

ORIGINAL ARTICLE

Stakeholder perspectives on Emergency Obstetric and Neonatal Care Signal Functions and Indicators in Malawi: A Qualitative Human-Centered Design Study

¹Elizabeth Chodzaza, ¹Charity Kabondo, ¹Abigail Kazembe, ¹Bertha Chakhame, ¹Gaily Lungu, ¹Lily Kumbani, ¹Felistus Kapalamula, ¹Martha Kamanga

¹Kamuzu University of Health Sciences

ABSTRACT

Background: Emergency Obstetric and Neonatal Care (EmONC) signal functions and indicators are central to efforts to reduce preventable maternal and neonatal mortality. Their implementation in low-resource settings is often constrained by health care system, contextual, and data-related challenges. This study explored stakeholder perspectives on the relevance, feasibility, and utility of EmONC signal functions and indicators in Malawi.

Methods: We conducted a qualitative descriptive study informed by a human-centred design (HCD) approach. Data were gathered through 10 semi-structured key informant interviews and one participatory co-design workshop with national policymakers, district health managers, safe motherhood coordinators, midwives, neonatal specialists, and implementing partners. Data were analysed thematically through an iterative, team-based process that integrated interview and workshop findings.

Findings: Stakeholders affirmed the clinical and policy value of EmONC signal functions but noted

implementation challenges at lower-level facilities, including limited provider confidence, low caseloads for key procedures, weak referral systems, and transport constraints. While indicators such as met need for EmONC and proportion of births in EmONC facilities were considered useful, participants raised concerns about data quality, infrequent reporting, vague definitions particularly for neonatal outcomes and indirect maternal deaths and contextual misalignment of caesarean section and case fatality rate indicators. Participants emphasised the need for indicators that better capture functional readiness, processes of care, and contextual interpretation of utilisation data.

Conclusion: EmONC signal functions and indicators remain essential for strengthening maternal and newborn care in Malawi but require contextual adaptation. Refining indicator definitions, improving data systems, and integrating measures of quality, effective coverage, and referral functionality are critical for improving accountability and outcomes in Malawi and similar low-resource settings.

Corresponding Author:

Dr. Elizabeth Chodzaza
echodzaza@kuhes.ac.mw

Keywords: Emergency Obstetric Care, Maternal Health Services, Obstetric Labor Complications, Referral and Consultation, Qualitative Research, Health care Quality.

This article is available online at: <http://www.mjz.co.zm>, <http://ajol.info/index.php/mjz>, doi: <https://doi.org/10.55320/mjz.53.2.940>
The Medical Journal of Zambia, ISSN 0047-651X, is published by the Zambia Medical Association

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INTRODUCTION

Maternal and neonatal mortality remain urgent global public health concerns and are widely recognised as indicators of the strength, equity, and responsiveness of health systems, particularly in low- and middle-income countries (LMICs). In 2023, an estimated 260,000 women died from maternal causes worldwide, corresponding to a global maternal mortality ratio (MMR) of 197 deaths per 100,000 live births, with approximately 70% of these deaths occurring in sub-Saharan Africa.¹ Neonatal mortality remains similarly high, with nearly 2.3 million newborn deaths recorded globally in 2022, most occurring during the first week of life.² The majority of deaths are preventable through timely, high-quality intrapartum and immediate postnatal care.

In Malawi, maternal mortality declined from 439 to 381 deaths per 100,000 live births between 2017 and 2020, reflecting progress in service coverage; however, mortality levels remain well above the Sustainable Development Goal (SDG) target of fewer than 70 deaths per 100,000 live births by 2030.³ Neonatal mortality has shown slower improvement, with approximately 19 neonatal deaths per 1,000 live births, exceeding the Every Newborn Action Plan target of 12 per 1,000 by 2025⁴. The leading causes of maternal death in Malawi include postpartum haemorrhage, hypertensive disorders of pregnancy, sepsis, unsafe abortion, and obstructed labour which are predominantly acute complications that can be effectively managed through timely and high-quality Emergency Obstetric and Neonatal Care (EmONC).⁵

The EmONC framework is structured around a set of nine life-saving signal functions, categorised as Basic EmONC (BEmONC) or Comprehensive EmONC (CEmONC), encompassing key interventions such as administration of parenteral antibiotics, uterotonics and anticonvulsants, manual removal of the placenta, assisted vaginal birth, caesarean section, blood transfusion, and neonatal resuscitation.⁶ These signal functions form the

foundation for assessing service availability, readiness, and utilisation. Evidence suggests that effective provision of EmONC can reduce maternal deaths in health facilities by 50–70% and intrapartum stillbirths by 15–50%, underscoring their central role in improving maternal and newborn survival.⁷

To support systematic monitoring of EmONC services, WHO, UNICEF, and UNFPA established a core set of EmONC indicators in 1997, later consolidated in the 2009 *Monitoring Emergency Obstetric Care* handbook. These indicators focus on service availability, utilisation, and outcomes, including EmONC facility density, met need for EmONC, caesarean section rate, direct obstetric case fatality rate, and intrapartum and early neonatal death rates. While EmONC indicators have been widely adopted, they have undergone limited revision over the past decade. Additionally, concerns have increasingly emerged regarding their ability to reflect real-world service performance. More recent WHO and UNFPA EmONC implementation manuals (2020–2023) increasingly emphasise concepts of effective coverage, functional readiness, referral networks, and quality of care, highlighting the need for monitoring frameworks that extend beyond facility counts and procedure volumes to capture whether life-saving care is delivered on time, at sufficient quality, and to those who need it most.⁷

In Malawi, EmONC coverage indicators reveal persistent gaps between nominal service availability and effective access to care. Although the country exceeds the recommended number of CEmONC facilities per population, only a small proportion of lower-level facilities are fully functional as BEmONC sites.⁸ National estimates indicate that the met need for EmONC remains low, while population-level caesarean section rates are below internationally recommended thresholds, suggesting ongoing barriers to timely access to life-saving surgical care.

Importantly, current indicators provide limited insight into critical determinants of outcome such as

timeliness of care, continuity across referral pathways, and quality of intrapartum and newborn care. Neonatal outcomes remain particularly concerning, with high rates of intrapartum stillbirths and very early neonatal deaths. These challenges are compounded by limited neonatal-specific signal functions and ambiguities in indicator definitions, particularly regarding the timing and attribution of neonatal deaths.⁹

Engaging stakeholders who are directly involved in the delivery, management, and oversight of maternal and newborn health services is critical to ensuring the relevance and utility of EmONC monitoring frameworks. Policymakers, clinicians, programme managers, and implementing partners play a central role in interpreting EmONC data, guiding resource allocation, and shaping service delivery models.¹⁰ When stakeholder perspectives are insufficiently incorporated, indicators may fail to reflect clinical realities, health system constraints, and contextual variation in care provision, limiting their usefulness for improving outcomes.¹¹ This study aimed to explore national and district-level stakeholders' views on how EmONC signal functions and indicators should be adapted to better capture quality and effective coverage in Malawi. The findings seek to inform ongoing national and global efforts to refine EmONC monitoring frameworks and strengthen accountability for maternal and newborn outcomes in Malawi and similar low-resource settings.

METHODS

Study Design

This study formed part of a larger multi-country mixed-methods project aimed at informing the global revision of Emergency Obstetric and Neonatal Care (EmONC) indicators. We employed a qualitative descriptive design, informed by a human-centred design (HCD) approach, to explore stakeholders' experiences with and perspectives on EmONC signal functions and indicators in Malawi. Qualitative description was selected to generate rich, practice-oriented accounts with low levels of

interpretation, making it particularly suitable for applied health services research.¹¹ HCD approaches have been shown to enhance stakeholder engagement, systems thinking, and co-creation of contextually appropriate solutions in global health research.¹²⁻¹⁴ The study is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.¹⁴

Human-Centred Design Approach

The HCD approach incorporated empathy-oriented interviewing, journey mapping of EmONC indicator use across health system levels, and co-creation activities during a participatory workshop. These methods are commonly applied in HCD-informed health research to identify system bottlenecks and iteratively refine solutions.¹²⁻¹⁴ Insights generated through HCD activities were integrated with thematic analysis findings to strengthen interpretation and ensure stakeholder-centred recommendations.

Study Setting

The study was conducted in Malawi and included participants working at national and district levels of the health system. Three (3) district hospitals and at least 1-2 BEmONC facilities within their catchment area. These included facilities with both the lowest performing sites and well-performing sites on selected signal functions. One district with a high maternal and neonatal disease burden was purposively selected based on relevance to EmONC service delivery. Similar approaches have been used in maternal health systems research to explore contextual influences on access to emergency obstetric care.¹⁵ We acknowledge potential limits to generalisability due to partner presence.

Participants and Sampling

Participants were recruited using purposive sampling to ensure representation of stakeholders directly involved in the delivery, management, and oversight of maternal and newborn health services. Eligible participants were required to have current or recent professional roles related to EmONC

implementation, monitoring, or policy development.

A total of ten stakeholders participated in the study, including clinical officers, midwives, a neonatologist, a neonatal nurse, Safe Motherhood Coordinators, a Reproductive Health Directorate officer, and a representative from a World Health Organization implementing partner. While participants represented diverse perspectives across service delivery and governance levels, practising obstetricians, anaesthetists, and theatre-based staff were not included, which may have influenced perspectives on caesarean section, assisted vaginal birth, and intraoperative care. However, the study utilised Clinical and medical officers who work as clinicians in obstetric care units.

Sample size was guided by the concept of information power, whereby the adequacy of the sample was determined by study aim specificity, sample relevance, quality of dialogue, and analytic strategy. The research team determined that thematic sufficiency was achieved.¹²

Data Collection

Data were collected between February and June 2023 through semi-structured key informant interviews (KIIs) and one participatory focus group co-design workshop. Interviews were conducted face-to-face in private settings selected by participants and lasted approximately 45 to 60 minutes. All interviews were conducted in English, audio-recorded with participant consent, and transcribed verbatim.

The co-design workshop brought together all participants and utilised facilitated HCD techniques to explore experiences with EmONC indicators, identify system-level challenges, and collaboratively generate recommendations for indicator refinement. Field notes, observation notes, and visual artefacts generated during the workshop (e.g., diagrams and maps) were documented to enrich contextual understanding.

Transcripts were returned to participants for member checking to verify accuracy and credibility of the recorded data.¹²

Positionality and Reflexivity

The research team comprised three academic midwives and one human-centered design specialist. Two midwives were also active in midwifery education with an emphasis on EmONC. Their professional experience and collaboration with the Ministry of Health enhanced contextual relevance and depth of inquiry.

Recognizing that pre-existing relationships with participants could shape the research process, the team maintained an ongoing practice of reflexivity. through critical self-reflection and team discussion to minimise bias.¹² Through critical self-reflection, they examined how their roles, assumptions, and disciplinary backgrounds influenced data collection and interpretation. While their insider status enriched understanding, they actively mitigated potential bias by remaining attentive to participants lived realities.

Data Analysis

Data collection and analysis were conducted iteratively and concurrently. Initial analysis involved affinity diagramming, in which interview and workshop data were visually clustered to identify emerging patterns, challenges, and stakeholder priorities. This process informed the development of an initial coding framework.

Transcripts were subsequently coded in NVivo (QSR International) using a team-based thematic analysis approach.^{12,13} Codes were developed inductively from the data, with regular team discussions to refine code definitions and resolve discrepancies through consensus. Coded data were grouped into categories, which were then synthesised into overarching themes that reflected stakeholder perspectives on EmONC signal functions and indicators.

To enhance rigour and trustworthiness, multiple strategies were employed, including triangulation of

interview and workshop data, team debriefing, member checking, and maintenance of an audit trail documenting analytic decisions.¹²

Ethical Considerations

Ethical approval was obtained from the College of Medicine Research Ethics Committee (Protocol No. P.01/23/3723). All participants provided written informed consent prior to participation. The study was conducted in accordance with the principles of the Declaration of Helsinki and complied with all relevant national and institutional ethical requirements. Participant confidentiality was maintained throughout data collection, analysis, and reporting.

FINDINGS

Participant Characteristics

A total of **ten stakeholders** participated in the study through ten key informant interviews and one participatory co-design workshop involving all

participants. Stakeholders represented national and district levels of the health system as highlighted in Table 1 below: Participants had direct roles in clinical care delivery, programme implementation, policy formulation, and EmONC monitoring. To preserve confidentiality, limited demographic information was collected.

Thematic analysis yielded **six interrelated themes** describing stakeholders' perspectives on the utility, challenges, and limitations of current EmONC signal functions and indicators in Malawi.

1: Clinical Value of EmONC Signal Functions in Guiding Care and Policy

Stakeholders consistently affirmed the clinical importance of EmONC signal functions as foundational tools for guiding obstetric and neonatal care, informing national protocols, and shaping maternal and newborn health strategies. Participants emphasised that signal functions provided a shared clinical framework for managing acute obstetric

Table 1: Demographic Characteristics of Key Informants (N = 10)

Institution/ Facility	Department	Position	Sex	Number of Participants (n)
Ministry of Health	Reproductive Health Directorate	Programme Officer	Female	1
World Health Organization	Maternal and Child Health	MCH Focal Person	Female	1
Central Hospital	Neonatal Unit	Nurse/Midwife	Female	1
Central Hospital	Paediatrics	Neonatologist	Male	1
District Hospitals (CEmONC centres)	Maternity Ward	Safe Motherhood Coordinators (RNMs)	All Female	3
District Hospitals (CEmONC centres)	Clinical Services	Clinical Officer In Charges	- All Males	3
Total				10

complications such as postpartum haemorrhage, hypertensive disorders of pregnancy, sepsis, and obstructed labour.

“They have been useful because when we are providing care, those signal functions assisted in coming up with protocols on case management for obstetric complications... we use the signal functions to provide care to our clients.” (Key Informant Interview-001)

Additionally, one focus group participant said:

“It works in assisting development of some guidelines and also capacity building for healthcare workers.” (Focus Group Participant)

At national level, participants highlighted the role of signal functions in aligning policy priorities, training curricula, and service delivery standards across levels of care.

“When we are doing national policies and strategies, we make sure that the signal functions are part of those strategies... always reminding ourselves these are the signal functions we really need to monitor.” (Key Informant Interview-004)

2. Practical Challenges in Implementing Signal Functions at Lower-Level Facilities

Participants raised concerns about the feasibility of implementing certain signal functions at BEmONC level, citing limited caseload, provider confidence, and referral capacity. Some suggested relocating assisted vaginal birth to CEmONC level, while others emphasised the need for strengthened training and mentorship to ensure safe implementation at appropriate facility levels.

“Some of the signal functions are done rarely due to lack of cases and lack of confidence by the providers... I would rather remove the vacuum extraction at the BEmONC site and keep it at the CEmONC site.” (Key Informant Interview-003)

Stakeholders expressed concern that attempting complex procedures in facilities without reliable transport, blood availability, or surgical backup could compromise maternal and neonatal outcomes, particularly in cases of failed assisted vaginal birth.

“When you don't have a stationed ambulance, don't attempt [vacuum extraction]... the newborn outcomes are very, very bad.” (Key Informant - 002)

While manual removal of the placenta was viewed as more feasible than vacuum extraction, participants emphasised that its safe performance still depended on adequate staffing, infection prevention, and referral readiness.

3. Contextual and Systemic Barriers to Effective EmONC Coverage

3.1. Geographic Access and Terrain Constraints

Although Malawi meets the WHO benchmark of five EmONC facilities per 500,000 population, stakeholders noted that geographic and terrain-related barriers significantly limit timely access to care. Rivers, poor road networks, and seasonal flooding were cited as critical impediments to emergency referral.

“In terms of ensuring there is availability of basic and comprehensive EmONC, I think we don't have a problem... but also the terrain in some of the areas... we may say eight kilometers, but the eight kilometers there is a river in between.” Key Informant Interview-004

These barriers were seen as contributing to delays in reaching care, particularly for women experiencing acute intrapartum complications.

3.2. Facility Functionality and Resource Allocation Gaps

Participants emphasised that **population-based facility ratios mask important gaps in functionality**. The standard three-month window used to assess EmONC functionality was viewed as insufficient to capture consistent service readiness. Irregular supplies, staff shortages, and inconsistent political and financial commitment were reported to undermine sustained EmONC performance.

“... Maybe the way we capture our data is not adequately informing resource allocation.” Key Informant Interview- Neonatal Nurse)

Stakeholders recommended more frequent (e.g. monthly) functionality assessments and greater attention to staffing stability, equipment availability, and supply chain reliability.

4. Utility of EmONC Indicators in Planning, Advocacy and Decentralised Care

Participants described several EmONC indicators as valuable tools for **health system planning and advocacy**, particularly the *proportion of births in EmONC facilities* indicator. This indicator was used to identify high-volume facilities, inform staff deployment, and support requests for additional resources.

“It has helped to identify where there is high volume of deliveries... we have managed to add staff at those facilities.” (Key Informant Interview-003)

The *met need for EmONC* indicator was highlighted as especially important in **strengthening decentralised emergency care**, empowering midwives to manage direct obstetric complications such as pre-eclampsia and eclampsia at lower-level facilities when referral was delayed or impractical.

“It has been useful in decision-making... if I see a woman with a major direct obstetric complication... you will be able to consult the right people.” (Key Informant Interview-007).

In remote settings, local management of complications was perceived to contribute to reduced maternal deaths.

5. Limitations of Current EmONC Indicators and Measurement Challenges

5.1 Data Quality and Documentation

Stakeholders raised persistent concerns about poor data quality, particularly in relation to stillbirths, neonatal deaths, and indirect maternal deaths. Fragmented documentation across maternity wards, neonatal units, and registers contributed to underreporting and misclassification.

“Neonatal deaths can also be registered at labour ward, but the data may only come from nursery.”

Key Informant Interview-001

Indirect maternal deaths related to conditions such as HIV and tuberculosis were frequently perceived as undervalued in audits.

“People tend to underrate it because it's an indirect cause.” (Key Informant Interview-007)

5.2 Caesarean Section and Case Fatality Rate Indicators

Stakeholders expressed mixed views regarding the interpretation of caesarean section (CS) rates as an EmONC indicator. Some participants felt that facilities with appropriately low obstetric risk might be perceived as underperforming, while others were concerned that the indicator could inadvertently incentivise unnecessary procedures. Several stakeholders suggested that a threshold closer to 15–20% might better reflect current obstetric realities. However, participants consistently emphasised that CS rates should be interpreted in the context of case-mix, referral dynamics, and quality of intrapartum care, rather than as a standalone performance target.

“Sometimes women are subjected to unnecessary caesarean sections.” (Key Informant Interview-001)

Some participants suggested revisiting the 5–15% target range, citing increasing adolescent pregnancies and obstructed labour, while others cautioned against simplistic target adjustments without accounting for case mix and service readiness.

The direct obstetric case fatality rate was valued as a quality indicator but criticised for excluding maternal deaths occurring outside health facilities or during transit, limiting its ability to reflect true system performance.

6: Poorly Defined Neonatal Indicators and Need for Expanded Measures

Participants highlighted ambiguity in the intrapartum and very early neonatal death rate indicator, particularly regarding definitions and denominators. Stakeholders emphasised the need to distinguish between antepartum stillbirths,

intrapartum stillbirths, and early neonatal deaths attributable to intrapartum events, as these outcomes are differentially influenced by EmONC care.

“I don't understand what they mean by 'very early' ... the denominator is unclear.” (*Neonatologist*)

Participants recommended expanding neonatal indicators to include **process-of-care measures**, such as antenatal corticosteroid use, accurate gestational age assessment, and quality of neonatal resuscitation, to better capture drivers of newborn survival.

Overall, stakeholders valued EmONC signal functions and indicators but emphasised that their impact is constrained by health system limitations, contextual realities, and measurement gaps. Participants consistently called for clearer indicator definitions, greater emphasis on quality and timeliness of care, contextual interpretation of utilisation metrics, and strengthened data **systems** to ensure EmONC monitoring meaningfully reflects service delivery and outcomes in Malawi.

DISCUSSION

This study explored national and district-level stakeholder perspectives on the relevance, feasibility, and utility of Emergency Obstetric and Neonatal Care (EmONC) signal functions and indicators in Malawi. Overall, stakeholders strongly affirmed the continued clinical and policy value of EmONC as a framework for guiding maternal and newborn care. However, findings highlight important gaps between indicator intent and practical implementation, particularly at lower-level facilities, and underscore the need for contextual adaptation to better capture quality, timeliness, and effective coverage of care.¹⁶

EmONC Signal Functions and Feasibility in Low-Resource Settings

Participants emphasised that while EmONC signal functions remain clinically sound, their feasibility at Basic EmONC (BEmONC) level is uneven. Assisted vaginal birth, especially vacuum extraction, was frequently described as challenging due to low case

volumes, limited provider confidence, and weak referral systems. Similar findings have been reported in other low-income settings, where infrequent performance of technically demanding procedures undermines skill retention and increases risk of adverse outcomes.¹⁷

These findings align with the World Health Organization's Quality of Care Framework for Maternal and Newborn Health, which emphasises that improved outcomes depend not only on service availability, but also on competent, timely, respectful, and safe care delivery.¹⁸⁻¹⁹ Stakeholders' concerns suggest that monitoring frameworks should distinguish between nominal service availability and functional readiness, including staffing stability, supervision, and referral capacity, particularly for procedures associated with higher clinical risk.²⁰

Interpreting EmONC Coverage and Utilisation Indicators

Despite Malawi meeting the recommended population-based benchmark for EmONC facility density, stakeholders highlighted persistent access barriers related to geography, terrain, and transport infrastructure. These findings reinforce evidence that facility counts alone are insufficient to reflect true access to life-saving care, particularly in rural and hard-to-reach settings.^{6,21}

Interpretation of caesarean section (CS) rates remains complex. Global evidence demonstrates wide variation in CS use across regions, with both underuse and overuse associated with adverse maternal and neonatal outcomes.^{22,23}

Stakeholders' concerns in this study support growing consensus that CS rates should not be used as stand-alone performance targets, but interpreted alongside indicators of obstetric need, quality of intrapartum care, and health system readiness.²⁴

Gaps in Neonatal Measurement and the Need for Expanded Indicators

A key finding of this study was stakeholders' concern regarding the limited scope and ambiguous

definitions of neonatal indicators within the current EmONC framework. In particular, the intrapartum and very early neonatal death rate was perceived as poorly defined, with unclear denominators and insufficient differentiation between antepartum CS, intrapartum stillbirths, and early neonatal deaths attributable to intrapartum care.^{9,25}

These concerns echo broader critiques of global maternal and newborn health monitoring frameworks, which increasingly call for indicators that capture processes of care, such as quality of neonatal resuscitation, timely use of antenatal corticosteroids, and accurate gestational age assessment.²⁶ Integrating such measures into EmONC monitoring could strengthen accountability for newborn outcomes and better align EmONC indicators with the Every Newborn Action Plan and WHO quality-of-care standards.^{4,18}

Implications for Policy, Practice, and Monitoring Frameworks

These findings align with broader calls for high-quality health systems that deliver effective, people-centred care and move beyond a sole focus on service contact to emphasise experience, safety, and clinical effectiveness.^{7,27} Findings from this study suggest several implications for strengthening EmONC monitoring in Malawi and similar settings.

First, there is a need to contextualise signal function expectations based on facility level, caseload, and referral capacity. Second, EmONC indicators should be complemented by measures of functional readiness, referral effectiveness, and quality of care, moving beyond binary assessments of service availability. Third, strengthening routine data systems and harmonising documentation across maternity and neonatal units is critical to improving the accuracy and usefulness of EmONC indicators. Recent UNFPA guidance similarly highlights the need to strengthen EmONC monitoring systems by integrating quality improvement, functional readiness, and service delivery processes alongside traditional coverage indicators.²⁸

Importantly, engaging frontline providers, programme managers, and policymakers in the

review and adaptation of EmONC indicators, as demonstrated in this study, can enhance ownership, relevance, and uptake of monitoring tools, supporting data-informed decision-making and resource allocation.^{10,11}

Limitations

This study has several limitations. The small sample size, while appropriate for qualitative inquiry, limits the generalisability of findings beyond the study context. Participants were drawn from one purposively selected district and national-level institutions, and perspectives from more remote or under-resourced facilities where signal function performance is often most limited may differ and under-represented.

In addition, practising obstetricians, anaesthetists, and theatre-based staff were not included, which may have influenced findings related to caesarean section, assisted vaginal birth, and surgical readiness. Finally, the presence of implementing partners in the study district may have shaped participant experiences and perceptions of EmONC functionality. Despite these limitations, the study provides valuable insights into real-world use of EmONC indicators from diverse health system actors.

CONCLUSIONS

Emergency Obstetric and Neonatal Care signal functions and indicators remain essential tools for improving maternal and newborn health in Malawi. However, their effectiveness is constrained by feasibility challenges at lower-level facilities, contextual barriers to access, and limitations in current measurement frameworks particularly for neonatal outcomes.

Adapting EmONC indicators to better capture quality of care, functional readiness, and effective coverage, while strengthening data systems and referral networks, is critical to ensuring that monitoring efforts translate into meaningful improvements in maternal and newborn survival. Stakeholder-engaged, context-sensitive refinement of EmONC frameworks offers a promising pathway

for enhancing accountability and outcomes in Malawi and similar low-resource settings.

What is known about the topic?

- Emergency Obstetric and Neonatal Care (EmONC) signal functions and indicators are widely used to monitor facility readiness and guide maternal and newborn health programmes in low- and middle-income countries.
- Despite broad adoption, existing EmONC indicators focus largely on service availability and procedure performance, and may not fully reflect quality, timeliness, referral effectiveness, or neonatal outcomes.
- In many low-resource settings, gaps persist between nominal EmONC availability and the actual capacity to deliver life-saving care, due to workforce limitations, weak referral systems, and data quality challenges.

What this study adds

- This study provides context-specific insights from national and district-level stakeholders in Malawi on the feasibility, interpretation, and real-world usefulness of EmONC signal functions and indicators.
- It highlights key implementation challenges at lower-level facilities, including limited provider confidence, weak referral systems, and unclear indicator definitions that restrict the ability of EmONC indicators to capture quality and timeliness of care.
- It identifies priority areas for strengthening EmONC monitoring, including clearer neonatal indicators, measures of functional readiness and referral effectiveness, and integrating stakeholder-prioritised indicators into routine health information systems.

Acknowledgements

The authors gratefully acknowledge all stakeholders who participated in this study and generously shared their time and experiences. We thank the Ministry of Health, Malawi, and district health management teams for their support and collaboration. We also acknowledge the contributions of implementing partners and facilitators who supported data collection and participatory workshop activities.

Funding

The research reported in this article was supported by Columbia University.

Author's Contributions

Elizabeth Chodzaza conceived the study, led the study design, conducted data collection, analysis, interpretation and manuscript writing. **Charity Kabondo** and **Abigail Kazembe** contributed to data collection and analysis. **Bertha Chakhame**, **Gaily Lungu** and **Lily Kumbani** contributed to interpretation of findings, manuscript drafting, and critical revision, and approved the final version of the manuscript. **Felistus Kapalamula** contributed to data collection and manuscript review. **Martha Kamanga** provided expertise in human-centred design and supported participatory workshop facilitation, and she contributed significantly from proposal development, data analysis and final approval of the manuscript.

Competing interests

The authors declare that they have no competing interests.

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