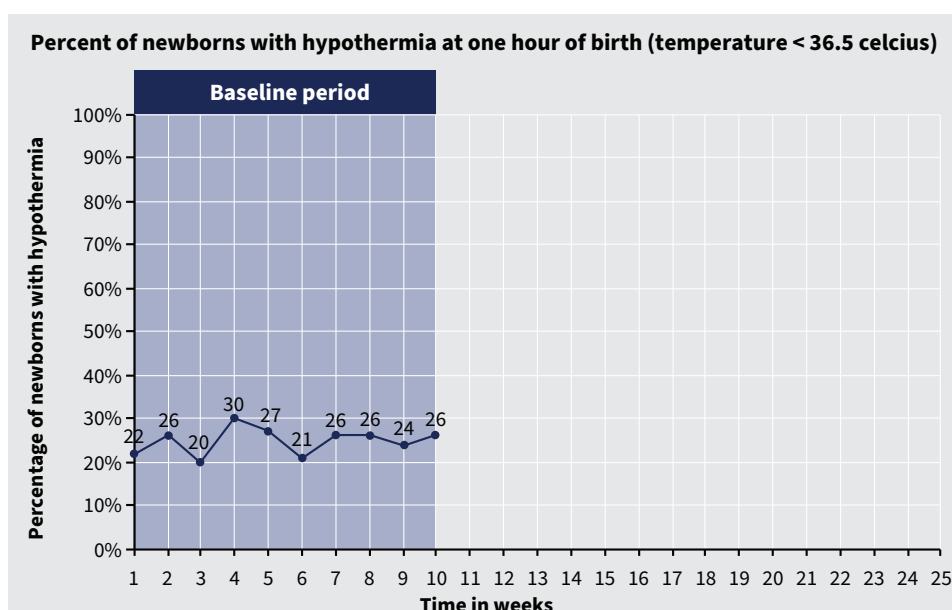
When deciding on the time interval for monitoring QoC indicators, it is important to consider the expected time interval to enable detection of a change in results after introduction of a change or intervention.

Fig. 14. Visual display of a run chart without indicator data



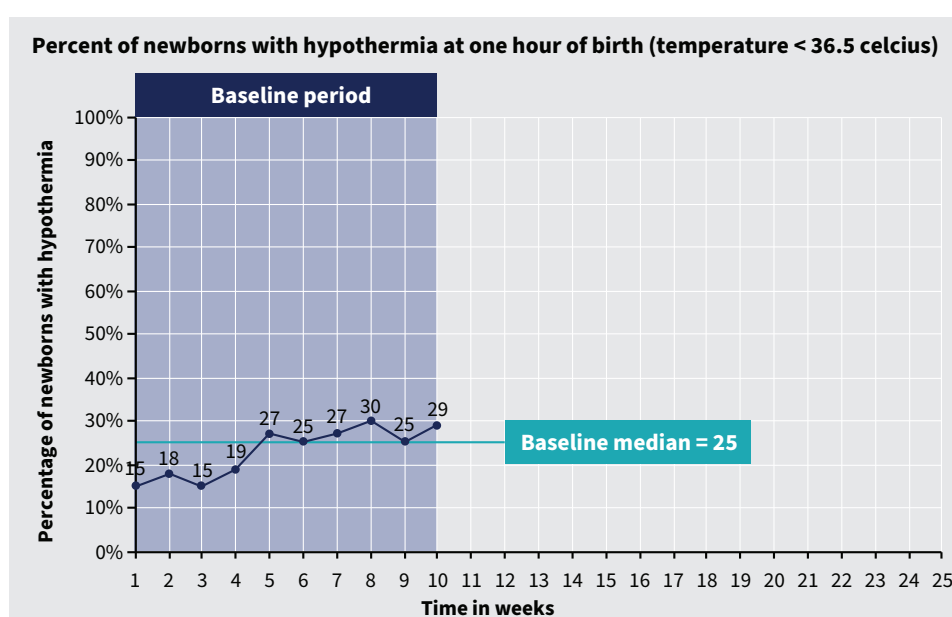
- Next, plot the indicator data values against time in the order they were collected, and then connect the data points on the graph with a line as shown in Fig. 15.

Fig. 15. Visual display of a run chart with baseline indicator data plotted against time



b. Calculate a median and draw its value in the chart

- Ideally, aim to plot 6–10 points of baseline data collected before starting your improvement efforts (39). This data will allow calculation of a baseline median. If no baseline data are available (e.g. measuring a new indicator with no prior data), the initial few data points can be treated as a de facto baseline to calculate the baseline median.
- Draw the baseline median (labelled line) using 6–10 baseline data points as shown in Fig. 16. See Box 6 for guidance on calculating a median. The baseline median is an important reference for interpreting results applying the “shift rule”, one type of rule for interpreting run charts. The shift rule is explained in section 5.4.2.

Fig. 16. Plot of indicator values against time with a baseline median line

Box 6. Calculating a baseline median based on 6–10 initial data points

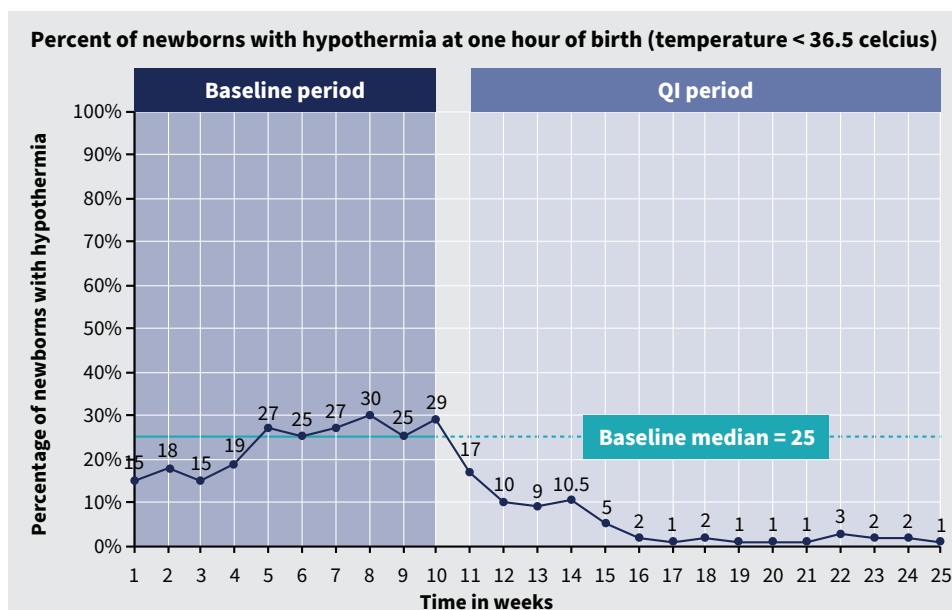
In basic terms, the *median* represents the middle value in a set of numbers, where half of the numbers are below the median and the other half are above it (42). You can quickly calculate the median using Microsoft Excel, or by hand. Assuming the baseline period in the dataset shown in Fig. 16 spans from Week₁ to Week₁₀ (the number of data points needed to determine the baseline median usually ranges between 6 and 10), the median can be calculated as follows:

- Begin by sorting the numbers in the dataset in ascending order. The original order is as follows: 15, 18, 15, 19, 27, 25, 27, 30, 25, 29.
- After sorting in an ascending order, the numbers are arranged as follows: 15, 15, 18, 19, 25, 25, 27, 27, 29, 30.
- If the dataset contains an odd number of data points (e.g. 7), the median is simply the middle value. However, if the dataset contains an even number of values, the median is calculated as the average of the two middle numbers.
- In this case, the dataset contains 10 values, so the median is the average of the two middle numbers (i.e. the 5th and 6th numbers) which are, 25 and 25. Therefore, the median is calculated as $(25 + 25) / 2$, which equals 25. This value is shown in Fig. 15.

c. Plot QoC indicator results as changes are implemented

- After plotting the baseline median line on the run chart, QoC indicator results should be plotted at the agreed time intervals while changes are implemented to try to reduce the percentage of newborns with hypothermia. Fig. 17 shows the QoC indicator results from Week₁₁ to Week₂₅ as the QI team introduced changes to improve care.

Fig. 17. Plot of indicator values over time with an extended baseline median line



d. Annotate the run chart

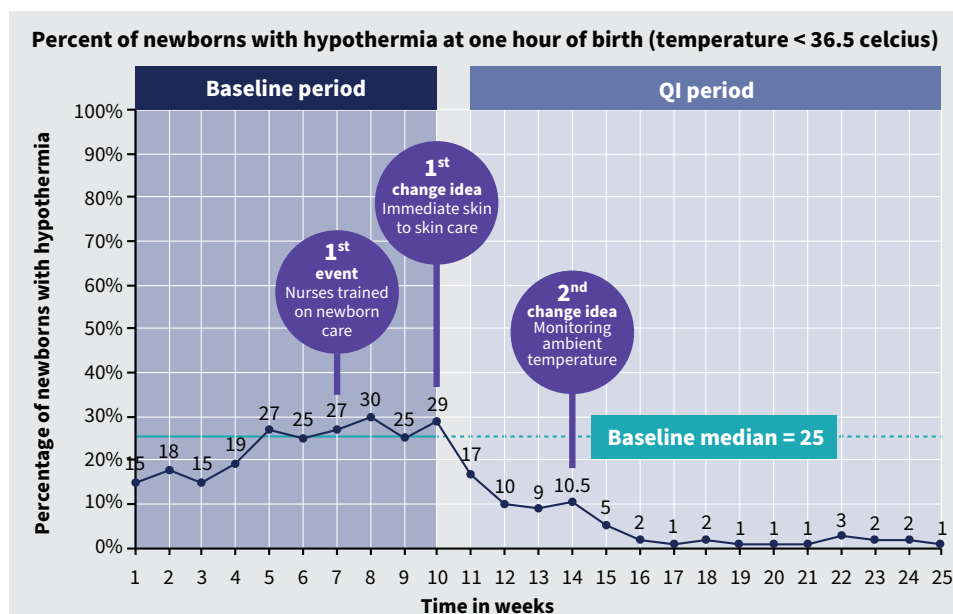
Adding labels or annotations to a run chart is important to show when specific changes were introduced by a QI team. This helps teams understand how specific changes influence the results. It is also helpful to note the timing of any external events or additional interventions implemented during the QI initiative that might have impacted the QoC indicator results (e.g. clinical training in the improvement area). It is straightforward to annotate a paper run chart. If you are using a computer with software that doesn't support annotations, you can print the chart and add the labels manually. In Fig. 18, the run chart is annotated to show when specific events and 'change ideas' were introduced to reduce hypothermia in newborns.

In this example, the 1st event was an *on-site training* for all maternity nurses on immediate and early newborn care. This training was introduced in *Week₇* as part of the QI initiative to ensure nurses and auxiliary nurses were aware of and gained skills to implement evidence-based guidelines for newborn care. The skills covered in the training included immediate skin-to-skin contact with the mother, drying and covering the newborn, assessing breathing to rule out asphyxia and resuscitating within the first minute after birth if needed, checking the newborn's temperature one hour after birth, and supporting initiation of breastfeeding within the first hour after birth.

The maternity QI team, which included nurses and midwives, used QI tools including a *process map* and the *5 Whys* to investigate why hypothermia rates were high at baseline. They discovered that immediately after cutting the umbilical cord, most newborns, even those not showing signs of asphyxia, were being taken away from their mothers for examination, weighing and a sponge bath. This practice delayed skin-to-skin contact with the mother and exposed newborns to an increased risk of hypothermia. When asked, the health workers in the maternity explained that this had been the routine for at least five years, as they believed it was important to examine, weigh and clean the newborn right away. After some resistance, particularly from auxiliary nurses who provided sponge baths for newborns, the QI team decided to change this practice. During *Week₁₀* they introduced the 1st change idea, which involved placing newborns immediately after birth on the mother's chest, wrapping them in a clean cloth, and covering the baby's head with a hat brought by the family.

During the initial test period (*Week₁₀* to *Week₁₄*), the team was surprised to see that the percentage of newborns with hypothermia dropped quickly (see Fig. 18). The team decided to adopt this change as the new standard for newborn care. However, some newborns continued to have temperatures below 36.5°C (hypothermia). The team looked for other causes and realized that the maternity ward's windows were often open, even during the rainy season, and staff sometimes used a window air conditioner on hot days. To prevent the room from getting too cold, the team introduced a 2nd change idea during *Week₁₄*. This involved assigning one staff member per shift to check and record the ambient temperature in the delivery room and make any needed changes to maintain the ambient temperature between 22–26°C, as recommended by WHO (e.g. closing the maternity windows, turning off a window air conditioning unit). During the second test period (*Week₁₄* to *Week₂₅*), the team noted an even greater decrease in the percentage of newborns with hypothermia. Although it required some extra effort to check the delivery room ambient temperature each shift, the QI team decided that this was a change they could adopt as regular practice without too much difficulty, incorporating it into the unit's standard operating procedure.

Fig. 18. Annotated run chart to show when specific events and changes were introduced to reduce hypothermia in newborns



5.4.2 Select and apply rule(s) to analyse data in a run chart

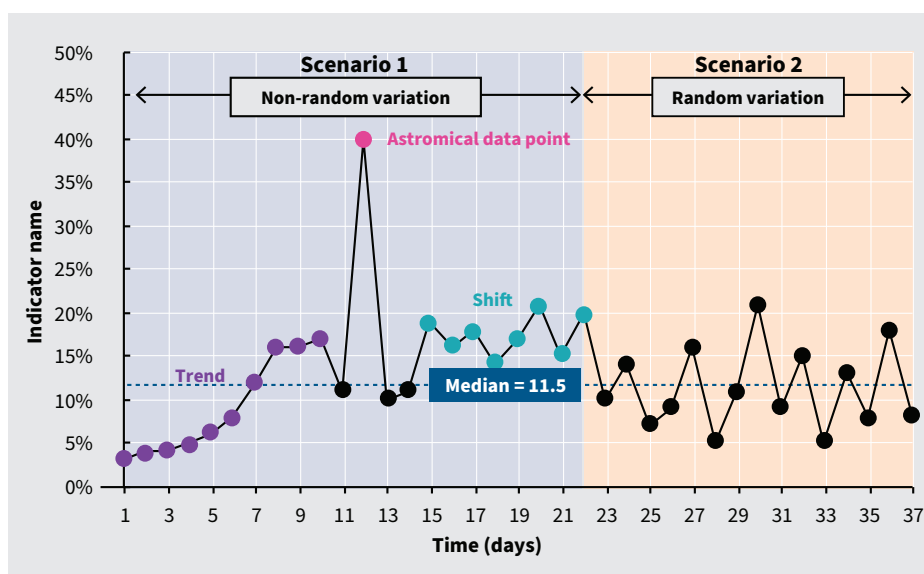
As QI teams plot data in a run chart in a QI initiative, it is important that they regularly analyse the data to determine if results are due to random variation or to the changes they are introducing to try to improve care.

Before delving into these rules and their application in QI monitoring, it is important to understand the concepts of random and non-random variation in run charts. When data points for an indicator in a QI initiative fluctuate up and down it doesn't necessarily indicate that the changes being introduced to try to improve care have had a significant effect on the health care process or outcome being monitored. Sometimes, fluctuations in an indicator result may be due to random variation. For an illustrative example of data patterns meeting the criteria for non-random and random variation, see Fig. 19, which is based on a hypothetical dataset.

NOTE!

Two rules that are a bit more technical and are not covered in this chapter are the 'runs' rule and the 'astronomical data point' rule. More information about these rules can be found in (40,43).

Fig. 19. Illustration of random and non-random variation as the basis for understanding run-charts rules



Upon examining the pattern of the indicator results in Scenario 2 in Fig. 19, it is clear that the data points fluctuate *randomly* around the median line between Day₂₄ and Day₃₈. This suggests that any changes made during this period probably had little to no effect on the indicator result and that the pattern of data in Scenario 2 data indicates “random variation.”

How can QI teams determine if the changes they are implementing are associated with real improvement? Scenario 1 in Figure 19 shows a different pattern of data points around the median line from day 1–23.

- Between Day₁₆ and Day₂₃, there are more than six consecutive data points that fall (‘shift’) above the baseline median line. Note that depending on the indicator’s desired direction, these data points might also appear below the median line.
- On Day₁₃, there is an outlier data point situated above the baseline median line. Note that this outlier could also be positioned below the median line, depending on the direction of the indicator.
- Between Day₁ and Day₁₁, there are more than five consecutive data points showing a consistent trend in a single direction (in this case, upward). Note that these data points might also display a downward trend based on the indicator’s desired direction of improvement.

These features are referred to as a shift, astronomical data point, and a trend, respectively, when applying run chart rules. They suggest that the data pattern being observed represents non-random variation in the dataset. In other words, there is a significant likelihood that the observed patterns in data are associated with one or more changes introduced during the period of measurement.

A shift or a trend of the plotted data in a run chart, in the desired direction of a QoC indicator, are signals of likely non-random variation in the data set resulting from one or more specific changes introduced during the measurement period. Evidence of non-random

variation in a QoC data set associated with the introduction of specific change(s) indicates that the change(s) are the likely reason for the improvement in the QoC indicator result during the measurement period. The application of these rules to interpret data in a run chart are illustrated below. The shift rule is illustrated in a hypothetical QI initiative to improve diagnosis and treatment of children with pneumonia. The trend rule is illustrated in a hypothetical example to strengthen blood pressure measurement in pregnant women as part of a QI initiative to improve detection and management of hypertensive disorders of pregnancy (e.g. pre-eclampsia, gestational hypertension).

Rule 1: A shift

Sometimes, the dataset plotted in a run chart during a QI initiative may shift above or below the baseline median in a single direction (i.e. either all above or below the median). A shift of six or more consecutive data points above or below the baseline median is referred to as a shift (40). When a shift is observed in a run chart, it is likely that the data pattern is due to the introduction of change(s) rather than due to random variation.

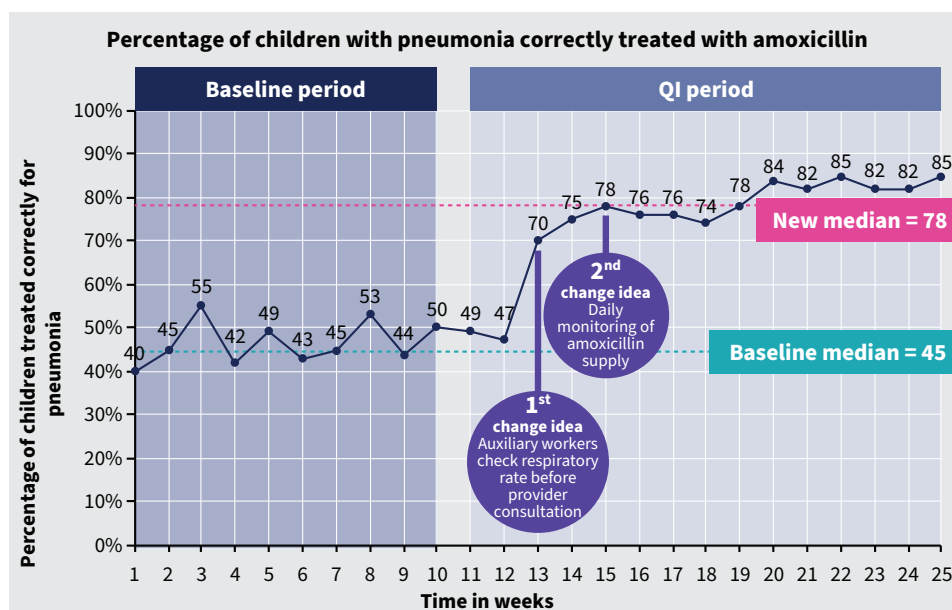
Fig. 20 shows the pattern of QoC indicators over time in a QI initiative to improve the diagnosis and treatment of children with pneumonia. One of the aims and QoC indicators in the QI initiative was to increase the percentage of children diagnosed with pneumonia correctly treated with the appropriate dose of amoxicillin. The figure shows a run chart plotting the pneumonia treatment QoC indicator over time. At baseline, before the start of the QI initiative, the median percentage of children with pneumonia receiving the correct amoxicillin treatment was 45%, based on a retrospective review of paediatric outpatient records. Between Week₁₁ and Week₁₅, the facility QI team tested two sequential changes to address two underlying causes of poor quality of pneumonia care that they identified using two standard problem analysis tools, a fishbone diagram and a process map:

- e) Lack of time in the busy outpatient clinic for providers to measure the respiratory rate of children, making pneumonia diagnosis difficult in individual children.
- f) Frequent stock-outs of amoxicillin in the facility, occurring weekly on average.

Two changes, shown in the annotated run chart in Fig. 20, were introduced by the QI team;

- *1st change idea:* Trained auxiliary workers measure and document the respiratory rate of all children *before* being seen by a provider, facilitating quick identification of children with cough and rapid breathing.
- *2nd change idea:* Initiation of a daily quick morning huddle with the facility outpatient nurse in charge and the pharmacist to check and document the stock of essential medications, including amoxicillin – with an automatic ‘pull’ order for amoxicillin when the amoxicillin stock drops to less than 50 treatment courses (rather than waiting for the usual monthly order to arrive).

Fig. 20. Illustration of a shift in a run chart demonstrating improvement in the percentage of children correctly treated for pneumonia



As can be seen in Fig. 20, there is a shift in the data around Week₁₃ in which six consecutive data points are plotted above the baseline median line during the time period when the QI team was introducing changes to improve diagnosis and treatment of pneumonia in children.

The shift shown in Fig. 20 demonstrates that the increase in the proportion of children correctly treated for pneumonia from Week₁₃ to Week₂₅ was likely due to the changes introduced by the QI team at Week₁₃ and Week₁₅ rather than the result of random variation. Because the improved indicator result remained stable until Week₂₅ (6–7 weeks after the shift was measured) the QI team can calculate a new median (in this case a 2nd median) to interpret indicator results as they introduce new changes after Week₂₅ to try to improve the percentage of children with pneumonia correctly treated from a median of 78% to a new third median greater than 90%.

NOTE!

Sometimes, a data point that is part of a visible shift may fall on the median, in which case it should not be counted.

Rule 2: A trend

Sometimes, the dataset plotted on a run chart may show a clear pattern of consecutive data points trending in a single direction (i.e. either going up or going down). Where there are **five or more** consecutive data points increasing or decreasing in a single direction, the pattern is referred to as a trend (40). When a trend is observed in a run chart, it is likely that the data pattern is due to specific change(s) rather than a result of random variation.

There are two important principles to apply when identifying a trend in a run chart:

- Ignore the median line and simply look for five or more consecutive data points either going up or going down.

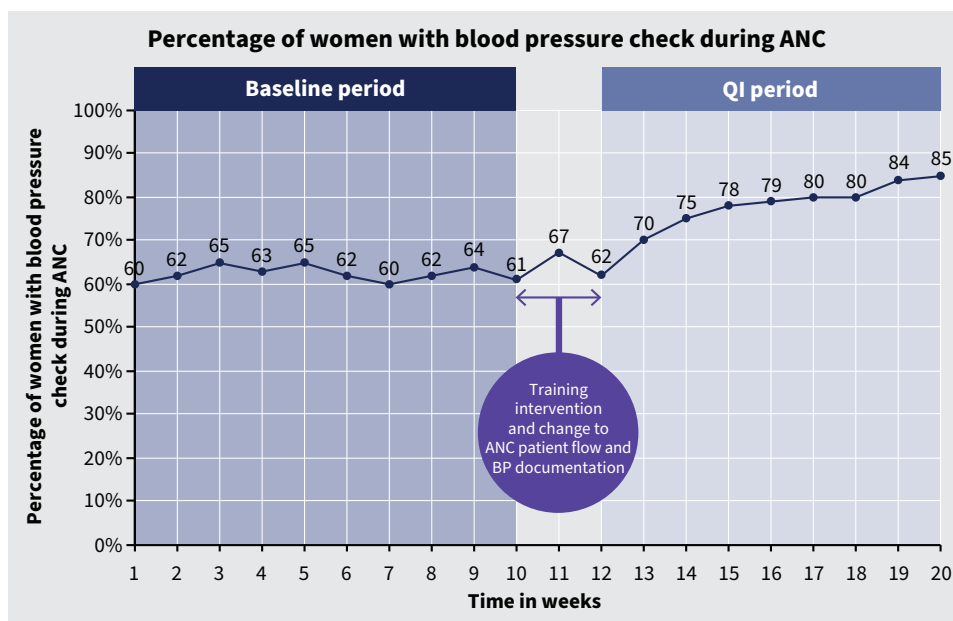
- If two consecutive data points are of the same value, they should be considered as one data point.

Fig. 21 shows the results of a QI initiative to improve the systematic measurement and documentation of blood pressure in pregnant women at every antenatal care (ANC) visit. High blood pressure is associated with leading causes of maternal mortality and morbidity including gestational hypertension, chronic hypertension, pre-eclampsia and eclampsia. A blood pressure (BP) check at every ANC visit is crucial for the early detection, diagnosis and management of hypertensive disorders of pregnancy.

As shown in Fig. 21, between Week₁₀ and Week₁₂, a training intervention and two changes to the usual ANC process were implemented by the facility in charge and the QI team to try to improve the measurement and documentation of BP at every ANC visit:

- *Training intervention:* One-day refresher training for all ANC health care providers and auxiliary health workers on hypertensive disorders of pregnancy, including the correct method of measuring BP and the importance of a quality BP check at every ANC contact.
- *Change:* Addition of a new column in the ANC register to document a woman's BP value at every ANC visit (in addition to documenting the BP value in the woman's ANC card).
- *Change:* Re-organization of ANC service flow to add a new step in the busy clinic: a trained auxiliary health worker checks and documents every pregnant woman's BP and weight *before* the midwife sees the woman with weekly quality checks of measured BP values in at least five pregnant women

Fig. 21. Illustration of a trend in a run chart demonstrating improvement in the percentage of pregnant women checked for blood pressure during ANC



As can be seen in Fig. 20, soon after the training intervention and changes to ANC processes to improve measurement and documentation of blood pressure at every ANC contact, there is a noticeable trend starting around Week₁₂, when eight consecutive data

points show a progressive increase in the proportion of women who had their blood pressure checked during ANC visits. Note that the data point on Week₁₇ and Week₁₈ have the same value. As indicated earlier, if two consecutive data points are of the same value, they should be considered as one data point. Therefore, the entire trend from Week₁₂ to Week₂₀ should be considered as having eight consecutive data points (instead of nine).

5.4.3 Display and analyse data across multiple sites

Subnational managers, such as district MNCAH managers, QoC focal points and health information officers, are often responsible for overseeing QI efforts across multiple health facilities. This includes monitoring quality of care results at the individual facility level and across facilities in multi-site QI initiatives. In some settings, a subnational QoC committee may be assigned to oversee subnational QI activities including a district or region-wide QI initiative.

To help subnational managers quickly review and interpret QoC data from multiple facilities, ‘small multiple’ data visualizations can be used (see Fig. 24 and the country sample in section 5.5). This involves displaying run charts for a common QoC indicator from different facilities side by side. These visualizations can be created on paper, in Microsoft Excel, or using data visualization software such as Tableau.

Managers can use both subnational-level data (e.g. district data aggregated across facilities) and individual facility-level data to inform management decisions. For example, they might encourage high-performing facilities to share their successful changes with other facilities during learning exchange visits, provide extra supervision to lower-performing facilities, or organize study tours to top-performing facilities. They can also monitor aggregated data to track and share overall progress at subnational level with participating facilities, other regions and with national-level stakeholders.

By segmenting data with an equity lens (e.g. race, gender, ethnicity, etc.) subnational or facility managers can also monitor how changes in QoC process and outcome indicators differ across sub-populations. Based on these results, they can analyse and address root causes of inequity in the local setting to guide interventions to reduce disparities in QoC. For subnational equity analysis to be possible, equity stratifiers need to be collected at the point of primary QoC data collection (e.g. ethnicity, marital status). The country example in section 5.5 includes an example of segmenting QoC indicator results for adolescents.

5.4.4 Use qualitative data

Qualitative data is an essential complement to quantitative data in a QI initiative. Qualitative data help inform improvement priorities, deepen understanding of local causes of quality problems, enhance understanding of the reasons for specific patterns in QoC indicator results, support analysis of promising changes, and help guide effective management of activities in a QI initiative. Common methods for collecting qualitative data include observations and focus groups with key stakeholders, including patients and caretakers (e.g. parents of paediatric patients), QI team members and managers.

Alongside quantitative data, qualitative insights are essential for evaluating the feasibility and acceptability of changes being tested by QI teams. These insights help teams decide whether to adopt, refine and retest, or abandon specific changes. For instance, reorganizing an emergency department triage process might result in the more timely

identification and diagnosis of children with severe acute health conditions. However, if focus groups with health workers and clients reveal widespread dissatisfaction with the reorganized triage system, it will be important to explore alternative changes to improve the triage process that are more acceptable to facility health workers and clients alike.

Qualitative data is particularly important for understanding ‘what matters most and why’ to patients, families, and health workers, shedding light on opportunities to improve people-centred health care and the experience of patients, families and health workers. Adaptive management approaches such as ‘after action reviews’ and ‘pause and reflect sessions’ provide valuable qualitative insights that can strengthen the management and adaptation of activities in a QI initiative. Box 7 describes the benefits of qualitative data in QI measurement.

Box 7. Benefits of qualitative data in QI measurement

Exploring the ‘Why?’ behind the data: While quantitative data offers valuable numerical insights into inputs, processes and outcomes for QI, it often lacks the context needed to fully understand the results. Qualitative data collected through methods such as interviews, focus groups or observations can clarify the reasons behind trends or unexpected results. For instance, if a hospital sees an increase in neonatal readmissions, qualitative insights from patient interviews or staff discussions can highlight gaps in discharge, communication, access and follow-up care processes.

Generating improvement ideas: Qualitative data is a useful tool for developing hypotheses, which can later be tested with quantitative data. Qualitative data is particularly helpful in the early phases of a QI initiative, when the problem is not yet clearly defined. For example, focus groups or interviews with health workers may reveal communications delays between maternity and surgical units during obstetric emergencies requiring surgical interventions (e.g. delayed C-section response times). This hypothesis could then be validated through quantitative indicators like tracking the time from a decision to operate urgently and the first surgical incision.

Gaining patient insights: Qualitative data offers a deeper understanding of patient experiences and can help inform the selection of improvement aims and patient-reported experience of care indicators and qualitative monitoring methods focused on what matters most to patients. Structured interviews or participatory workshops with patients, families and/or staff can capture lived experiences and inform interventions to improve patient-centred care as well as the experience of health workers. For example, learning how patients perceive their interactions with health care providers can guide the selection of interventions to improve patients’ experience as well as monitoring approaches that include qualitative methods (e.g. periodic focus groups with clients) and quantitative methods (e.g. regular administration of a brief client questionnaire).

Understanding causes of quality problems in a complex health system: Many health systems have underlying complexities that cannot be revealed through quantitative data alone. Qualitative methods can identify how processes in a health system

operate in practice versus how they were designed to function. Techniques such as ethnographic observations, shadowing or workflow analysis can map out the actual workings of a system, exposing bottlenecks, or system failures that may not be detected via quantitative data. Understanding the root causes of quality problems in complex health systems is essential for identifying and testing changes to address these causes.

Assessing the effectiveness of QI initiatives: While quantitative data can show whether selected QoC indicators have improved after a QI initiative was introduced, qualitative data is crucial for understanding the reasons behind success or failure. Qualitative data can also help identify any unintended consequences. By exploring challenges encountered during implementation of a QI initiative, qualitative insights can guide necessary adjustments to achieve or sustain improvement.

Enhancing the learning process: Establishing continuous feedback loops through regular focus groups, staff meetings or patient interviews can help monitor and strengthen the implementation of a QI initiative. This real-time feedback supports iterative improvements and allows the QI initiative to adapt to changing conditions. Moreover, stories derived from qualitative data can engage stakeholders emotionally, helping to drive motivation and support for further quality improvement efforts.

Table 10. Summary of key actions for national, subnational and facility levels

National	Subnational (regional/district)	Facility
• Provide leadership to foster a culture of data for improvement rather than for blame • Prioritize and regularly monitor selected QoC indicators to improve care across system levels • Value and provide resources and leadership for QI initiatives including support for data systems and measurement	• Provide leadership to foster a culture of data for improvement rather than for blame • Support front-line QI teams to collect, analyse and use data to improve care • Collect and regularly analyse QoC results (facility-specific and aggregated across facilities) to manage district-wide QI activities and provide information to national and facility stakeholders • Visualize run charts as small multiples (i.e. view multiple facilities' run charts side by side) to guide management of district-wide QI initiative activities	• Review existing QoC data to inform improvement priorities and define facility targets for improvement aims • Regularly plot QoC data using run charts • Interpret patterns in QoC data applying run chart rules to assess the effect of and guide iterative changes to improve quality of care

5.5 Country example

Several examples in this chapter illustrate the use of a run chart by a QI team to track progress and analyse the effect of iterative changes to improve care. The following country example describes a multi-facility QI initiative in two counties in Kenya to improve quality of client-reported family planning (FP) counselling, and the quality of postpartum family planning (PPFP) services as part of integrated MNH services. The example highlights many themes covered in this chapter. QoC indicators in the example below include indicators of effectiveness of care (PPFP initiated within 48 hours after birth), person-centred FP counselling as measured by client-reported experience, and equity of counselling by

calculation of client experience indicators among adolescent clients. Because there is limited literature on incorporating regular measurement of client-reported experience of care into FP programs and QI initiatives in resource-limited settings, mixed methods implementation research assessed the feasibility and acceptability of using a FP client questionnaire in a multi-site QI initiative.



A quality improvement initiative to improve quality of family planning counselling and postpartum family planning services in Vihiga and Homabay counties in Kenya

Context

Kenya has a well-established quality model for health and has recently adopted national health standards for improving quality of care for maternal, newborn and child health based on WHO standards. In 2021, the Kenya Ministry of Health published national FP standards. Standard 2 (QI) specifies that facilities should monitor quality of FP services including client satisfaction and interventions to address gaps and should conduct and analyse client exit interviews using a standard form. Standard 8 (service delivery and counselling) specifies that clients should receive information, education and communication to make informed choices on FP methods. Standard 12 (respect and dignity) specifies that clients should receive care that ensures respect, dignity without discrimination, autonomy, privacy and confidentiality.

QI initiative

Participatory design (late 2022)

In 2022, the MOMENTUM Country and Global Leadership Project in Kenya, funded by USAID, worked with the Ministry of Health and county and sub-county managers in Vihiga and Homabay counties to design and implement a QI initiative to support roll-out of the national FP standards with a focus on QI (standard 2), service delivery and counselling (standard 8) and respect and dignity (standard 12). Eight high-volume facilities – with support from county and sub-county managers, the Midwifery Association of Kenya (MAK) and the project – worked together to apply QI methods to achieve common improvement aims, regularly measuring and analysing a common set of QoC indicators and sharing learning across sites. County and sub-county managers were supported to monitor and analyse results across facilities to guide oversight and management of activities across sites.

Stakeholders elected to focus on national FP standards 2, 8 and 12 (with the assumption the approach could be used to achieve other standards in the future), and selected the improvement aims, QoC indicators, and data sources shown in Table 11. To achieve standard 2 – stipulating the use of standard client exit interviews – stakeholders recommended adapting two FP client questionnaires validated in other settings: the Person-centred Contraceptive Counselling Scale developed by Dehlendorf et al. (44), and the Method Information Index (45). To ensure that women in Vihiga and Homabay counties understood the questions, the project supported cognitive testing of a 10-item questionnaire that combined a subset of questions from the two questionnaires. Client questionnaires were administered in

the FP clinic and the maternity unit in the eight facilities. Questionnaire items were used to calculate client reported QoC indicators. Existing facility maternity registers and monthly reporting forms were used to calculate the PPFP indicator.

Table 11. Improvement aims, selected quality of care indicators and corresponding data sources

Improvement aims (adapted in each facility)	FP QoC indicators	Data sources
Improve quality of immediate PPFP	% of women who receive PPFP method of choice prior to discharge after delivery	Kenya Health Information system (based on summary reporting forms populated from data in facility maternity register)
Improve quality of person-centred FP counselling and Improve quality of adolescent-centred FP counselling	Respect, decision support, communication % clients who felt respected % clients who felt their preferences were taken seriously % clients who felt they were given enough information Counselling content % clients informed about possible side-effects % clients told what to do if they experience side-effects % clients told about bleeding changes % clients informed about other methods % clients told about switching to another method	Client exit questionnaires (~40/month per facility) Calculated for all clients and clients < 20 years of age

Implementation (2023–2024)

Key activities during the implementation phase included:

- **Initial training** (in-person): Initial training included basic QI training for facility QI teams, called Work Improvement Teams (WITs) in Kenya, and coach-level QI training for county and subcounty managers and MAK representatives to build their skills for coaching facility WITs and managing activities of the FP QI initiative. Training materials were based on existing Kenya Quality Model for Health and Institute for Healthcare Improvement basic QI training materials, which were adapted to incorporate practical skills-building exercises focused on the selected FP aims and QoC indicators.
- **Follow-up coaching** (in-person/virtual): The training was followed by nine rounds of on-site coaching visits (every 1–2 months) to the eight facilities conducted by county/sub-county managers and MAK representatives supported by the project. The coaching supported multi-cadre facility WITs to analyse root causes of quality problems related to improvement aims, identify and test changes to address

causes, and monitor patterns in selected QoC indicators using run charts. On-site coaching was augmented by regular virtual support to QI coaches and facility WITs by the project from January 2023 to September 2024. Emphasis was placed on building the confidence and skills of county and sub-county managers and MAK representatives to coach facility WITs.

- **Regular monitoring** (weekly to monthly): Facility WITs performed regular calculation, visualization and analysis of the selected QoC indicators with support from county and sub-county managers, MAK, and project staff to build core skills. The project developed a user-friendly data entry tool that auto-generated run charts that could then be annotated with key events and changes being tested. A baseline median for the PPFP indicator was calculated in each facility based on six months of retrospective HMIS data. In the absence of pre-intervention data, start-up 'baseline' medians were calculated using the first three months of data for client-reported indicators (six bi-weekly averages) from the newly introduced client questionnaires. County and sub-county managers coached WITs to enter their data to generate run charts and to analyse their results applying run chart rules (described in this section, above). The county and sub-county coaches were supported by the project to visualize and analyse aggregate results across the eight facilities and to use 'small multiples' to visualize and analyse results for individual facilities to guide management of the multi-facility QI initiative (e.g. facilitating learning exchange visits to higher-performing facilities; increasing coaching frequency for lower-performing facilities; planning sessions to update skills or facilitate learning in specific areas).
- **Regular learning exchange meetings:** Five learning exchange meetings were convened with county/sub-county managers, MAK representatives and facility WITs to share results and local solutions, foster friendly competition, and engage stakeholders in a shared journey of improvement. Representatives from other facilities and sub-counties joined the 4th and 5th learning exchange meetings to expose other sub-county and facility managers to the results and learning and to explore interest in expansion of the QI initiative to new sub-counties and sites.

Selected results

Selected results are shown for two client-reported FP counselling indicators (i.e. clients who felt respected; clients who reported they were given enough information to select a FP method) and for the PPFP indicator on initiation of FP by recently delivered women. Each result includes a brief synthesis of successful changes implemented by facility WITs to achieve the measured improvements in care.

Client-reported experience of FP counselling and selected changes implemented by WITs

Figs. 22 and 23 show the aggregate data across the eight facilities during the start-up and QI periods for the proportion of clients who reported they were given enough information during FP counselling (Fig. 22) and the proportion of clients who felt respected during FP counselling (Fig. 23). A total of 5781 clients of all ages completed the client questionnaire across the eight facilities from January 2023 to April 2024 (2735 clients all-ages [662 clients < 20 years] in Vihiga County and 3046 clients all-ages [793 clients < 20 years] from Homabay County).

Fig. 22. Proportion of interviewed clients who felt they were given enough information during FP counselling (all ages and < 20 years)

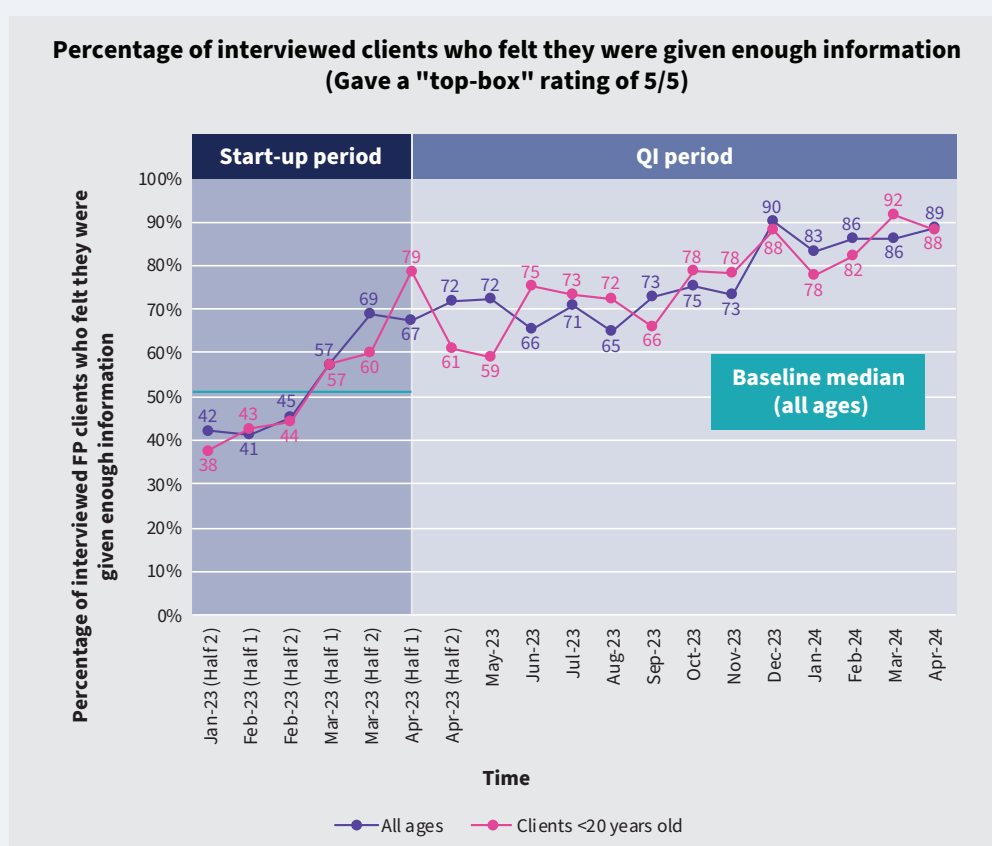
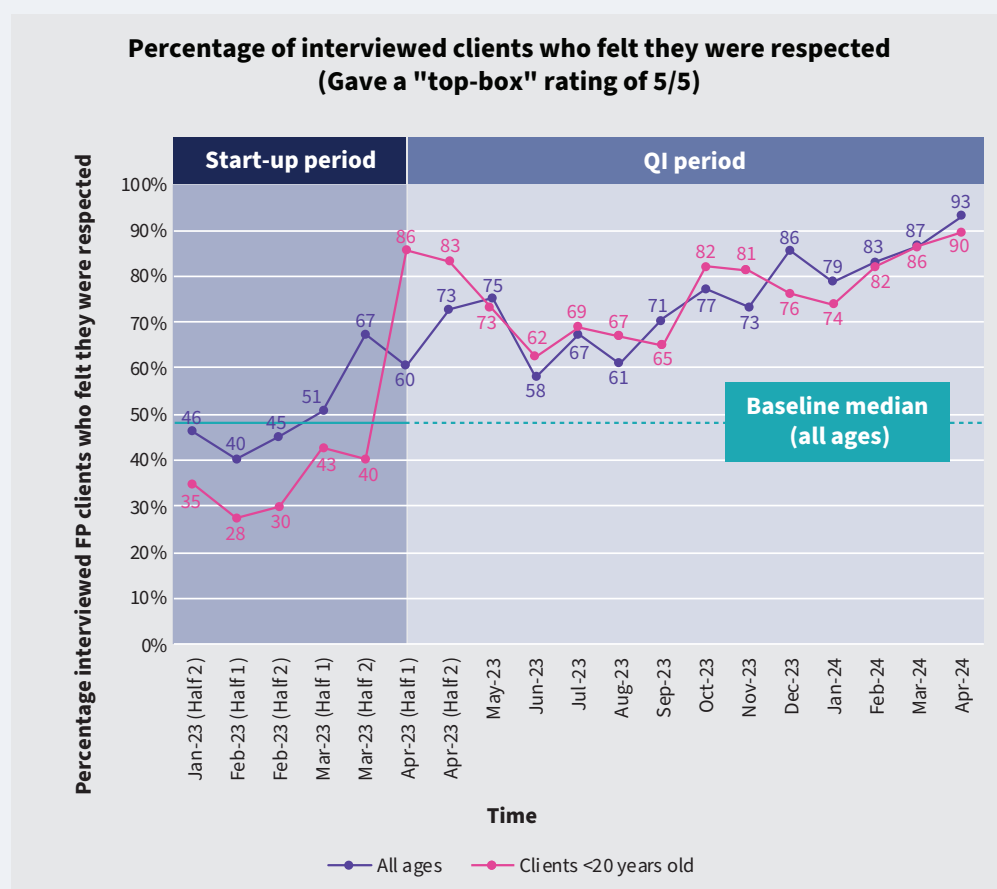


Fig. 23. Proportion of interviewed clients who felt they were respected during FP counselling (all ages and < 20 years)



As seen in Figs. 22 and 23, there is a shift of greater than six consecutive data points above the start-up baseline median in the % clients reporting they received enough information (Fig. 22) and felt respected (Fig. 23) during the QI intervention period. The presence of a shift of six consecutive data points above the baseline median during the QI intervention period indicates a high probability that results are due to changes introduced during the QI intervention period (see explanation of the run chart shift rule in section 5.4.2). As seen in Fig. 24, a lower % of adolescent clients than % of all-age clients reported that they felt respected during the start-up 'baseline' period. Over time, the difference in reported respect between adolescent clients and all-age clients diminishes. Selected common changes implemented across facilities to improve quality of FP counselling for all-age and adolescent clients are described below.

Fig. 24. Small multiple facility-specific results: Proportion of interviewed clients in facilities A-H who reported they felt respected during FP counselling (n=5781 total clients across all eight facilities from January 2023 to April 2024)

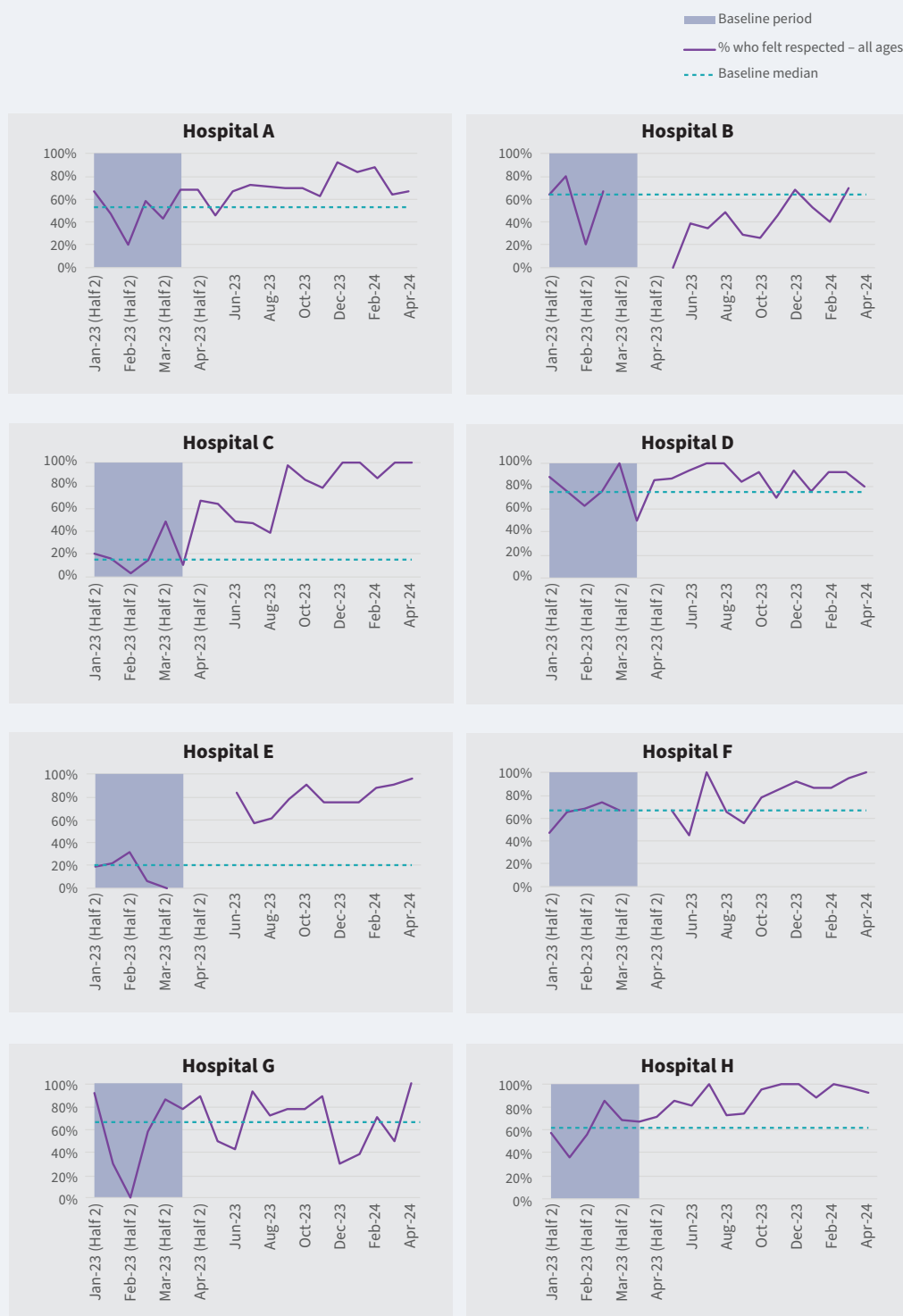


Fig. 24 shows the individual facility results for the percentage of clients who felt respected during FP counselling during the QI period. As seen in Fig. 24, the pattern of results over time for % clients who felt respected varies by individual facility,

with 6 of 8 facilities demonstrating a shift of six consecutive data points above the start-up baseline median during the QI intervention period. Fig. 24 demonstrates the importance of analysing patterns in facility-specific data (in addition to aggregate data), since aggregate results may obscure important differences across individual sites. Analysis of patterns in aggregate and facility-specific data by managers is important to guide effective management of a multi-facility QI initiative.

Selected changes implemented by facility WITs to improve person-centred FP counselling in the facility FP clinic and maternity ward

- Regular administration of client questionnaire by facility WITs.
- Regular analysis of client-reported QoC indicators by facility WIT members using a run chart to understand the effect of the changes they are testing and to identify additional change ideas to address areas of poor performance.
- Periodic focus group discussions with clients (including adolescents) to understand clients' perceptions of respect and desired information during FP counselling.
- Use of a flipchart, anatomical models and fixed tray of FP methods that women could touch to support person-centred individual and group FP counselling.
- Redesign of the outpatient FP clinic triage process to avoid redundant procedures at multiple points.
- Recruitment of youth champions to sensitize adolescents on FP services by initiating biweekly weekend clinics and offering FP services during weekdays at flexible hours.
- Training youth champions and stationing them at the maternal–child health clinic to counsel and direct adolescents to respective service points.

Enabling interventions implemented by county and sub-county managers and MAK representatives supported by project team

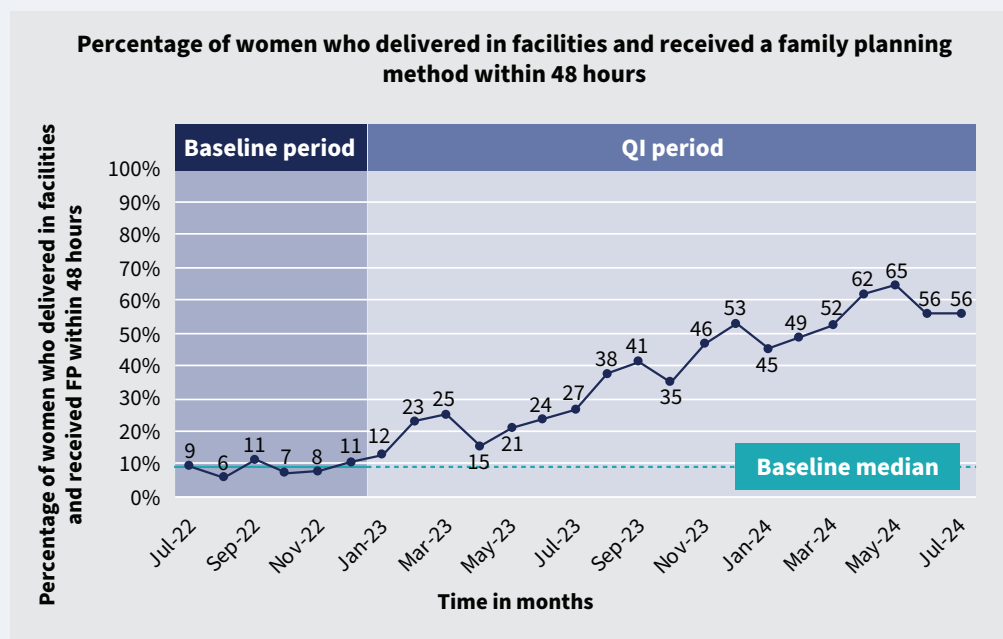
- On-site clinical mentorship of nurses organized by facility in-charge, sub-county reproductive health managers and MAK representatives (mentoring focused on strengthening health worker confidence and skills to provide person-centered, evidence-based FP counselling using medical eligibility criteria (MEC) wheels and balanced strategy plus counselling cards (https://knowledgecommons.popcouncil.org/departments_sbsr-rh/727/).
- Reinforcement of FP counselling skills using interactive role plays and peer feedback during learning exchange meetings.
- Orientation of the maternal–child health team on adolescent-friendly FP counselling approaches, emphasizing respect, confidentiality and non-judgmental attitudes.
- Introduction of a tally sheet to document FP counselling and selected method, including dates, numbers counselled, and selected method. Facility WITs reviewed the tally sheet during weekly meetings.

Initiation of a PPFP method of choice by women who recently delivered

Fig. 25 shows the aggregate results across the eight facilities during the baseline and QI period for the proportion of recently delivered women who initiated a PPFP method prior to discharge. The baseline data is based on a retrospective review of

the maternity records. A total of 17 841 deliveries occurred across the eight facilities during the baseline and QI periods. Selected common changes implemented by the facilities are noted below.

Fig. 25. Proportion of recently delivered women who initiated a PPFP method prior to discharge in the eight facilities



Selected changes implemented by facility WITs in the maternity ward to improve initiation of a PPFP method of choice by women who recently delivered (see also changes above to improve quality of person-centred FP counselling):

- Designation of a 'PPFP nurse' to provide counselling and a FP method of choice prior to discharge for all recently delivered women in the maternity ward.
- Strengthening of PPFP counselling during antenatal care (ANC) visits, with systematic documentation of selected FP method in ANC section of mother-child booklet.
- Confirmation of FP method selected during ANC (as documented in mother-child booklet) during intrapartum and postpartum care, including support for selection of a different method if desired.
- Inclusion of spouse in PPFP counselling when desired by the woman.
- Use of a privacy screen (or separate room when available) to ensure privacy during counselling and administration of a PPFP method of choice.
- Inclusion of a pharmacy technician on facility WIT and standardization of re-order processes to ensure minimum buffer stock of FP commodities.
- Public display of stock levels in maternity ward and FP clinic with review during weekly WIT meetings.
- Orientation and mentorship of village health teams (volunteers) by facility midwife on key FP messages to include in existing regular village counselling sessions
- Regular review and analysis of PPFP QoC indicator results using a run chart and applying run chart analysis rules during WIT meetings.

Chapter

6

**Assessing and
improving data quality
to strengthen quality
improvement results
and stakeholder trust**

6. Assessing and improving data quality to strengthen quality improvement results and stakeholder trust



6.1 Key messages

- The data collected and utilized in a QI initiative must be of high quality to ensure accurate insights for meaningful improvements and to build trust with QI stakeholders.
- There is a cycle of data use and quality, which can either strengthen or erode both elements: when the quality of data is poor it is less trusted and less used, leading to lower demand for data and investment in strengthening data systems.
- Using data on an ongoing basis provides an opportunity to identify data quality problems early and develop appropriate remedial actions.
- Interventions to assess and improve quality of data can be applied to data already integrated into HIS or to data that is collected during a time-limited QI initiative (e.g. a QI initiative in a single facility or district).



6.2 Chapter overview

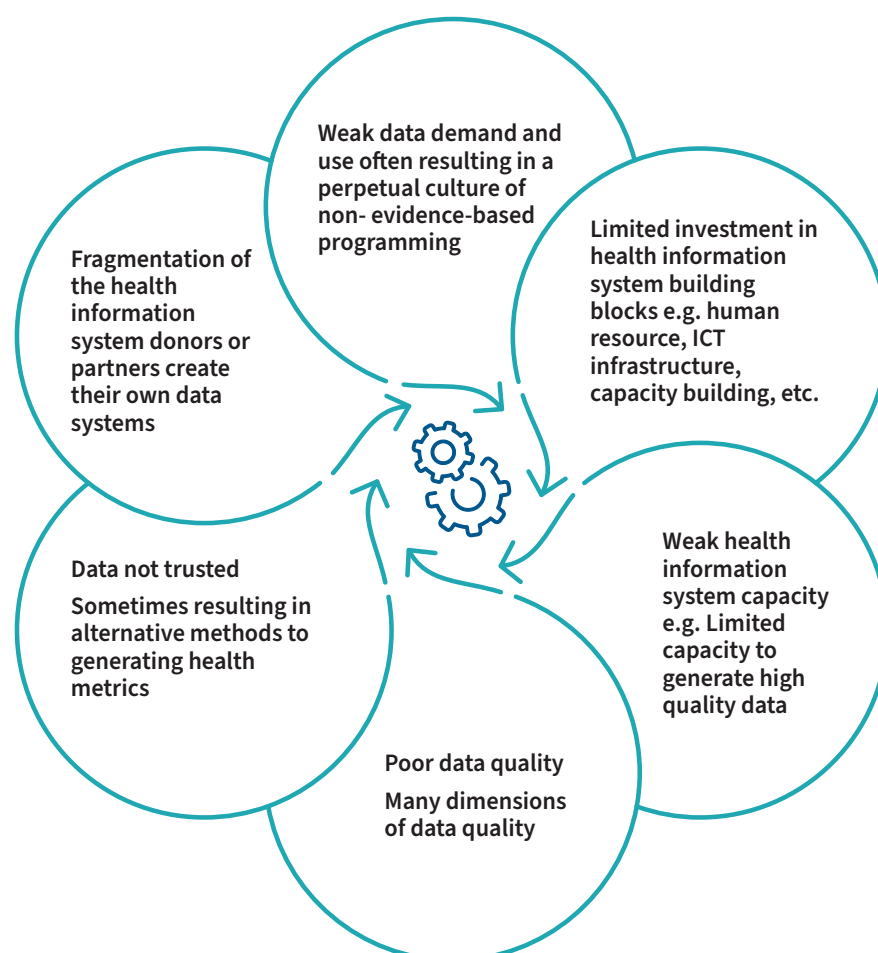
Chapter 3 describes some approaches to assessing the availability of data in the local HIS for QoC indicators, required for both long- and short-term monitoring of QI efforts. Guidelines for assessing and improving the quality of data collected routinely in the national HIS are available in several technical resources published by WHO (47–49). These resources include generic guidance and tools on data quality assurance (DQA) and data quality control (DQC), which can each be used for or adapted to any programme area. The DQA training package (49) includes an application for use in the DHIS2 for routine data quality checks and for annual data quality desk reviews. For countries that do not use DHIS2, Excel and CSPro tools are available together with the training materials.

This chapter does not reproduce the guidance already published by WHO. Rather, it provides guidance on localized data quality improvement (DQI) approaches, applying the principles and methods used in QI initiatives to understand causes for poor quality of data and iteratively test changes to improve data quality based on identified causes.

6.2.1 Vicious cycle of poor-quality data

Successful QI initiatives generate and use high-quality data to guide iterative improvement. As described in chapter 4, data required for a QI programme can be obtained directly from various data sources in the local HIS, or QI teams can generate new data based on their information needs for a specific QI programme. However, in many low-income settings, data collected through the existing HIS may be of poor quality. The lack of quality HIS data has created pressure for the measurement community to use alternative methods of generating health-related estimates including mathematical modelling. Such alternative methods continue to divert already scarce resources that are needed to strengthen HIS (50–53). Furthermore, when the quality of data is poor, some donors may collect their own data by establishing parallel data systems, which further fragments country-level data pipelines. This creates a vicious cycle of poor data quality as illustrated in Fig. 26.

Fig. 26. A vicious cycle of poor data quality in HIS



Source: (46).

In many LMICs, health facility data can be inaccurately recorded or not recorded at all (54–56). Some of the factors that lead to poor data quality in health facility data collection and recording tools include: illegible handwriting during data capture or reporting; unsuitable or unstandardized data formats; lack of a standardized data dictionary in health facilities; lack of time or motivation to record high-quality data; calculation errors; insufficient data quality checks at data entry level; non-adherence to data collection

or recording guidelines and data definitions; and a poor culture of data use which disincentivises health facility-based teams to collect and report high-quality data (57). In QI programs, these challenges can emerge when new QoC indicators are integrated into the HMIS for routine measurement and monitoring. If health care workers perceive these new indicators as an added burden, especially when their value is not yet evident, data recording and indicator calculation may initially suffer in quality. Likewise, established indicators can be affected by ingrained practices, such as habitual inaccuracies in data entry, which can also undermine data quality. Efforts to improve the quality of data must therefore address the underlying factors that contribute to poor quality of data.

6.2.2 Mechanisms for improving data quality

Assessing and improving the quality of data in the context of a QI initiative will typically involve three interrelated mechanisms namely DQA, DQC and DQI. These concepts are explained below.

Data quality assurance

DQA is preventive in nature and involves the use of tools and procedures aimed at minimizing or even preventing errors during data recording, extraction, collation, reporting, analysis and dissemination. If done well, and given its preventive focus, DQA can be a cost-effective intervention to improve the quality of data collected as part of a QI initiative. Proactive prevention of errors means that less time and money will be required to correct errors retrospectively.

Data quality control

Conversely, DQC involves the use of data verification and review techniques and tools on an ongoing basis, with a view to ascertaining the extent to which pre-determined data quality requirements are met. DQC is therefore an important component of data quality improvement in that data quality checks are routinely conducted, process failures identified, and corrective efforts put in place to improve the quality of the data at any level of the HIS hierarchy.

Data quality improvement

DQI is an approach that applies key QI principles to improve the quality of data based on: a) an understanding of leading data quality problems in a local setting (e.g. information generated through DQC and other assessments of data quality ; b) a structured analysis of the root causes for poor quality of data in the local setting using QI analytic tools such as fishbone diagrams, '5 whys', process mapping; and c) testing of local changes that address root causes of poor-quality data and monitoring a few selected indicators of data quality (e.g. data completeness, accuracy, timeliness) to determine if the quality of data is improving.



6.3 Practical guidance

6.3.1 Localizing the assessment and improvement of data quality using QI methods

Implementing QI methods to enhance the quality of data collected and reported by health facilities for improving MNCH care can significantly complement existing government mechanisms, such as DQA and periodic data quality reviews. The importance of this hybrid approach is highlighted below:

- DQA mechanisms establish guidelines and standards for data quality at a national or subnational level, ensuring consistency and compliance across the health care system. QI methods can provide a systematic, step-by-step process for health care facilities to implement and operationalize these national standards. By embedding QI cycles like the Plan-Do-Study-Act, organizations can continuously improve how they meet national data quality standards in a practical, timely and localized manner.
- Periodic data quality reviews highlight gaps, inconsistencies and areas where data quality falls short of national standards. These reviews provide important insights but are often more retrospective and evaluative. QI methods are action-oriented and can help QI teams respond to the gaps identified by these reviews. For example, after a review identifies issues with timeliness or completeness of data for newly introduced QoC indicators, QI approaches can help health facilities and administrators at subnational level systematically design, test and implement interventions to address these specific gaps.
- Data quality reviews are also often conducted at specific intervals (e.g. annually, or semi-annually), focusing on snapshots of data quality over time. QI methods can complement such processes by fostering continuous improvement in data quality through integrating ongoing monitoring and real-time feedback loops. This ensures that improvements are sustained between periodic reviews and that health facilities are continuously improving their data collection, management and reporting processes, not just responding to the review outcomes.
- If not implemented properly, national and subnational DQA mechanisms may also appear to promote a top-down approach to ensuring data quality, due to their focus on compliance and adherence to protocols. When QI methods are embedded in such mechanisms, this can promote a culture of data quality within health care organizations. By involving staff at all levels in continuous improvement efforts, QI creates a bottom-up culture where data quality is seen as an ongoing priority, not just something to be reviewed periodically.
- National and subnational DQA mechanisms also typically involve auditing and validating data reported through national or subnational HIS, focusing on various data quality attributes for the data that feeds into aggregated reports. Using QI methods to improve data quality can help ensure that the data feeding into national and subnational systems is accurate *at the point of care*.

6.3.2 Key actions at health facility and subnational level

Health facilities are the primary source of health care data, where patient information is recorded, and services are delivered. Ensuring data accuracy at this level is foundational for generating reliable reports at subnational, national and global levels. Quality individual patient data at the facility level also directly influences the quality of patient care because accurate individual patient data is essential for clinical care decision-making (e.g. making an accurate diagnosis; selecting and accurate dosing an appropriate medication; accurately monitoring a patient's clinical status; providing appropriate follow up care). By improving data quality at the source, the entire data reporting and utilization chain benefits from cleaner, more reliable data. This reduces the need for extensive data cleaning or validation at subnational or national levels, streamlining reporting processes and improving overall system efficiency. However, subnational actors also have a role to play in ensuring the quality of data submitted from health facilities. The key actions at both levels are reviewed in this section of the chapter.

Illustrative actors



Health information officers, in consultation with QI team members and subnational HIS and M&E managers as appropriate.

a. Identify and define the data quality problem

Identifying the specific data quality issue and its underlying causes is a crucial first step in crafting a strategy to improve data quality. While common data quality problems and their causes are generally understood, they can vary across health facilities at any given time. Clearly defining the local data quality issue and its causes enables targeted interventions and provides a solid foundation for a successful data QI initiative.

- Start by collecting information that clearly defines and demonstrates the existence and scale of data quality problems. Both qualitative and quantitative data are valuable at this stage.
 - For instance, in a multi-site QI initiative overseen at the subnational level, the manager might observe unusual patterns in the completeness and timeliness of data submitted by health facilities for newly introduced QoC indicators prioritized for long-term monitoring of integrated management of childhood illnesses (IMCI). To validate these observations, the manager could commission a data quality audit of historical data. This audit would help quantify the percentage of missing fields, incorrect entries and delays in data submission. Establishing this baseline provides measurable evidence of the problem and offers a concrete starting point for monitoring progress toward improvement.
 - Once the audit has been completed, the manager may also convene the subnational and/or the concerned health facility QI teams during the regular QI meeting, to discuss where the problem is occurring, who is involved or affected by the problem, when it occurs, and the consequences of the having this problem in this QI initiative. From here, a clear and concise problem statement that captures the issue in specific and measurable terms can be prepared. In this case, a problem statement can be written as follows: *Health facilities X and Y have been reporting incomplete and inaccurate data for the IMCI QoC indicators, with over 30% of fields left blank or filled incorrectly in*

routine reports over the past three months. This has delayed timely decision-making and resource allocation, undermining efforts to improve IMCI-related processes and outcomes.

- When multiple data quality problems are identified it may be necessary to prioritize problems based on their urgency, the feasibility of improvement, and their impact on the QI initiative. Prioritization ensures that the team focuses on the most critical issues first.

b. Analyse the root causes of the data quality problem(s)

Identifying the root causes of the data quality problem enables QI teams to understand why data quality problems occur and to develop targeted solutions that address the underlying issues, rather than just the symptoms. A thorough root cause analysis will help prevent recurrence of the issues and ensure that any improvements are sustainable.

- Consider creating a process map or flowchart that illustrates how data are collected, entered, processed and reported. Understanding the flow of data helps identify potential points where errors could occur. Mapping patient flow and data flow at service points is also useful in visualizing where problems arise. Chapter 5 explains and gives an example of how data flow mapping can be conducted in health facility for any technical area.
- Consider applying structured problem-solving tools to uncover the root causes of data quality issues. There is a host of such tools used in mainstream QI which can be adapted to a data QI improvement initiative. However, this chapter does not go into details to explain what each of these methods entails but provides some illustrative examples of their application in data QI.
 - *Fishbone diagram (also known as an Ishikawa diagram)*: This is a visual tool used to categorize potential causes of a problem into different types (e.g. people, process, technology, environment and data). Each category helps the team brainstorm possible sources of a given issue (58). Using the IMCI example, assuming the identified problem is inaccurate data, the ‘People’ category could include issues like insufficient training of staff, while the ‘Process’ category might include lack of standardized data entry procedures.
 - *5 Whys*: This is a simple but effective method of asking ‘why?’ repeatedly (usually five times) to drill down into the root cause of the problem. This technique helps reveal deeper, systemic causes that might not be immediately obvious (59). Using the IMCI example, assuming the identified problem is data entry errors, the 5 Whys could be developed as follows:
 - Why are there frequent data entry errors for the newly introduced IMCI QoC indicators?*
Because the staff entering the data often makes mistakes while inputting patient information.
 - Why do staff make mistakes while inputting patient information?*
Because they are rushed due to the high workload and insufficient time to enter data carefully.
 - Why is the workload so high for the staff responsible for data entry?*
Because there aren’t enough staff members assigned to handle both patient care and data entry tasks.

iv. *Why aren't there enough staff members to manage both patient care and data entry?*

Because the facility has not prioritized hiring additional staff or reassigning roles to specifically address data management needs.

v. *Why hasn't the facility prioritized hiring or reallocating staff for data management?*

Because there is a lack of awareness of the importance of accurate data and no budget allocated for expanding the team dedicated to data quality.

- *Pareto analysis*: This is a technique used to identify the most significant causes of a problem, based on the principle that a small number of causes often contribute most to the problem (the 80/20 rule). By prioritizing the most common causes, the team can focus their efforts effectively (60). For example, a Pareto analysis of data quality issues related to the IMCI QoC indicators might reveal that 80% of data inaccuracies are caused by just 20% of health workers who were not trained in the new data collection system.
- Consider engaging the right stakeholders on the QI teams to gather credible insights that may not be evident during data review. Such insights can be gathered during the same QI meetings mentioned in the previous action on problem identification and definition.
- After identifying the root causes, prioritize them based on their impact on the data quality issue and the feasibility of addressing them. This ensures that the team focuses its efforts on the most significant causes that are within their control to change. For example, if training is identified as a major root cause, and it is feasible to implement a structured training programme, this issue may be prioritized over technical issues that require extensive resource investments.
- Depending on resource availability, it may be helpful to confirm the identified root causes by reviewing data, engaging stakeholders and testing assumptions. For example, the team may choose to validate that lack of training is a root cause of inaccurate data recording by reviewing staff training records or observing data entry practices in real time.

c. Develop and test interventions

After identifying the root causes of data quality problem, the next step is to develop and test localized interventions. This step involves generating potential solutions (or change ideas), referred to as 'interventions' in this chapter, to address the identified problems and then testing these ideas on a small scale before adopting the intervention permanently and extending to other facility units and facilities. It is important that adopted interventions are effective, feasible and sustainable.

- Once the root causes have been identified and prioritized, the QI teams can engage in brainstorming sessions to generate ideas for change. All team members, regardless of their role, should be encouraged to contribute suggestions for solving the identified problems. When trying to find a potential solution, it is important to:
 - Ensure that change ideas directly address the root causes uncovered during the analysis phase. For example, the solutions should target the systemic, human, technical or process factors that are contributing to the problem, whichever is or are the root cause(s).

- Leverage all members of a multidisciplinary QI team. Clinical staff might suggest workflow changes, data clerks might offer insights into improving data entry tools, and IT staff might propose technological upgrades. Finding a balance between several and sometimes conflicting perspectives may be tough but is important, nevertheless.
- After generating a list of potential change ideas, the QI team should evaluate and prioritize them based on several criteria:
 - Can the change idea be realistically implemented with the available resources, staff, and infrastructure?
 - Will the change idea significantly improve the identified problem? It is important to prioritize interventions that address the most critical root causes and have the potential for high impact. For example, if the QI team is considering both training workshops for existing staff and hiring additional staff, they might prioritize training workshops if they are more immediately feasible and expected to have a more direct impact on data quality.
 - Can the intervention be maintained over time? Consider whether the change can be easily integrated into routine practices or workflows.
 - Is there existing evidence or previous experience suggesting that the intervention will likely lead to improvement?
- For each selected intervention, the QI team should create an action plan, including:
 - The specific improvement to be achieved by implementing the selected intervention(s) (e.g. to reduce data entry errors by 20% within three months).
 - The steps required to implement the intervention, including who is responsible for each step and what resources will be needed. An implementation plan may, for example, include developing a training curriculum on data entry standards for the indicators of interest, scheduling and conducting the training session for all data clerks and health workers, and providing data entry jobs such as checklists or guides at each service point.
 - A timeline for implementing the intervention, including key milestones and deadlines.
 - Indicators to assess whether the intervention is leading to improvement. These indicators should be specific, measurable, achievable, relevant and time-bound (SMART).
- Consider carrying out small-scale testing (i.e. a pilot) of the intervention depending on the geographical scope. If the intervention is to be implemented across several health facilities, it would be important to test it on a small scale before full implementation to see how it works in practice. Testing allows the QI team to refine the idea, address any unforeseen challenges, and gather data on its effectiveness before scaling up. It is also important to start small by testing the intervention in a single service point or group of staff, which would allow teams to manage issues that arise during the testing phase more effectively. For example, if the change idea involves introducing a new data entry process, the QI team can pilot the process in one unit of the health facility to gather feedback and assess impact before rolling it out more widely.
- It is important to define timebound indicators to monitor the effect of the priority interventions on the data quality problem. The performance indicators might be quantitative (e.g. % of records with data errors, timeliness of data reporting) or

qualitative (e.g. staff satisfaction, ease of use). During the testing phase, the QI team should closely monitor the implementation and collect data to track progress. This involves gathering feedback from staff involved in the testing and monitoring the selected indicators regularly. For example, after training staff in a new data entry protocol, the QI team in participating health facilities might review a sample of data records every week to see if errors are decreasing. Additionally, they could conduct brief enquiries (e.g. interviews) with data clerks or health workers to gather perspectives on whether the new process is easier or more difficult to use.

- During the planning phase, it is important to anticipate potential challenges or resistance that may arise during the testing phase. For example, the staff may initially resist changes due to unfamiliarity or perceived increased workload, or technical issues with data entry tools may arise. It is therefore important to create contingency plans to address these challenges proactively, for example by developing a plan for ongoing support, such as regular onsite support conducted by subnational QI teams.

d. Implement effective interventions at scale

This step entails implementing the interventions that have been piloted and found to be successful at small scale and gathering additional context-specific data to evaluate their performance in the new setting.

- Before fully implementing the intervention at scale, ensure that all necessary resources, staff and materials are in place. Preparation may include: communicating the upcoming change to all relevant stakeholders at national and subnational levels to ensure that they are aware of the purpose, process and their roles in the implementation; providing training or orientation to individuals who will be directly involved in implementing the intervention; and ensuring that any tools, templates or technological systems needed for the intervention are ready and accessible.
- Closely monitor the process as the interventions is being implemented in new sites as this is important for the identification of any unexpected issues, bottlenecks or challenges that may arise. Monitoring also involves gathering feedback from those involved in the implementation. Data can be collected for the same indicators used during the pilot phase to evaluate the effectiveness of the change across the settings of interest.
- Throughout the implementation phase, it is important to engage with staff and other stakeholders to gather their input and feedback. This can be done at the same time the regular QI meetings are taking place, where both data quality issues and the wider QI related issues can be discussed simultaneously. This helps identify areas where the changes are working well and where adjustments may be needed. Staff buy-in is critical to the success of the change, so fostering open communication is essential.
- If any issues arise during the initial implementation of an intervention, the QI team should be prepared to troubleshoot problems and make minor adjustments to the process as needed. However, major changes to the plan should be avoided unless necessary, as they could undermine the validity of the change ideas. For instance, if data clerks and health care workers are struggling to adapt to a newly adapted health facility register or case note, the QI team might provide additional training or technical support. If a specific workflow is causing delays, the team could adjust the sequence of steps to improve efficiency.

- Consider maintaining detailed accounts of what was implemented, how it was done and any deviations from the original plan. Documentation is crucial for analysing the results during improvement and for replicating the change if it proves successful.

e. Evaluate progress and opportunities for further implementation

It is important for QI teams to evaluate the effectiveness of the implemented interventions to determine whether they led to the desired improvements. This phase involves a careful and systematic analysis of the data collected during the large-scale implementation phase, comparing it to baseline data and the objectives set during the planning phase.

- For quantitative data, consider applying the same methods described (in Chapter 4) on how to analyse and visualize data collected routinely in health facilities. The principles remain the same although other data analysis techniques can be used to assess the significance of change. The QI team might be interested to see if the performance steadily improved over time or if it fluctuated, or whether there are specific days or times when errors spiked or dropped. This kind of information can feed into the next phase of improvement planning. They may also segment the data based on the roles of the data capture team, service point, etc.
- For qualitative data it might be useful to review feedback from staff and stakeholders to assess whether the change is perceived as effective and sustainable. For example, the baseline data showed a 20% error rate in data entry before the intervention. After implementing a new training programme, the error rate dropped to 10%. This meets the QI team's objective of reducing errors by at least 50%, but may not be sustainable if the same resources needed to bring about this change are not maintained. It may also be important to consider if there have been unintended consequences of the change, such as increased workload, reduced efficiencies in the routine care of patients.
- Once the data has been analysed, consider holding a meeting with the relevant QI stakeholders to discuss the results and their implications. It is important to encourage an open discussion on what worked, what didn't, and what could be improved. This meeting may also be a conducive platform to make decisions as to whether the intervention should be adopted on the basis that it led to significant improvements with minimal unintended effects across different settings, or be adapted if it had missed results. If the intervention did not lead to improvement or created unintended negative results across settings, it may be necessary to abandon it and explore alternative solutions.
- If the QI team decides to adopt the intervention to improve data quality for long-term implementation, the next step is to standardize the process to ensure that the new practice becomes the norm and is consistently followed across all concerned health facilities. This may include detailed documentation of protocols, workflows, roles and responsibilities to serve as a reference for all staff to ensure consistent implementation across sites. In some instances, it may only be necessary to revise existing guidelines, protocols, forms or tools to reflect the standardized change.
- As the goal is to ensure that the interventions implemented can be maintained over time and continue to produce positive results without requiring ongoing external support or intervention, it is important to ensure that the standardized change are embedded into job descriptions, performance evaluations, as well as local policies.

Table 12. Summary of key data actions for national, subnational and facility levels

National	Subnational	Facility
• Ensure there are enough resources at subnational and facility levels to support DQI activities • Provide ongoing capacity building and training around DQI • Create learning platform/systems for peer learning among health information officers/data clerks on DQI efforts	• Include standing agenda item for QI teams at subnational QI meetings to discuss data quality issues and their implications for the QI initiative(s) • Incorporate data quality into supervision mechanisms (e.g. supportive supervision) • Ensure that all health facilities have a list of operational definitions of what is being measured as part of the QI programme, and how to collect and report the data • Support health facilities to ensure that the responsibility for data collection and reporting at each service point is clearly assigned to the relevant staff (i.e. should be in their job description) • Ensure that all health facilities use standardized or compatible data collection forms (e.g. medical records, registers) that are adapted to the QI initiative • Ensure that data received from lower levels (district/health facility) are systematically verified for data quality • Regularly implement procedures to reconcile discrepancies in the reported data	• Consider appointing a data quality focal person on the facility QI team • Establish strong DQA, DQC and DQI mechanisms in QI monitoring efforts • Ensure that all data source documents (e.g. medical records, registers) are available for auditing purposes • Incorporate health care improvement actions by QI teams and DQI efforts into management meeting agenda

6.4 Country example

This case study describes how a DQI programme was built into the Project Fives Alive! (PFA!) which was implemented in Ghana by the National Catholic Health Service, the Ghana Health Service and the Institute for Healthcare Improvement between 2008 and 2015.



Project Fives Alive! in Ghana

The mission of the Project Fives Alive! (PFA!) was to reduce preventable deaths among children under five by embedding QI approaches into health care across the nation. With over 80% of the public sector hospitals involved and a target of covering 30% of the districts, the project set out to create lasting change in health care delivery for some of the most vulnerable populations.

The path to achieving this monumental goal was not easy. For PFA! to succeed, reliable and high-quality data was essential. Data-informed decisions helped track progress, highlighted gaps in health care delivery, and guided new actions to improve service delivery. But like many developing health care systems, the country struggled with data quality – completeness, accuracy, timeliness, and reliability of the data reported in the district health management information system (DHIMS).

Realizing this, PFA! launched a bold initiative to improve data quality – one that was built on thorough planning and a deep understanding of the local context. This DQI programme aimed to strengthen the data collection process, root out inaccuracies, and ensure that every bit of information that made it into the system could be trusted.

At the heart of this effort were the district health information officers and hospital data officers. The PFA! team began by empowering them, providing intensive training on quality planning tools to help diagnose the root causes of poor data. For many, this was their first opportunity to develop skills in understanding and resolving data quality issues systematically.

One of the major challenges lay in discrepancies between the raw data collected in health facilities and the final figures entered into DHIMS. This mismatch meant that critical information could be lost or distorted, affecting everything from patient care decisions to the allocation of resources. In response, PFA! implemented a robust auditing process where the data officers meticulously compared source data with what was ultimately reported, identifying and addressing discrepancies to restore trust in the system.

As data began to improve, PFA! introduced a system to track the progress of key data metrics: completeness, accuracy and timeliness. Through annotated run charts, they could visually represent the progress made, showing health care workers at all levels how their efforts were closing the gaps and improving the quality of both the data and the care.

PFA!’s work didn’t happen in isolation. In some geographic areas, it overlapped with other important health care initiatives. USAID funded a project focused on improving malaria care, while PATH was working on improving maternal and newborn outcomes. Rather than operate in silos, the Policy, Planning, Monitoring and Evaluation Division of the Ghana Health Service saw an opportunity to bring these projects together, harmonizing their efforts to improve data quality at the national level. The result was a unified approach to data QI that became the gold standard across multiple health care domains.

The joint approach to DQI led to the development of a comprehensive national protocol. Fourteen priority indicators in MNCH were selected, and a Data Learning Network was created to foster collaboration among district health information officers. Through in-person meetings, coaching and mentoring, officers across the country exchanged ideas and developed action plans to tackle data challenges in their own facilities. National and regional data validation teams visited districts to guide and validate efforts, ensuring that data was complete, accurate and timely.

At the district level, officers took proactive measures to improve data quality. They sent letters to health facilities clarifying data flow processes, highlighted key data issues, and reinforced reporting timelines. Facility managers were engaged in action plans, and monthly performance updates were shared with the District Director of Health Services, creating a culture of accountability and continuous improvement. Ranking facilities according to their data quality performance added a competitive edge, motivating teams to strive for better outcomes.

Data audit teams were formed, and regular monthly meetings became the norm. Validation of summary reports became a monthly exercise, ensuring that data at every level of the system was scrutinized and improved upon.

But perhaps the most innovative change PFA! introduced was the concept of multiple feedback loops. In the old system, data flowed only in one direction – upwards from the health facilities to district, regional and national levels – with little to no feedback provided to the lower levels of the health system. This unidirectional flow created a disconnect, where health care workers reported data without knowing how it was being used or whether it was even reviewed. PFA changed that dynamic, ensuring that data quality feedback was provided at every level, and that lower levels had visibility into how their data was being utilized to inform decisions.

Management teams got involved, reviewing dashboards that showcased data quality performance. A space was created in management meetings for data officers to present their findings, giving them a voice and recognizing their role in driving QI initiatives.

Learning sessions became a platform for sharing best practices across facilities. Teams gathered for periodic review meetings, where they presented their successes and challenges in improving data quality. In a marketplace format, facilities taught one another, cross-pollinating ideas that spread innovation across the country.

Coaching and mentoring were key to sustaining these efforts. Improvement coaches, trained in QI and data quality, visited districts to assess the impact of changes and to help plan future improvement cycles. Their hands-on guidance helped facilities stay on track and continually push for better results.

By the end of the project, PFA! had fundamentally influenced, and in some respects helped to change, how data was collected, reported and used across the country's health care system. Data quality improved dramatically, which in turn strengthened the health care system's ability to track progress, allocate resources effectively, and ultimately, reduce preventable deaths among children under five years of age. The ripple effect of the DQI programme reached far beyond PFA!'s immediate goals and geographic areas, setting a standard for data-driven health care improvement across the nation.

Chapter

7

Strengthening quality improvement measurement capability of key actors

7. Strengthening quality improvement measurement capability of key actors



7.1 Key messages

- Many managers and health workers have limited skills and experience with selecting QoC indicators and measuring and interpreting patterns in QoC indicators over time.
- Capability-strengthening approaches should be practical and competency-based with regular opportunities to reinforce skills.
- Opportunities for strengthening QI measurement capability include pre-service education, in-service training, mentoring, supervision, and professional development platforms.
- Different actors need distinct QI measurement knowledge and skills based on their roles supporting QI measurement in a health system or organization.
- Strengthening QI competencies (including measurement competencies) at scale requires enabling policy, leadership, technical resources, committed funding, skilled human resources and coordination between health and education ministries.



7.2 Chapter overview

This chapter outlines the QI measurement knowledge and skills needed by different actors and reviews approaches for building these skills. The chapter also reviews the system inputs that are required to build QI measurement competencies including enabling policy, leadership, financing and skilled human resources.

In line with WHO implementation guidance for improving quality of facility based MNCH services (2) that emphasizes the subnational health system (e.g. region, district) as a primary unit for implementing and monitoring large-scale QI initiatives, this chapter focuses in particular on the skills needed by subnational managers and front-line QI teams. Many of the principles, however, are applicable to building the QI skills of managers and health workers in any large health care organization (e.g. large public or private sector hospital).



7.3 Key terms and concepts

7

Strengthening
quality
improvement
measurement
capability

7.3.1 Importance of building QI measurement capabilities and selected challenges

The successful design and implementation of large-scale QI initiatives to improve care and health outcomes for women, newborns and children requires, among other things, that managers and health care workers possess the knowledge, skills, experience and tools necessary to improve and measure the quality of the care they provide and manage. Multiple actors in a health system or organization (public or private) need QI measurement knowledge and skills to support the design, management and improvement of MNCAH services. These actors include members of QI teams, facility managers, subnational MNCAH and QoC programme managers and health information officers as well as national-level policy-makers, programme managers and health information officers. Individual actors need different skills based on their specific role supporting the planning, implementation and monitoring of quality improvement initiatives at various system levels. Since not everyone in a health system or organization needs the same depth of knowledge and skills, capability-strengthening strategies should be tailored to the needs of individual actors.

Many frontline health workers may have little to no familiarity with QoC indicators and even less familiarity with how to measure QoC indicators over time to help guide improvement. There may be limited opportunities for managers and health workers to develop QI skills to implement key steps in a QI initiative, including selecting improvement aims and QoC indicators, analysing root causes for poor QoC, iteratively testing changes to close gaps, and regularly monitoring patterns in QoC indicators over time to track progress and guide improvement (see Fig. 1). In many settings, health worker pre-service education and in-service training do not include QI skills and health workers have limited opportunities to learn skills on the job. Often, the leadership, financing, skilled expert trainers and skills-building materials necessary for training and mentoring are lacking.

a. Different actors need different QI measurement knowledge and skills

Table 12 outlines the common QI measurement knowledge and skills needed by health workers and managers at service delivery, subnational and national level. The table is not prescriptive, and some elements may not be applicable in all settings. Users of this guide are encouraged to adapt the table to define the QI measurement competencies needed by specific actors and health worker cadres in their setting, recognizing that all actors do not need the same depth of QoC measurement knowledge and skills to support improvement.

Capability-strengthening strategies should target the specific QI measurement skills and knowledge needed by distinct actors. For example, members of multidisciplinary QI teams need to be able to extract data and calculate agreed QoC indicators, plot indicator results in a run chart, and apply simple rules to analyse patterns in results over time as they make iterative changes to improve care (see chapter 5). QoC programme managers, on the other hand, need the skills of QI team members as well as a deeper set of QI management skills related to the planning and management of facility, district and region-wide QI initiatives including the selection of improvement aims and quality of care indicators and the supervision of QI teams. To fulfil these functions, managers in an organization

or health system need to ensure the necessary combination of measurement, subject matter and QI expertise to: 1) define improvement aims and guide development of QoC indicators and measurement methods in a QI initiative; 2) regularly support and build capability of QI teams to plot and analyse their results; and 3) monitor site-specific and aggregated results across sites to guide oversight and management of activities in a multi-site QI initiative (e.g. spreading learning from high-performing teams; providing extra support to lower-performing QI teams).

Table 12. QI measurement knowledge and skills needed by different health worker cadres and actors at distinct system levels

Key actors	Required QI measurement knowledge and skills
Facility managers and QI team members	• Understand data sources in facility HMIS • Understand QoC indicator definitions and data collection methods • Collect data and calculate selected QoC indicators • Regularly plot QoC indicators in a run chart and annotate with key activities and changes being tested (see 5.4.1) • Analyse run chart results applying probability rules to interpret the effectiveness of changes being introduced by QI teams (see 5.4.2) • With support from an expert (within or outside the health care facility), select QoC indicators based on selected improvement aims (see section 3.4).
Subnational (e.g. MNCAH, QoC, health information managers)	All skills above for QI teams and facility managers, <i>plus</i>: • Select a small set of MNCAH QoC indicators to monitor periodically for QI and QC purposes • Regularly monitor, visualize, interpret and communicate results of subnational QoC indicators (e.g. using a dashboard) • Analyse site-specific and multi-site aggregated QoC indicator results and use results to manage multi-site QI initiatives (analyse small multiple data visualizations) (see sections 5.4.3 and 5.5) • Coach/supervise QI teams to retain and deepen QI measurement skills • Understand importance of and possess skills to disaggregate QoC results by equity stratifiers (see section 5.4.3)
National (e.g. policy-makers, programme managers)	• Define QI measurement knowledge and skills needed by health worker cadres and managers across system levels • Support development of national strategies to strengthen QI skills as part of pre-service education, in-service training, supervision and professional development platforms • Lead development of pre-service education and training resources • Interpret annotated run charts • Understand importance of and possess skills to disaggregate QoC indicator results by equity stratifiers.



7.4 Practical guidance

7.4.1 Develop a capability-strengthening strategy

National and subnational managers can adapt Table 12 to define the core QI measurement knowledge and skills needed by specific health worker cadres and managers in their context. Because measurement is an integral component of a broader process of improving care, measurement-specific skills can and should be incorporated into QI capability-strengthening strategies and curricula. Once required QI skills (inclusive of measurement) have been defined for specific actors and health worker cadres, national and subnational managers should develop a strategy and costed operational plan at appropriate system levels (e.g. district) to build these skills applying adult learning best practices. Important platforms for building core QI skills include pre-service education, in-service training, mentoring, supportive supervision and professional development platforms among others.

a. Strengthen pre-service education

Almost all cadres of health workers will benefit from learning basic QI measurement skills during pre-service education, including calculation, plotting and interpretation of QoC indicators over time. However, in practice, pre-service education for health workers often does not include QI skills and students have limited opportunities to learn QI skills during practicums. Because pre-service education programmes for health workers are led or regulated by the ministry of education in many countries, it is important that ministries of education and health (including MNCAH and QoC departments) collaborate to ensure that pre-service education programmes target QI skills based on future competency needs. It is also important for national policy-makers and programme managers to invest in the development of competency-based pre-service QI curricula, drawing on existing global and local resources and applicable resources in other countries (44,61–66).

b. Bolster in-service training

In the absence of strong pre-service education, in-service training is an important platform for building QI measurement skills of health workers. Training approaches should be based on adult learning best practices emphasizing on-site skills-based training methods reinforced via follow-up coaching or mentoring. Training all members of a QI team together, preferably in their place of work, strengthens the cohesiveness of a QI team as well as strengthening the skills and confidence of individual team members. Similarly, training members of a regional or district health management team who support regional- or district-wide QI initiatives (e.g. health information officer, MNCH programme manager, QoC officer) helps build and reinforce skills of individual members as well as the cohesiveness and effectiveness of the subnational management team. Team-based on-site training is generally more effective than off-site didactic training in a classroom.

In some cases, a QI team may designate a data officer team member to lead data collection, calculation and plotting of QoC indicators in a run chart. In other cases, QI teams may work together to support these steps or may rotate responsibility for this

Illustrative actors



National and subnational managers

function. Regardless of who leads specific steps, all managers and QI team members should have a basic understanding of data sources, calculation of QoC indicators, and plotting and interpretation of indicators in a run chart. This understanding is fundamental for assessing the effect of the changes the QI team will be testing and monitoring as a team. On-site training of QI teams can incorporate simple team-based exercises such as plotting and interpreting QoC indicator results on a paper run chart (e.g. flip chart), using their own HMIS data or simulated data (e.g. using data from a facility's antenatal care register to calculate and plot selected QoC indicators in a paper run chart). Using paper run charts for initial training can help demystify the process of plotting and analysing QoC indicator results in a run chart, especially for team-members who may not have access to a computer or may not have strong computer skills.

When appropriate, QI training (inclusive of measurement) can be incorporated into existing technical training (e.g. clinical training) incorporating practical exercises relevant to the technical area. This helps trainees understand the value of QI and QoC measurement for improving quality of care in priority technical areas. Several global MNCH clinical training resources incorporate QI exercises (e.g. identifying and defining a plan to address common causes for poor quality of MNCAH care in a specific clinical area as part of an MNCAH clinical training curriculum).

It is important that training and mentoring for managers and supervisors (including supervisors of supervisors such as regional ministry of health managers) build the skills needed by managers to provide effective leadership of the planning, financing and oversight of QI initiatives including QI capability-strengthening activities. In addition to the skills needed by QI teams, managers and leaders need additional skills for supporting the design and implementation of subnational QI initiatives, including selection of improvement aims and meaningful QoC indicators, supporting QI teams and monitoring individual site and multi-site aggregated QoC indicators to guide effective management of subnational training and QI initiatives (e.g. using small multiple run charts – see Chapter 5).

It is important that national and subnational managers invest in the development or adaptation of robust QI training materials and a pool of expert QI trainers. Many global MNCAH QI training resources focus primarily on QI skills needed by front-line QI team members (41,42,61–66). Unfortunately, there are fewer training materials that address the broader set of QI skills needed by managers supporting a subnational (e.g. district-wide) or organization-wide QI initiative (e.g. large hospital).

7.4.2 Incorporate QI measurement into mentoring and supportive supervision

Mentoring after training to reinforce and deepen QI skills is an important best practice since QI skills, like clinical skills, often decay after initial training if not reinforced and used on a regular basis. In many settings, supervision is infrequent and highly structured, and it may be difficult to incorporate mentoring to reinforce skills into supervision visits. However, when supervisors possess the necessary skills and have the necessary flexibility, supervision visits can be an important platform to reinforce health worker QI skills. Ideally, supervision visits should include a review of local QoC indicator results and support to QI teams. Other options for reinforcing QI skills include periodic mentoring by local experts (ideally, experts who led the initial training and have strong mastery of skills).

For example, experts from local institutions, organizations, professional associations and other entities can support training and follow-up mentoring in many settings. Follow up mentoring can be provided via blended virtual and in-person approaches. In some settings, subnational QI initiatives organize periodic learning meetings across sites to share and spread learning; such learning meetings can be an efficient mechanism to reinforce health worker QI skills.

7.4.3 Strengthen professional development platforms

In many countries, health workers must participate in continuing professional development (CPD) activities to maintain their professional licensure. Requiring a certain proportion of CPD activities or points to be focused on QI skills is one approach to strengthen and reinforce skills, provided that CPD activities are of high-quality. CPD activities may encompass a range of modalities including virtual self-directed learning materials, training workshops in professional conferences, virtual synchronous and asynchronous training courses leading to certification, mentored practicums, and others. It is important that CPD activities and materials be well vetted by experts to ensure that materials are of high quality, apply adult learning best practices and focus on important QI competencies. In some settings, CPD activities and materials are regulated by professional associations.

Table 13. Summary of key actions for national, subnational and facility levels

National	Subnational	Facility
• Define QI measurement skills needed by specific health worker cadres • Develop or adapt practical competency-based QI curriculum and tools • Define strategies to build health worker QI measurement skills at scale (e.g. via pre-service education, in-service training and supervision platforms) • Promote a non-punitive culture that encourages open sharing of local QoC results by managers • Develop and certify continuing professional development (CPD) QI skills-building materials • Consider linking CPD QI activities to maintenance of licensure • Invest in the development and maintenance of a pool of expert QI trainers	• Assess QI measurement knowledge and skills of health workers based on defined needed QI competencies • Develop, finance and oversee costed subnational plans to build and reinforce essential QI skills (e.g. via training, supervision and other activities integrated into annual operational plans) • Coach/supervise QI teams to retain and deepen QI measurement skills • Identify and engage experts to support training and mentoring • Recognize high-performing QI teams that demonstrate strong measurement skills and solicit their support as mentors to other QI teams • Incorporate skills-building into established standing meetings	• Incorporate regular report-outs of QoC results by QI teams as part of facility management meetings • Support and finance health workers' participation in training and CPD opportunities focused on QI skills, including measurement (virtual and in-person) • Promote access to experts to support QI team and individual health worker learning as needed • Recognize QI teams and individual health workers who demonstrate QI measurement leadership and skills

7.5 Country example

This case study describes the approaches used to strengthen QI capabilities of key actors in a large-scale child health care improvement initiative in Ghana (this initiative is also the focus of the case study in chapter 6).



Project Fives Alive! in Ghana

Project Fives Alive! (PFA!) was implemented in Ghana as a partnership between the National Catholic Health Service, the Ghana Health Service, and the Institute for Healthcare Improvement from 2008 to 2015. PFA! strengthened the use of quality improvement methods and approaches to accelerate reduction of preventable deaths among children less than five years of age, progressively covering about 30% of districts and 80% of public sector hospitals in Ghana. Between 2016 and 2021, through additional support from the Bill & Melinda Gates Foundation, the Institute for Healthcare Improvement and Uboru Quality Institute partnered with the Ministry of Health to develop and implement a Ghana Healthcare Quality Strategy.

Given the critical role of reliable data and measurement in quality improvement efforts, building improvement and measurement knowledge and skills of actors at multiple system levels was integral to PFA!'s approaches. Training approaches employed a variety of strategies to build skills for two primary roles: Improvement advisors and improvement coaches. 10–15 improvement advisors responsible for technical oversight of all PFA! activities received intensive training in the science of improvement, including systems thinking, data and variation, theory of knowledge and the psychology of human behaviour. This sequential training was provided over a nine-month period and included three weeks of classroom-based learning interspersed with practical on-the-job training in the field, periodic in-person and virtual sessions to apply key concepts and receive peer feedback and one-on-one coaching from experts. These highly trained improvement advisors were leveraged by the project team to drive large system change including visioning, design and adaptation, and teaching and training.

As PFA! went to scale, 400 regional, district, facility managers and QI team managers employed in the Ghana Health Service were trained as improvement coaches to provide more intensive support to local activities. PFA! designed a 6–8 week progressive training course to train these staff, including three days of in-person instructional time followed by regular facility-based mentoring and learning. With minimal theoretical concepts, the training focused on practical skills, removing the requirement for laptops, and emphasizing the plotting and analysis of QoC indicator results using paper-based run charts. The training focused on the practical application of five basic QI tools including fishbone analysis, process maps, 5 Whys, Plan–Do–Study–Act cycles, and Pareto charts. Improvement coaches were mentored by experts and learned on the job, visiting facility QI teams on a monthly basis to support their use of local data to assess the effect of changes they were making based on QoC indicator results.

Brought into the centre of QI teams, information officers became critical decision support analysts to other QI team members as they often led the process of plotting and interpreting annotated run charts to identify successful, feasible and scalable changes based on testing. Additionally, PFA! created a learning network of health information officers that helped build the skills, confidence, and status of health information officers at facility and district levels. Learning from PFA! highlights the importance of targeting different knowledge and skills tailored to the roles of specific actors and the importance of approaches that strengthen and regularly reinforce skills over time emphasizing on-the-job skills-building and regular peer to peer learning. Support of senior managers was critical to spread and sustainability. At the end of the project, an independent evaluation concluded that “the initial investment in capacity building had proved to be cost effective”.

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Annex. Detailed metadata for core MNCH QoC indicators

Core maternal and newborn QoC indicators mapped to the QoC standards

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
1	Institutional maternal mortality ratio	Number of maternal deaths prior to discharge per 100 000 births (live and stillbirths)	Outcome/ Impact	Number of maternal deaths prior to discharge	Number of births (live & stillbirths) in the health facility during the reporting period	Type of health facility	Routine health management information system	Monthly
2	Institutional obstetric case fatality rate	Percentage of women who delivered at the facility and experienced obstetric complications (regardless of time of onset) and died from these complications before discharge	Outcome/ Impact	Number of women who delivered at the facility and experienced obstetric complications (regardless of time of onset) and died from these complications before discharge	Number of women who delivered at the facility during the reporting period	Direct and Indirect Type of health facility	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
3	Pre-discharge neonatal mortality rate (disaggregated by cause)	Percentage of babies born live in a facility who die prior to discharge	Outcome/ Impact	Number of babies born live in a facility prior to discharge from the facility (up to 28 days of completed life), per 1000 live births in a given year or period. This excludes re-admissions for illness.	Number of babies born live in a facility during the reporting period	Cause Type of health facility	Routine health management information system	Monthly
4	Institutional stillbirth rate	Percentage of total institutional stillbirths among all institutional deliveries	Outcome/ Impact	Number of babies delivered in a facility with no signs of life and born weighing at least 1,000 grams or after 28 weeks of gestation, per 1000 births (alive or dead at birth)	Number of babies born in the facility (live and stillbirth) during the reporting period	Antepartum or Intrapartum Type of health facility	Routine health management information system	Monthly
5	Immediate administration of a uterotonic after birth for postpartum haemorrhage prevention	Percentage of women who gave birth in a health facility who received a prophylactic uterotonic immediately after birth (ideally within one minute) for postpartum haemorrhage prevention	Process	Number of women who gave birth in a facility who received a prophylactic uterotonic immediately after birth (ideally within one minute) for prevention of postpartum haemorrhage	Number of women who gave birth in the facility during the reporting period	Type of health facility	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
6	Breastfeeding initiation within one hour of birth	Percentage of babies born alive in a facility who are breastfed within one hour of birth	Process	Number of babies born alive in a facility who are breastfed within one hour of birth	Number of babies born alive in the facility during the reporting period	Type of health facility	Routine health management information system	Monthly
7	Newborns with birthweight documented	Percentage of babies born in a health facility in a given period with documented birthweight before discharge	Process	Number of babies born (livebirths and stillbirths) in a facility in a given period with documented birthweight before discharge	Total number of babies born in the facility (livebirths and stillbirths) during the reporting period	Type of health facility	Routine health management information system	Monthly
8	Kangaroo mother care for newborns weighing 2000 g or less	Percentage of newborns weighing $\leq 2,000$ g who are initiated on kangaroo mother care	Process	Number of newborns weighing $\leq 2,000$ g who are initiated on KMC (or admitted to kangaroo mother care unit if separate unit exists)	Total number of newborns weighing $\leq 2,000$ g during the reporting period	Weight (≤ 1500 g and $1500 - <2000$ g) Immediate/ non-immediate Type of health facility	Routine health management information system	Monthly
9	Postpartum counselling for mother and baby	Percentage of women who received pre-discharge counselling for the mother and the baby in a given period	Process	Number of women who received pre-discharge counselling for the mother and the baby in a given period (for minimum elements)	Number of women interviewed who delivered at the facility during the reporting period	Type of health facility	Client exit interviews	Quarterly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
10	Companion of choice during labour and childbirth	Percentage of women who wanted and had a companion of choice supporting them during labour and childbirth in the health facility	Outcome	Number of women who wanted and had a companion supporting them during labour and childbirth in the health facility	Number of women interviewed who wanted a companion during labour and childbirth who delivered at the facility during the reporting period	Type of health facility	Client exit interviews	Quarterly
11	Physical abuse during labour, or childbirth or postpartum period	Percentage of women who reported being physically abused anytime during labour, childbirth, or postpartum period in the health facility (Physical abuse: slapped, pinched, or punched by a health worker or other facility staff)	Outcome	Number of women who report physical abuse during labour or childbirth	Number of women interviewed who delivered at the facility during the reporting period	Type of health facility	Client exit interviews	Quarterly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
12	Verbal abuse during labour, or childbirth, or postpartum period	Percentage of women who reported being verbally abused anytime during labour, childbirth, or postpartum period in the health facility (Verbal abuse: shouted or screamed at, insulted, scolded, or mocked by a health worker or other staff)	Outcome	Number of women who report verbal abuse during labour or childbirth	Number of women interviewed who delivered at the facility during the reporting period	Type of health facility	Client exit interviews	Quarterly
13	Basic hygiene provision	Percentage of health facilities in which [all] delivery room(s) have at least one functional handwashing station with water and soap available	Input	Number of facilities in which [all] [at least one] delivery room(s) have at least one functional handwashing station with water and soap available	Number of facilities assessed during the reporting period	Type of health facility	Health facility survey/assessment	Quarterly
14	Basic sanitation for women and their family	Percentage of health facilities with basic sanitation available for women and their families during and after labour and childbirth	Input	Number of facilities with basic sanitation available for women during and after labour and childbirth (clean running water, waste disposal facilities, toilets, and sanitation material for women)	Number of facilities assessed during the reporting period	Type of health facility	Health facility survey/assessment	Quarterly

Core paediatric and young adolescent QoC indicators mapped to the QoC standards

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
1	Institutional child mortality rate	Number of pre-discharge child deaths per 1000 children who visited the health facility	Impact	Number of children who died in the health facility before discharge	Number of children who visited the health facility for medical care during reporting period	Sex Types of health facility Age groups (0–7 days, 8–27, 28–59 days, 60 days–<1 year, 1–<5 years, 5–<10 years, 10–14 years) Death within and after 24 hours of admission	Routine health management information system	Monthly
2	In-hospital paediatric case fatality rate by common paediatric conditions	Percentage of children who were diagnosed with sepsis, pneumonia, malaria, meningitis or severe acute malnutrition (SAM) and died in the health facility	Outcome/impact	Percentage of children who were diagnosed with sepsis, pneumonia, malaria, meningitis, or SAM and died in the health facility	Number of children who visited the health facility and were diagnosed with sepsis, pneumonia, malaria, meningitis, or SAM during reporting period	Condition Levels of health facilities (e.g., secondary level) Age groups (0–7 days, 8–27, 28–59 days, 60 days–<1 year, 1–<5 years, 5–<10 years, 10–14 years) Death within and after 24 hours of admission to the facility	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
3	Assessment for the sick children < 5 years old based on the integrated management of newborn and childhood illness criteria	Percentage of sick children < 5 years old who were assessed in the health facility based on key integrated management of newborn and childhood illness (IMNCI) criteria (<i>Presence or absence of danger signs (ability to drink or breastfeed; vomits everything; convulsions, lethargy) and received rapid physical and clinical assessment including, weight, Z-score or MUAC, respiratory rate, temperature, cough, difficult breathing/chest indrawing, diarrhoea/dehydration status, vaccination status, and palmar pallor</i>)	Process/ Output	Number of sick children < 5 years old who were assessed based on key IMNCI assessment criteria.	Number of sick children < 5 years old who visited the health facility during reporting period	Type of health facility Age (0 – <2 month, 2 month – <5 years) Sex	Patient medical records	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
4	Treatment of possible severe bacterial infection at outpatient level	Percentage of young infants (<2 months old) classified as having possible severe bacterial infection (PSBI) or signs of PSBI, or very severe disease or sepsis – who were prescribed appropriate antibiotics according to WHO guidelines. (Signs of PSBI: Movement only when stimulated or no movement at all, not feeding well on observation, temperature greater than or equal to 38°C or less than 35.5°C, severe chest in-drawing, convulsions, fast breathing (60 breaths per minute or more) in infants less than 7 days old)	Process/ Output	Number of young infants (<2 months old) classified as having PSBI or any child with related signs or very severe disease or sepsis, who were prescribed appropriate antibiotics according to WHO guidelines	Number of sick young infants (<2 months old) classified as having PSBI or any child with related signs or very severe disease or sepsis who visited health facility during reporting period	Sex Weight cut-offs (<2000g, ≥2000g)	Patient medical records	Monthly
5	Kangaroo mother care for newborns weighing 2000 g or less	Percentage of newborns weighing ≤ 2,000g who are initiated on Kangaroo mother care (KMC) according to WHO guidelines	Process/ Output	Number of newborns weighing ≤ 2,000g who are initiated on Kangaroo mother care (KMC) according to WHO guidelines	Number of newborns weighing ≤ 2,000g who were born in or presented to the health facility during reporting period	Type of health facility Sex Weight (≤1500g and 1500 – <2000g)	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
6	Pneumonia treatment with 1st choice antibiotic for children aged between 7 days and 5 years	Percentage of children aged between 7 days and 5 years who were prescribed amoxicillin for treatment of pneumonia	Process/ Output	Number of children aged between 7 days and 5 years who were diagnosed with pneumonia or showed signs of fast breathing and/or chest indrawing and were prescribed oral amoxicillin	Number of children aged between 7 days and 5 years seen in the health facility with pneumonia or fast breathing and/or chest indrawing during reporting period	Sex Type of health facility Age (7–59 days, 2 month – <5 years)	Routine health management information system	Monthly
7	Management of acute watery diarrhoea among children <5 years old	Percentage of children <5 years old diagnosed with acute watery diarrhoea in a health facility who received appropriate treatment for diarrhoea [Oral rehydration solution (ORS) and Zinc supplementation if 2 months- <5 years]	Process/ Output	Number of children <5 years who were diagnosed with acute watery diarrhoea and received appropriate treatment for diarrhoea	Number of children <5 years old with a diagnosis of acute watery diarrhoea who visited health facility	Age (0–59 days, 2 months – <5 years) Sex Type if health facility	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
8	Children and young adolescents with documented malaria test results	Percentage of children and young adolescents (< 15 years old) in malaria endemic areas who presented to the health facility with fever and their malaria test results are available (results from microscopy or malaria Rapid Diagnostic Test).	Process/ Output	Number of children and young adolescents (< 15 years old) in malaria endemic areas who presented to the health facility with fever and their malaria test results are available	Number of children and young adolescents (< 15 years old) in malaria endemic area who visited the health facility with fever during reporting period	Type of health facility Sex Diagnosis Age (<1 year, 1 – < 5 years, 5 – 9 years, 10–14 years)	Routine health management information system	Monthly
<i>Note: According to WHO, malaria endemic areas are areas in which there is an ongoing, measurable incidence of malaria infection and mosquito-borne transmission over a succession of years.</i>								
9	Treatment of uncomplicated severe acute malnutrition	Percentage of children aged between 6 months and 5 years with uncomplicated severe acute malnutrition (SAM) who were treated according to WHO guidelines	Process/ Output	Number of children aged between 6 months and 5 years with uncomplicated SAM who were treated according to WHO guidelines	Number of children aged between 6 months and 5 years diagnosed with uncomplicated SAM who visited health facility during reporting period	Sex	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
10	Management of anaemia in children and young adolescents	Percentage of children and young adolescents (2 months ≤ 15 years old) with anaemia who were treated according to WHO guidelines (<i>Iron and mebendazole if 1 year or older and not given mebendazole last 6 months</i>)	Process/ Output	Number of children and young adolescents (2 months ≤ 15 years old) diagnosed with anaemia who were treated according to WHO guidelines.	Number of children and young adolescents (2 months ≤ 15 years old) diagnosed with anaemia who visited health facility	Sex Age groups <1 year, 1 – < 5 years, 5 – 9 years, 10–14 years)	Routine health management information system	Monthly
11	Children < 2 years of age with known HIV status for either the mother and/or the child	Percentage of children < 2 years of age for whom the HIV status of the mother and/or the child is known (positive or negative)	Process/ Output	Number of children < 2 years of age for whom the HIV status of the mother and/or the child is known	Number of children < 2 years old who visited the health facility during reporting period	Sex of the child Mother or child status known	Routine health management information system	Monthly
12	TB evaluation for children and young adolescents with presumptive TB	Percentage of children and young adolescents (<15 years old) eligible for TB screening who were referred or further assessed for TB (TB screening eligibility: <i>reported a cough duration >14 days or were diagnosed with SAM or had confirmed HIV infection</i>)	Process/ Output	Number of children and young adolescents (<15 years old) eligible for TB screening who were referred or further assessed for TB	Number of children and young adolescents (<15 years old) eligible for TB screening who visited health facility during reporting period	Sex Age groups <1 year, 1 – < 5 years, 5 – 9 years, 10–14 years)	Routine health management information system	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
13	Catch up immunization for children < 2 years old	Percentage of children < 2 years of age eligible for DTP-Hep-B-HIB, IPV, RTV, PCV or Measles-containing vaccine, who received all catch up immunization during medical visits (<i>Eligibility: unvaccinated or partially vaccinated with these vaccines according to their age and national immunization schedule</i>)	Process/ Output	Number of children < 2 years of age eligible for DTP-Hep-B-HIB, IPV, RTV, PCV and measles-containing vaccine who were administered all catch up immunization	Number of children < 2 years of age eligible for DTP-Hep-B-HIB, IPV, RTV, PCV and measles-containing vaccine who received medical care in the health facility during reporting period	Sex Age (<1 year, 1-<2 years) Type of antigen	Routine health management information system	Monthly
14	Inappropriate use of antibiotics for cough or cold in children and young adolescents	Percentage of children and young adolescents (<15 years old) seen in a health facility with a cough or cold, or an unspecified respiratory tract infection, and without a comorbidity requiring antibiotic treatment (e.g., <i>pneumonia, severe pneumonia, severe acute malnutrition, very severe disease, sepsis, meningitis, cholera, HIV+</i>) who were prescribed an antibiotic.	Process	Number of children and young adolescents (<15 years old) seen in a health facility with a cough or cold, or an unspecified respiratory tract infection, and without a comorbidity requiring antibiotic treatment (e.g., <i>pneumonia, severe pneumonia, severe acute malnutrition, very severe disease, sepsis, meningitis, cholera, HIV+</i>) who were prescribed an antibiotic.	Number of children and young adolescents (<15 years old) seen in a health facility during the reporting period with a cough or cold, or an unspecified respiratory tract infection, and without a comorbidity requiring antibiotic treatment (e.g., <i>pneumonia, severe pneumonia, severe acute malnutrition, very severe disease, sepsis, meningitis, cholera, HIV+</i>)	Type of health facility Sex Diagnosis	Patient medical records	Monthly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
15	Completion of medical documentation for children and young adolescents	Percentage of children and young adolescents (<15 years old) seen in a health facility with complete key patient information in the health facility register (<i>patient demographic data, assessment findings, classification / diagnosis, treatment, counselling, and care outcomes</i>)	Input	Number of children and young adolescents (<15 years old) seen in a health facility with complete key patient information in the health facility register	Number of children and young adolescents (<15 years old) seen in a health facility during reporting period	Type of health facility Sex Age groups (<1 year, 1 – < 5 years, 5 – 9 years, 10–14 years)	Health facility register	Monthly
16	Quality of care data reviews for children and young adolescents	Percentage of health facilities that conducted monthly quality of care data reviews for patients under 15 years old in the past 3 months	Process/ Output	Number of health facilities that conducted monthly quality of care data reviews for patients under 15 years old in the past 3 months	Number of facilities assessed during the reporting period	Type of health facilities	Survey	Quarterly
17	Knowledge and understanding of the condition and treatment plan among children and young adolescents or their caregivers	Percentage of children and young adolescents (<15 years old) or their caregivers who can describe the child's condition and how to administer home treatment	Process/ Output	Number of children and young adolescents (<15 years old) or their caregivers who can describe the child's condition and how to administer home treatment	children and young adolescents (<15 years old) or their caregivers who were interviewed during reporting period	Respondent Service level (inpatient, outpatient) Type of health facility	Facility survey, client exit interviews, or similar assessments	Quarterly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
18	Satisfaction with decision-making process for care	Percentage of children and young adolescents (<15 years old) or their caregivers who are satisfied with the care decision-making process	Outcome (patient-reported)	Number of children and young adolescents (<15 years old) or their caregivers who are satisfied with the care decision-making process	Number of children and young adolescents (<15 years old) or their caregivers who were interviewed during reporting period	Type of health facilities Respondent Health condition	Facility survey, client exit interviews, or similar assessments	Quarterly
19	Pre-discharge counselling on danger signs and feeding for children < 5 years old	Percentage of caregivers of children under 5 years old who are aware of the danger signs of paediatric illness, when to seek care, and how to manage feeding during illness	Process/ Output	Number of caregivers of children under 5 years old who are aware of the danger signs of paediatric illness, when to seek care, and how to manage feeding during illness	Number of caregivers of children < 5 years who received care and were interviewed in health facility during reporting period	Type of health facility	Facility survey, client exit interviews, or similar assessments	Quarterly
20	Awareness of child rights during health care	Percentage of children and young adolescents (<15 years old) or their caregivers who reported being adequately informed about their rights to care (e.g., free treatment, medication, food, bedding, room-in etc.)	Process/ Output	Number of children and young adolescents (<15 years old) or their caregivers who reported being adequately informed about their rights to care	Number children and young adolescents (<15 years old) or their caregivers were interviewed during reporting period	Respondent Age groups (<1 year, 1 – < 5 years, 5 – 9 years, 10–14 years) Type of health facility	Facility survey, client exit interviews, or similar assessments	Quarterly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
21	Disrespectful care for the child or caregiver	Percentage of children and young adolescents (<15 years old) or their caregivers who reported mistreatment during care (includes those who felt that they were being yelled at or screamed at (verbal abuse), or were hit, or pinched (physical abuse)	Outcome (patient-reported)	Number of children and young adolescents (<15 years old) or their caregivers who reported mistreatment during car	Number of children and young adolescents (<15 years old) or their caregivers who received care and were interviewed in health facility during reporting period	Age groups (<1 year, 1 – < 5 years, 5 – 9 years, 10–14 years) Type of health facility Type of mistreatment Respondent	Survey or interview records	Quarterly
22	Accompaniment during care	Percentage of children and young adolescents (<15 years old) whose caregivers were able to accompany them during minor medical procedures	Process/ Output	Number of children and young adolescents (<15 years old) whose caregivers were able to accompany them during minor medical procedures	Number of children and young adolescents (<15 years old) or their caregivers who received care and were interviewed in health facility during reporting period	Type of health facility	Survey or interview records	Quarterly

#	Indicator name	Indicator definition	Indicator classification	Numerator	Denominator	Proposed disaggregation	Proposed data source	Proposed
23	Access to play and educational material during hospitalization	Percentage of children (or their caregivers) who reported that the child was able to play and access educational materials during hospitalization	Input	Number of children (or their caregivers) who reported that the child was able to play and access educational material during hospitalization	Number of children treated as inpatient or their caregiver who were interviewed in health facility during reporting period	Age groups (<1 year, 1 – <5 years, 5 – 9 years, 10–14 years) Type of health facility	Survey or interview records	Quarterly
24	Clinical mentorship or training for childcare providers	Percentage of health workers providing care for children who received clinical mentorship or training in the last 6 months	Input	Number of health workers providing care for children who received clinical mentorship or training in the last 6 months	Number of health workers providing care for children who were interviewed during reporting period	Provider cadre, Facility type	Provider interviews	Quarterly
25	Stock out of essential child health medicines	Number of days in the past 3 months when there were stock outs of at least 3 essential children medicines (amoxicillin, injectable gentamicin, and zinc)	Input	Total number of days with stock outs of at least three essential medicines	N/A	Inpatient / outpatient	Inventory of the pharmacy or dispensary	Quarterly

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