**Re-Visioning EmONC Delphi Survey Round 1**

1. Introduction

INTRODUCTION

Welcome to Round 1 of the Emergency Obstetric Newborn Care (EmONC) Delphi survey!

**Background**
Twenty-five years ago the novel emergency obstetric care (EmOC) framework provided for the first time [guidelines](https://www.publichealth.columbia.edu/sites/default/files/pdf/unguidelinesen.pdf) for monitoring the availability and use of obstetric services. The set of connected indicators standardised measurement and monitoring of the availability, utilisation, and quality of EmOC in low- and middle-income countries (LMICs). The original EmOC framework, built around signal functions, categorised two levels of care: basic and comprehensive (Figure 1). This common language for policy makers, measurement experts, clinicians and researchers has been enormously influential. The 2009 update (Figure 1) led by Averting Maternal Death and Disability (AMDD) and UN agencies published[Monitoring emergency obstetric care: A Handbook.](https://www.who.int/reproductivehealth/publications/monitoring/9789241547734/en/) Since then, the term "EmONC" has been adopted and the maternal and newborn health (MNH) landscape has continued to progress; this has included an increase in health facility delivery.

**Figure 1. Basic and Comprehensive Emergency Obstetric Care (EmOC) signal functions from 1997 to present**

**Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project**
The Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project is led by a Steering Committee coordinated by the Averting Maternal Death and Disability (AMDD) program at Columbia University Mailman School of Public Health, in collaboration with the London School of Hygiene & Tropical Medicine, UNICEF, UNFPA, and WHO. The overall aim is to create a revised framework for obstetric and newborn care with indicators, tools, and guidance that can meet country needs in 2022 and beyond. Separate workstreams in the Re-Visioning EmONC project are looking in detail at: 1) signal functions; 2) levels of care; 3) quality of care, including potential new indicators on readiness and experience of care; and 4) the framework and indicators, as a connected set, informed by country case studies and global experience of their use.

**The Delphi Survey**
A Delphi study is a widely used methodology to build consensus among a panel of experts through a series of interrelated survey rounds. As part of the Re-Visioning EmONC project, this online Delphi survey (LSHTM Ethics Ref No. 26292) seeks to provide input specifically on the A) signal functions and B) levels of care for the framework. Due to your clinical and programme expertise in maternal and newborn health, you are being invited to join this Delphi survey to build consensus on an optimal (but adaptable) service delivery framework that integrates maternal and newborn care.

This online Delphi survey will include three or more rounds of interrelated surveys, which will be sent out over the next 3-6 months. Each round will take an estimated 20-30+ minutes to complete. Participants who complete all rounds of the survey will be offered collaborative group authorship on the resulting Delphi survey publication.

The first round of this Delphi survey includes open-ended questions that will invite you to share your opinion regarding:

Section A) Which aspects of maternal and newborn care that the revised signal functions should capture.
Section B) Which criteria should influence how levels of care for maternal and newborn care should be organised.

2. Consent

CONSENT FORM \*

|  | Yes | No |
| --- | --- | --- |
| I confirm that I have read and understood the participant information about the modified Delphi study on obstetric and newborn care signal functions and levels of care (sent in the invitation email). I have had the opportunity to consider the information. |    |    |
| I understand that my consent is voluntary and that I am free to withdraw this consent at any time without giving any reason and without my legal rights being affected. |    |    |
| I understand that information submitted in questionnaires will be transcribed and reviewed by researchers in the study and that directly identifiable details will be removed from this transcription for confidentiality. |    |    |
| I understand that information that I submit in the questionnaires for this study will be used by researchers in the study and I give permission for these individuals to have access to my fully anonymised records. |    |    |
| I understand that the study is carried out in a series of rounds and that if I withdraw in a later round of the study it won’t be possible to withdraw information that was provided in previous rounds of the study. |    |    |
| I agree that anonymised direct quotes from my responses may be used in the study report, publications and/or presentations on the results of this study. |    |    |
| I understand that the anonymised data from this study will be stored in a data repository and that access to this data will only be provided at the discretion of the principal investigator by means of a request form. |    |    |
| I consent to provide my email address for the purpose of this study, which will be used to contact me and identify my responses by the study team, and that my email will be deleted from stored files at the end of the study. |    |    |
| I agree to taking part in the above named study. |    |    |

3. Contact Information

1. Have you ever, or do you currently work in Reproductive, Maternal, Newborn or Child Health (RMNCH)? \*

|  |  |
| --- | --- |
|    | Yes |
|    | No |

Name (First and Last) \*

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Email (please use the same email address in every survey you take part in) \*

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SECTION A: Which aspects of maternal and newborn care should the revised signal functions capture?

SIGNAL FUNCTIONS – A RECAP

The term "signal functions", in this context, means a short list of key interventions intended to "signal" health system capability to deliver a certain level of care.

In 1997 the original list of EmOC signal functions was based on providing emergency obstetric care for complications in childbirth. At the time, most births in LMICs were at home and health facilities were mainly accessed for emergency obstetric care. Now in the sustainable development goal (SDG) era >80% of global births are in health facilities and guidelines and updated standards for improving the quality of care for women and newborns in LMICs have been [published.](https://apps.who.int/iris/bitstream/handle/10665/249155/9789241511216-eng.pdf?sequence=1&isAllowed=y)

Newborn resuscitation was added as a signal function in 2009 (Figure 1), but it is widely accepted that a greater focus on newborn care is now needed. The Re-Visioning EmONC project aspires to reflect the need for synergy for women and newborns in facility capacity for high-quality, respectful care.

Re-Visioning Signal Functions

The existing EmOC signal functions (1997 and 2009) are based on providing emergency care for obstetric complications. The original signal functions are:

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| Inpatient clinical interventions or services (and therefore contain an action verb) e.g. "administer" (which assumes that minimum equipment, drugs and human resources are available) |
| Evidence based and/or based on up to date guidelines |
| Indicative of the level of care of a facility |
| Key to averting maternal mortality  |

Since the original EmOC signal functions were designed, poor quality of care has been recognised as a major contributor to the slow progress in ending preventable maternal and newborn death and disability, and stillbirths. [Quality of care](https://www.who.int/docs/default-source/mca-documents/advisory-groups/quality-of-care/standards-for-improving-quality-of-maternal-and-newborn-care-in-health-facilities.pdf) has two interrelated dimensions - provision of care and patient experience of care.  Quality of care standards for maternal and newborn care and [small and sick newborns](https://www.who.int/publications/i/item/9789240010765) are published that explicitly define what is required in order to achieve high-quality care.

The Re-Visioning EmONC project is committed to integrating maternal and newborn care in the revised list of signal functions.

The revised indicator set for the 2022 Re-Visioning EmONC project is expected to include signal functions and separate indicators for quality of care including experience of care as well as new indicators for facility readiness (e.g. infrastructure, referral, human resources).

In this Re-Visioning EmONC project, as well as integrating newborn care more fully, we also have the opportunity to re-visit signal functions and to consider covering aspects of care beyond the management of obstetric emergencies.

2. Type of care

For 2022 onwards, signal functions should cover these types of care (tick all that you think apply). For each one ticked please give your rationale in the comments box below. \*

|  |  |
| --- | --- |
|    | Emergency care for women and newborns |
|    | Routine care for women and newborns, including detection and prevention of complications |

Comments:

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3. Type of interventions

Signal functions should cover these types of care (tick all that you think apply). For each one ticked please give your rationale in the comments box below.\*

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| --- | --- |
|    | Clinical interventions or services (e.g. medical treatments/drugs or procedures) for women and newborns |
|    | Non-clinical interventions or services (e.g. include broader dimensions of facility-based care such as organisation of referral) for women and newborns |

Comments:

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4. Timing of care

Signal functions should cover these areas of care (tick all that you think apply). For each one ticked please give your rationale in the comments box below. \*

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|    | Intrapartum care (for both women and newborns) |
|    | Care during pregnancy |
|    | Postnatal care (for both women and newborns) |
|    | Care for small and sick newborns |
|    | Post abortion care |
|    | Other (please specify):

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Comments:

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5. If we maintain current assumptions based on signal functions as interventions/services to treat complications:

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| a) Which priority complications for women should be included? (Include as many as you wish)   |

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| b) Which priority complications for newborns should be included? (Include as many as you wish)   |

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SECTION B. Which criteria should influence how levels of maternal and newborn care should be organised

The original EmOC signal function framework (1997 and 2009) was based on two levels of care, basic and comprehensive. These levels reflected health system capability to deliver care determined by signal functions of interventions to treat complications: eight obstetric and one neonatal. These two levels of facility care also broadly correspond to competencies for midwives (basic EmOC) or physicians (comprehensive EmOC).

Levels of care can be organised around interventions/signal functions or other criteria. The Re-Visioning EmONC project is committed to exploring an optimal configuration of levels of care both within and between health facilities for both women and newborns.

6. If you think about defining levels of care for women and newborns, which important health system criteria should be considered?

Are interventions/signal functions sufficient to differentiate levels of care or which other criteria should be considered?

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7. Linkage between maternal and newborn levels of care

The 2009 signal function framework has maternal and newborn signal functions grouped together for levels of care.

Should the revised 2022 framework group maternal and newborn signal functions together or separately for levels of care? Please explain your rationale in the comments box. \*

|  |  |
| --- | --- |
|    | Together |
|    | Separately |
|    | No preference |

Comments:

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8. Current levels of care for women and newborns in national health systems
Think about the levels in your national health system (or a system you are very familiar with). Some countries have 2 or 3 levels, others have 6 or more.

Please describe how many levels of care there are in the setting you work in or know best and fill in one criterion of care for women and one for newborns that is used to designate these levels. Please name the levels beginning with level 1 as the lowest health system level, then level 2 as the next level up until all levels are numbered.

Please add any comments in the comments box below the table.

|  | Name of level | Women | Newborn |
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Comments:

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9. Optimal configuration of levels of care
Newborn care levels have recently been envisaged with 3 levels plus a transitional level between levels 2 and 3 (Figure 2). Transition means delivering more care than a lower level, but not all the care required to classify as a higher level of care.

Figure 2. Newborn care interventions by health system levels



Source: World Health Organization. Survive and Thrive Transforming care for every small and sick newborn. 2019. https://apps.who.int/iris/bitstream/handle/10665/326495/9789241515887-eng.pdf(accessed 25 Jan 2021).

What is the optimal number of levels of care for women and newborns with complications? Please give your rationale in the comments box below. \*

|  |  |
| --- | --- |
|    | 2 levels |
|    | 3 levels |
|    | 3 levels plus one transition level between level 2 and level 3 (total 4 levels) |
|    | 3 levels plus one transition level between level 2 and level 3 and one transition between level 1 and 2 (total 5 levels) |
|    | More levels- please specify how many levels below |

Comments:

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8. Information about you

To ensure that our survey includes a diverse panel of experts, please complete the section below to tell us a bit about yourself.

10. Are you a:
(select all that apply) \*

|  |  |
| --- | --- |
|    | 1. Obstetrician-Gynaecologist |
|    | 2. Neonatologist |
|    | 3. Paediatrician |
|    | 4. Physician/Medical Doctor |
|    | 5. Nurse |
|    | 6. Neonatal Nurse |
|    | 7. Midwife |
|    | 8. Associate Clinician/Clinical Officer |
|    | 9. Researcher/Academic in Maternal Health |
|    | 10. Researcher/Academic in Newborn Health |
|    | 11. Technical Advisor in Reproductive, Maternal, Newborn or Child Health |
|    | 12. Programme Manager in Reproductive, Maternal, Newborn or Child Health |
|    | 13. Policy-maker/Planner in Reproductive, Maternal, Newborn or Child Health |
|    | 14. Government Official |
|    | 15. Clinical Trainer or Instructor |
|    | 16. Other (please specify):

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11. How many years of experience do you have working in RMNCH? \*

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|    | Less than 2 years |
|    | 2-5 years |
|    | 6-10 years |
|    | 11-20 years |
|    | More than 20 years |

12. Are you trained as a clinician? \*

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| --- | --- |
|    | Yes |
|    | No |

13. Are you currently providing clinical care in Maternal and Newborn Health? \*

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| --- | --- |
|    | Yes |
|    | No |

14. In which type of setting(s) are you currently providing clinical care? \*

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| --- | --- |
|    | Community |
|    | Health post |
|    | Health centre |
|    | Hospital |
|    | Other (please specify):

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15. In which sector do you provide clinical care? (select all that apply) \*

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|    | Public |
|    | Private |

16. Which WHO regions of the world do you have significant experience working in Maternal and Newborn Health? (select all that apply) \*

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| --- | --- |
|    | African Region |
|    | Americas Region |
|    | Eastern Mediterranean Region |
|    | European Region |
|    | South-East Asian Region |
|    | Western Pacific Region |

17. In which country do you have the most experience working in Maternal and Newborn Health? \*

18. In which country are you currently based? \*

19. Which settings have you worked in? \*

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| --- | --- |
|    | 1. High-income country only |
|    | 2. Low and Middle-income country only |
|    | 3. A combination of High and Low and Middle-income countries |

20. Please write the name of the primary institution where you are currently employed/affiliated:

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21. To which gender identity do you most identify? \*

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| --- | --- |
|    | 1. Female |
|    | 2. Male |
|    | 3. Transgender female |
|    | 4. Transgender male |
|    | 5. Prefer not to say |
|    | 6. Not listed, option to specify:

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Thank you so much for completing the Round 1 Survey!

We will email you a link to the Round 2 Survey in the next 1-2 months. If you have any questions, please contact: Sarah.Moxon@lshtm.ac.uk.

Best regards,
Dr Sarah Moxon and Dr Sudha Sharma
On behalf of the EmONC Steering Committee**R2 survey**

Delphi study on obstetric and newborn signal functions and levels of care: ROUND 2

1. Introduction

**Delphi study on obstetric and newborn care signal functions for the Re-Visioning Emergency Obstetric and Newborn care (EmONC) Project**

Thank you for your participation in round one of the Delphi study on obstetric and newborn care signal functions and levels of care for the Re-Visioning EmONC project. In total, 212 experts participated, sharing many insightful responses and comments.

**Welcome to Round Two!**

**Background**

Twenty-five years ago, the novel emergency obstetric care (EmOC) framework provided for the first time [**guidelines**](https://www.publichealth.columbia.edu/sites/default/files/pdf/unguidelinesen.pdf) for monitoring the availability and use of obstetric services. The set of connected indicators standardised measurement and monitoring of the availability, utilisation, and quality of EmOC in low- and middle-income countries (LMICs). The original EmOC framework, built around ***signal functions***, categorised two ***levels of care***: basic and comprehensive (Figure 1). This common language for policy makers, program planners, measurement experts, clinicians and researchers has been enormously influential. Since then, the term "EmONC" has been adopted and the maternal and newborn health (MNH) landscape has continued to progress; this has included an increase in health facility delivery.

**Figure 1. Basic and Comprehensive Emergency Obstetric Care (EmOC) signal functions from 1997 to present**


**The Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project**

The Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project is led by a Steering Committee coordinated by the Averting Maternal Death and Disability (AMDD) program at Columbia University Mailman School of Public Health, in collaboration with UNICEF, UNFPA, WHO and the London School of Hygiene & Tropical Medicine. The overall aim is to create a revised framework for obstetric and newborn care with indicators, tools, and guidance that can meet country needs in 2022 and beyond.

**The Delphi study**

A Delphi study is a widely used methodology to build consensus among a panel of experts through a series of interrelated survey rounds; this is round two of what we expect to be a total of three rounds. As part of the Re-Visioning EmONC project, the overall aim of this Delphi study (LSHTM Ethics Ref No. 26292) is to build consensus on maternal and newborn signal functions and levels of care for a revised EmONC framework.

**Round Two of the Delphi Survey**

Round two of this Delphi study is focused on **prioritising obstetric and newborn emergency signal functions** for the revised EmONC framework. We will provide a clear definition of signal functions and their desired characteristics and ask you to select priority emergency signal functions for the revised framework based on these.

The content presented for this round of the Delphi is grounded in the results from the first round of this Delphi study, as well as background work, which was refined during a Re-Visioning EmONC technical workshop in May 2022.

***What are emergency signal functions?***

Emergency signal functions are: **a parsimonious list of clinical tracer interventions, representing key processes of care, to treat the main complications of childbirth that would otherwise result in maternal or newborn death and disability, or stillbirth.** They are a simple measure of ***whether the facility performed the function.*** Signal functions are usually captured through surveys and/or routine data collection processes at the facility level.

***What else will be in the revised EmONC framework?***

Emergency signal functions will be used as part of the revised EmONC framework to monitor the availability of emergency obstetric services and small and sick newborn care. The framework will also include additional input indicators such as infrastructure, drugs, and equipment, as well as output and outcome indicators that assess access and quality, including experience of care. Routine care signal functions such as essential newborn care and active management of third stage of labour (AMTSL) will also be included as a separate domain of the revised framework, but are not included in this round, which focuses on emergency signal functions. **All these additional indicators are not part of the signal functions being addressed in this Delphi round two, which focuses only on emergency care signal functions.**

***What are the key characteristics of emergency obstetric and newborn signal functions?***

An ideal obstetric and newborn care emergency signal function for the revised framework should be:

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|  **CRITICAL:** The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth. **a TRACER:** Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia). **FREQUENT:**The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.  **SIMPLE:** Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.\*  |

\*For new signal functions (especially some newborn signal functions) it might be several years before they can be measured reliably in many contexts, therefore, the proposed signal function should be a clearly defined intervention such that in future it can be measured reliably across contexts.

2. Your information

Name (First and Last, as you entered it in the round one survey): **\***

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Email (please use the same email address that you used in the round one survey): **\***

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In the past, for which purpose(s) have you used the EmONC framework? Please describe in the comments box below. **\***

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3. Please select your sections

The first section presents the proposed emergency obstetric care signal functions, the second section presents the small and sick newborn signal functions. Click to select the section(s) you would like to complete. **\***

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| --- | --- |
|    | Obstetric |
|    | Newborn |
|    | Obstetric and newborn |

**Emergency obstetric care signal functions**
***As you review these emergency signal functions, consider the following context:***

Imagine you are working in a managerial or planning role at a district hospital in a low- or middle-income setting that you know well. The facility has a delivery caseload of at least 1000 births per year. There is a labour and delivery ward, an obstetric surgery operating room, and a neonatal unit. Think about the type of supplies, equipment, and staffing capacity typically available as well as some of the regular challenges facing the facility in this context.

Listed below are ***emergency obstetric signal functions.*** Choose the nine most important emergency signal functions for the low- and middle income facility context you imagined. While prioritising, consider the key characteristics of a signal function for the revised framework as defined below:

**CRITICAL:**The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
**a TRACER:** Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
**FREQUENT:** The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
**SIMPLE:** Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.\*

\*For new signal functions (especially some newborn signal functions) it might be several years before they can be measured reliably in many contexts, therefore, the proposed signal function should be a clearly defined intervention such that in future it can be measured reliably across contexts.

1. Drag and drop (or number) the top nine signal functions that you think should be prioritised for the revised EmONC framework based on the information above. The numbers 1-9 will be used to count your top nine signal functions, not to rank them in order of importance.

The document attached to your email invitation contains a table with additional information for each proposed signal function. You can also view the document using this QR code:
Drag and drop (or number) your top nine below: **\***

|  |  |  |
| --- | --- | --- |
| Administer parenteral antibiotics (e.g. ampicillin, gentamicin) (maternal)   |

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| Administer appropriate medications to treat post-partum haemorrhage (PPH) (appropriate medications in the algorithm for PPH e.g. oxytocin or ergometrine (or combination of oxytocin and ergometrine), or oral misoprostol, or prostaglandin or heat stable carbetocin or tranexamic acid).   |

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| Administer magnesium sulfate for pre-eclampsia or eclampsia   |

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| Administer maternal antihypertensives (e.g. alpha methyldopa, hydralazine, labetalol, nifedipine)   |

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| Provide intravenous (IV) infusion/IV fluid replacement therapy (e.g. maternal resuscitation)   |

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| Perform manual uterine exploration and removal of placenta   |

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| Perform removal of retained products of conception (e.g. manual vacuum aspiration), dilation and curettage, medical management)   |

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| Perform assisted vaginal birth (e.g. vacuum extractor, forceps)   |

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| Perform blood transfusion   |

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| Perform caesarean section   |

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| Perform mechanical ventilation   |

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| Provide high dependency/intensive-care   |

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| Provision of continued emergency clinical obstetric and newborn care during interfacility transfer   |

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Is there an additional emergency obstetric signal function that you think is essential to add? If so, please list below.

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Do you have any comments/suggestions on the wording of any of the signal functions?

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**Small and Sick Newborn Care Signal Functions**
***As you review these small and sick newborn care signal functions, consider the following context:***

Imagine you are working in a managerial or planning role at a district hospital in a low- or middle-income setting that you know well. The facility has a delivery caseload of at least 1000 births per year. There is a labour and delivery ward, an obstetric surgery operating room, and a neonatal unit. Think about the type of supplies, equipment, and staffing capacity typically available as well as some of the regular challenges facing the facility in this context.

Listed below are ***small and sick newborn signal functions.*** Choose the nine most important signal functions for the LMIC facility context you imagined. While prioritising, consider the key characteristics of a signal function for the revised framework as defined below:

**CRITICAL:**The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
**a TRACER:** Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
**FREQUENT:** The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
**SIMPLE:** Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.\*

\*For new signal functions (especially some newborn signal functions) it might be several years before they can be measured reliably in many contexts, therefore, the proposed signal function should be a clearly defined intervention such that in future it can be measured reliably across contexts.

2. Drag and drop (or number) the top nine signal functions that you think should be prioritised for the revised EmONC framework based on the information above. The numbers 1-9 will be used to count your top nine signal functions, not to rank them in order of importance.
The document attached to your email invitation contains a table with additional information for each proposed signal function. You can also view the document using this QR code:
Drag and drop (or number) your top nine below: **\***

|  |  |  |
| --- | --- | --- |
| Administer antenatal corticosteroids (ACS) (e.g. dexamethasone, betamethasone) to women at risk of preterm birth   |

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| Administer magnesium sulfate to women at risk of preterm birth   |

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| Perform neonatal resuscitation with bag and mask   |

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| Initiate kangaroo mother care (for LBW/preterm newborns)   |

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| Administer oxygen therapy with pulse oximetry   |

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| Administer parenteral antibiotics (e.g. gentamicin, ampicillin) (newborn)   |

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| Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding)   |

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| Administer phototherapy for hyperbilirubinemia (jaundice)   |

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 |
| Administer parenteral anticonvulsants for seizures (newborn) (e.g. phenobarbitone)   |

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 |
| Perform blood transfusion (newborn)   |

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 |
| Administer CPAP (newborn)   |

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 |
| Perform services for retinopathy of prematurity   |

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 |
| Administer intravenous (IV) fluids (newborn)   |

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 |
| Provide thermal care (e.g. radiant warmer, incubator, heated cot) for preterm/LBW newborns   |

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 |
| Administer methylxanthines (e.g. caffeine) for preterm newborns for prevention and treatment of apnoea   |

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 |
| Provision of continued emergency clinical obstetric and newborn care during interfacility transfer   |

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Is there an additional small and sick newborn signal function that you think is essential to add? If so, please list below.

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Do you have any comments/suggestions on the wording of any of the signal functions?

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**Emergency obstetric care signal functions**

***As you review these emergency signal functions, consider the following context:***

Imagine you are working in a managerial or planning role at a district hospital in a low- or middle-income setting that you know well. The facility has a delivery caseload of at least 1000 births per year. There is a labour and delivery ward, an obstetric surgery operating room, and a neonatal unit. Think about the type of supplies, equipment, and staffing capacity typically available as well as some of the regular challenges facing the facility in this context.

Listed below are ***emergency obstetric signal functions.*** Choose the nine most important emergency signal functions for the low- or middle-income facility context you imagined. While prioritising, consider the key characteristics of a signal function for the revised framework as defined below:

**CRITICAL:**The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
**a TRACER:** Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
**FREQUENT:** The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
**SIMPLE:** Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.\*

\*For new signal functions (especially some newborn signal functions) it might be several years before they can be measured reliably in many contexts, therefore, the proposed signal function should be a clearly defined intervention such that in future it can be measured reliably across contexts.

3. Drag and drop (or number) the top nine signal functions that you think should be prioritised for the revised EmONC framework based on the information above. The numbers 1-9 will be used to count your top nine signal functions, not to rank them in order of importance.

The document attached to your email invitation contains a table with additional information for each proposed signal function. You can also view the document using this QR code:
Drag and drop (or number) your top nine below: **\***

|  |  |  |
| --- | --- | --- |
| Administer parenteral antibiotics (e.g. ampicillin, gentamicin) (maternal)   |

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| Administer appropriate medications to treat post-partum haemorrhage (PPH) (appropriate medications in the algorithm for PPH e.g. oxytocin or ergometrine (or combination of oxytocin and ergometrine), or oral misoprostol, or prostaglandin or heat stable carbetocin or tranexamic acid).   |

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| Administer magnesium sulfate for pre-eclampsia or eclampsia   |

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| Administer maternal antihypertensives (e.g. alpha methyldopa, hydralazine, labetalol, nifedipine)   |

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| Provide intravenous (IV) infusion/IV fluid replacement therapy (e.g. maternal resuscitation)   |

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 |
| Perform manual uterine exploration and removal of placenta   |

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 |
| Perform removal of retained products of conception (e.g. manual vacuum aspiration, dilation and curettage, medical management)   |

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 |
| Perform assisted vaginal birth (e.g. vacuum extractor, forceps)   |

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| Perform blood transfusion   |

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| Perform caesarean section   |

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| Perform mechanical ventilation   |

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| Provide high dependency/intensive-care   |

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 |
| Provision of continued emergency clinical obstetric and newborn care during interfacility transfer   |

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Is there an additional emergency obstetric signal function that you think is essential to add? If so, please list below.

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Do you have any comments/suggestions on the wording of any of the signal functions?

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**Small and Sick Newborn Care Signal Functions**

***As you review these small and sick newborn signal functions, consider the following context:***

Imagine you are working in a managerial or planning role at a district hospital in a low- or middle-income setting that you know well. The facility has a delivery caseload of at least 1000 births per year. There is a labour and delivery ward, an obstetric surgery operating room, and a neonatal unit. Think about the type of supplies, equipment, and staffing capacity typically available as well as some of the regular challenges facing the facility in this context.

Listed below are ***small and sick newborn signal functions.*** Choose the nine most important emergency signal functions for the low- or middle-income facility context you imagined. While prioritising, consider the key characteristics of a signal function for the revised framework as defined below:

**CRITICAL:**The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
**a TRACER:** Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
**FREQUENT:** The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
**SIMPLE:** Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.\*

\*For new signal functions (especially some newborn signal functions) it might be several years before they can be measured reliably in many contexts, therefore, the proposed signal function should be a clearly defined intervention such that in future it can be measured reliably across contexts.

4. Drag and drop (or number) the top nine signal functions that you think should be prioritised for the revised EmONC framework based on the information above. The numbers 1-9 will be used to count your top nine signal functions, not to rank them in order of importance.

The document attached to your email invitation contains a table with additional information for each proposed signal function. You can also view the document using this QR code:
Drag and drop (or number) your top nine below: **\***

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| Administer antenatal corticosteroids (ACS) (e.g. dexamethasone, betamethasone) to women at risk of preterm birth   |

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| Administer magnesium sulfate to women at risk of preterm birth   |

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| Perform neonatal resuscitation with bag and mask   |

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| Initiate kangaroo mother care (for LBW/preterm newborns)   |

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| Administer oxygen therapy with pulse oximetry   |

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 |
| Administer parenteral antibiotics (e.g. gentamicin, ampicillin) (newborn)   |

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 |
| Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding)   |

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 |
| Administer phototherapy for hyperbilirubinemia (jaundice)   |

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 |
| Administer parenteral anticonvulsants for seizures (newborn) (e.g. phenobarbitone)   |

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 |
| Perform blood transfusion (newborn)   |

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 |
| Administer CPAP (newborn)   |

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 |
| Perform services for retinopathy of prematurity   |

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 |
| Administer intravenous (IV) fluids (newborn)   |

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 |
| Provide thermal care (e.g. radiant warmer, incubator, heated cot) for preterm/LBW newborns   |

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 |
| Administer methylxanthines (e.g. caffeine) for preterm newborns for prevention and treatment of apnoea   |

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 |
| Provision of continued emergency clinical obstetric and newborn care during interfacility transfer   |

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Is there an additional small and sick newborn signal function that you think is essential to add? If so, please list below.

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Do you have any comments/suggestions on the wording of any of the signal functions?

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**Thank you so much for completing the round two survey!**

Participants who complete all rounds of the survey will be offered collaborative group authorship on the resulting Delphi survey publication.

Once analysis of round two is complete, we will contact you with a link to the round three survey. If you have any questions, please contact: Sarah.Moxon@lshtm.ac.uk.

Best regards,
Dr Sarah Moxon, Dr Sudha Sharma and Dr Jalemba Aluvaala
On behalf of the Re-Visioning EmONC Project Steering Committee

**Delphi study on obstetric and newborn signal functions and levels of care: ROUND 3**

1. Introduction

**Delphi study on obstetric and newborn care signal functions for the Re-Visioning Emergency Obstetric and Newborn care (EmONC) Project**

Thank you for your participation in rounds one and two of the Delphi study on obstetric and newborn care signal functions and levels of care for the Re-Visioning EmONC project. In total, 131 experts participated in round two, which was focused on prioritising emergency obstetric and newborn care signal functions for the revised EmONC framework.

Welcome to Round Three!

**Background**

Twenty-five years ago, the novel emergency obstetric care (EmOC) framework provided for the first time [guidelines](https://www.publichealth.columbia.edu/sites/default/files/pdf/unguidelinesen.pdf) for monitoring the availability and use of obstetric services. The set of connected indicators standardised measurement and monitoring of the availability, utilisation, and quality of EmOC in low- and middle-income countries (LMICs). The original EmOC framework, built around signal functions, categorised two levels of care: basic and comprehensive (Figure 1). This common language for policy makers, program planners, measurement experts, clinicians and researchers has been enormously influential. With increased recognition of the importance of newborns in global health, the term "EmONC" has been adopted for programme implementation and the maternal and newborn health (MNH) landscape has continued to progress; this has included an increase in health facility delivery.

**Figure 1. Basic and Comprehensive Emergency Obstetric Care (EmOC) signal functions from 1997 to present**


**The Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project**

The Re-Visioning Emergency Obstetric and Newborn Care (EmONC) Project is led by a Steering Committee coordinated by the Averting Maternal Death and Disability (AMDD) program at Columbia University Mailman School of Public Health, in collaboration with UNICEF, UNFPA, WHO and the London School of Hygiene & Tropical Medicine (LSHTM). The overall aim is to create a revised framework for obstetric and newborn care with indicators, tools, and guidance that can meet country needs in 2023 and beyond.

**The Delphi study on obstetric and newborn signal functions and levels of care**

A Delphi study is a widely used method to build consensus among experts through a series of interrelated survey rounds. The first round of the Delphi study on obstetric and newborn signal functions and levels of care was carried out in November-December 2021, the second round in August-September 2022, and this is the third and final of three rounds. As part of the Re-Visioning EmONC project, the overall aim of this Delphi study is to build consensus on obstetric and newborn signal functions and levels of care. The study has ethical approval from LSHTM Ethics Ref No. 26292.

**Round three of the Delphi study**

The objective of round three of this Delphi study is to build consensus on a configuration of EmONC signal functions linked to specific levels of care. You will be invited to answer questions and provide feedback on a prototype (a preliminary model) of the signal functions and the recommended levels of care at which these are provided. We anticipate that this will take 20 minutes to complete.

The prototype presented in this round is grounded in results from the previous two rounds of the Delphi study and from a Re-Visioning EmONC Project technical workshop held in September 2022.

**What are emergency signal functions?**

Emergency signal functions are: a parsimonious list of clinical tracer interventions, representing key processes of care, to treat the main complications of childbirth that would otherwise result in maternal or newborn death and disability, or stillbirth. Signal functions are a simple measure of whether the facility performed the function in a specified time period; they are usually captured through surveys and/or routine health information systems at the facility level.

**What are the EmONC signal functions used for?**

EmOC signal functions have been primarily used for planning purposes, to ascertain the availability of basic and comprehensive level EmOC facilities across a population. The Re-Visioning EmONC Project aims to integrate emergency newborn care signal functions to be used for the same purpose. Emergency signal functions are tracers – they do not capture all interventions performed or act as indicators of quality of care. In addition to their use for planning, signal functions have also been used for research, advocacy, accountability, and for training programmes.

**What else will be in the revised EmONC framework?**

In addition to signal functions, the revised EmONC framework will also include a set of updated indicators including input (e.g. infrastructure, drugs, and equipment), output and outcome indicators to assess access and quality, including experience of care. Routine care for women and newborns will also be included as a separate part of the revised framework, but is not included in this Delphi study, which focuses on emergency signal functions and levels of care.

2. Your information

Name (First and Last, as you entered it in the round one survey): \*

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Email (please use the same email address that you used in the round one survey): \*

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3. Your opinion on signal functions and levels of care

Emergency obstetric and newborn care (EmONC) signal functions by three levels of care: A prototype


\*These signal functions are required at comprehensive and intensive EmONC levels, but they can (and often will) be part of service delivery at first line EmONC facilities.

The document attached to your email invitation contains a table with additional information for each proposed signal function.

**Section A. Levels of care**

This section is about the proposed organisation of signal functions into three levels of care. In round one of this Delphi study, 85% of participants indicated a configuration of signal functions built around three levels of care would be optimal for the revised EmONC framework.

1. What is your opinion on the proposal to use three levels of care as shown in the prototype above?
(This question is not about which signal functions are in each level in the prototype; the signal functions themselves will be discussed in the next section. We simply wish to know your opinion on using three levels of care, as compared to fewer or more levels.) \*

|  |  |
| --- | --- |
|    | Strongly disagree |
|    | Disagree |
|    | Agree |
|    | Strongly agree |

If you disagree or strongly disagree please state your reasons in the text box below:

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|   |

2. In the prototype, we have proposed naming the three levels (first line, comprehensive, intensive).

What is your opinion on naming the lowest level of care "first line"? \*

|  |  |
| --- | --- |
|    | Strongly disagree |
|    | Disagree |
|    | Agree |
|    | Strongly agree |

If you disagree or strongly disagree please state your reasons in the text box below:

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|   |

3. What is your opinion on naming the middle level of care "comprehensive"? \*

|  |  |
| --- | --- |
|    | Strongly disagree |
|    | Disagree |
|    | Agree |
|    | Strongly agree |

If you disagree or strongly disagree please state your reasons in the text box below:

|  |
| --- |
|   |

4. What is your opinion on naming the highest level of care "intensive"? \*

|  |  |
| --- | --- |
|    | Strongly disagree |
|    | Disagree |
|    | Agree |
|    | Strongly agree |

If you disagree or strongly disagree please state your reasons in the text box below:

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5. Do you have any other general comments about the naming of the three levels?

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4. Select which sections to complete

**Section B. Signal functions**
This section is about the proposed signal functions for the three levels of care. Please choose whether you would like to complete the sections on obstetric signal functions, newborn signal functions or obstetric and newborn signal functions for levels of care. \*

|  |  |
| --- | --- |
|    | Obstetric signal functions |
|    | Newborn signal functions |
|    | Obstetric and newborn signal functions |

5. Obstetric

Obstetric care signal functions

An ideal EmONC signal function for the revised EmONC framework should meet these criteria:

CRITICAL: The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
a TRACER: Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
FREQUENT: The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
SIMPLE: Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.

Emergency obstetric and newborn care (EmONC) signal functions by three levels of care: A prototype



\*These signal functions are required at comprehensive and intensive EmONC levels, but they can (and often will) be part of service delivery at first line EmONC facilities.

6. Based on the above criteria, the following obstetric signal functions should be included in the revised EmONC framework: \*

|  | Agree | Disagree |
| --- | --- | --- |
| Administer parenteral antibiotics (maternal) |    |    |
| Administer medications to treat post-partum-haemorrhage (PPH) |    |    |
| Administer magnesium sulfate for severe pre-eclampsia or eclampsia |    |    |
| Provide IV fluid replacement therapy (e.g. for shock or sepsis) |    |    |
| Perform manual removal of retained placenta and uterine exploration |    |    |
| Perform removal of retained products of conception (POC) for abortion or post-abortion care (e.g., vacuum aspiration, dilation and evacuation, medical management) |    |    |
| Perform assisted vaginal birth (e.g. vacuum extractor, ventouse, forceps) |    |    |
| Perform blood transfusion |    |    |
| Perform caesarean section |    |    |
| Provide intensive level organ support |    |    |
| Provide continued clinical care during interfacility transfer |    |    |

Comments:

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7. I agree with the placement of "Administer parenteral antibiotics (maternal)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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8. I agree with the placement of "Administer magnesium sulfate for severe pre-eclampsia or eclampsia" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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9. I agree with the placement of "Administer medications to treat post-partum-haemorrhage (PPH)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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10. I agree with the placement of "Provide IV fluid replacement therapy (e.g. for shock or sepsis)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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11. I agree with the placement of "Perform removal of retained products of conception (POC) for abortion or post-abortion care (e.g., vacuum aspiration, dilation and evacuation, medical management)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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12. I agree with the placement of "Perform manual removal of retained placenta and uterine exploration" at the comprehensive level of care as proposed in the prototype. \*

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| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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13. I agree with the placement of "Perform assisted vaginal birth (e.g. vacuum extractor, ventouse, forceps)" at the comprehensive level of care as proposed in the prototype. \*

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| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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14. I agree with the placement of "Perform blood transfusion" at the comprehensive level of care as proposed in the prototype. \*

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| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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15. I agree with the placement of "Perform caesarean section" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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16. I agree with the placement of "Provide intensive level organ support" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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6. Newborn

Newborn Care Signal Functions

An ideal EmONC signal function for the revised EmONC framework should meet these criteria:

CRITICAL: The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
a TRACER: Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
FREQUENT: The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
SIMPLE: Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.

Emergency obstetric and newborn care (EmONC) signal functions by three levels of care: A prototype


\*These signal functions are required at comprehensive and intensive EmONC levels, but they can (and often will) be part of service delivery at first line EmONC facilities.

17. Based on the above criteria, the following newborn signal functions should be included in the revised EmONC framework: \*

|  | Agree | Disagree |
| --- | --- | --- |
| Administer antenatal corticosteroids (ACS) to women at risk of preterm birth |    |    |
| Perform neonatal resuscitation with bag and mask |    |    |
| Initiate kangaroo mother care (for LBW/preterm newborns) |    |    |
| Administer oxygen therapy for respiratory support |    |    |
| Administer parenteral antibiotics (newborn) |    |    |
| Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding) |    |    |
| Administer phototherapy for hyperbilirubinemia (jaundice) |    |    |
| Provide thermal care (e.g. with radiant warmer, incubator) |    |    |
| Perform blood transfusion (newborn) |    |    |
| Administer continuous positive airway pressure (CPAP) (newborn) |    |    |
| Administer mechanical ventilation (newborn) |    |    |
| Perform services for retinopathy of prematurity |    |    |
| Provide continued clinical care during interfacility transfer |    |    |

Comments:

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18. I agree with the placement of "Provide continued clinical care during interfacility transfer" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

|  |
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19. I agree with the placement of "Perform neonatal resuscitation with bag and mask" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

|  |
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20. I agree with the placement of "Initiate kangaroo mother care (for LBW/preterm newborns)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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21. I agree with the placement of "Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding)" at the first line level of care as proposed in the prototype.\*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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22. I agree with the placement of "Administer oxygen therapy for respiratory support" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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23. I agree with the placement of "Administer parenteral antibiotics (newborn)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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24. I agree with the placement of "Provide thermal care (e.g. with radiant warmer, incubator)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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25. I agree with the placement of "Administer antenatal corticosteroids (ACS) to women at risk of preterm birth" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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26. I agree with the placement of "Administer phototherapy for hyperbilirubinemia (jaundice)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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27. I agree with the placement of "Perform services for retinopathy of prematurity" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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28. I agree with the placement of "Administer continuous positive airway pressure (CPAP) (newborn)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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29. I agree with the placement of "Perform blood transfusion (newborn)" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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30. I agree with the placement of "Administer mechanical ventilation (newborn)" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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7. Obstetric and Newborn

Obstetric care signal functions

An ideal EmONC signal function for the revised EmONC framework should meet these criteria:

CRITICAL: The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
a TRACER: Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
FREQUENT: The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
SIMPLE: Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.

Emergency obstetric and newborn care (EmONC) signal functions by three levels of care: A prototype

\*These signal functions are required at comprehensive and intensive EmONC levels, but they can (and often will) be part of service delivery at first line EmONC facilities.

31. Based on the above criteria, the following obstetric signal functions should be included in the revised EmONC framework: \*

|  | Agree | Disagree |
| --- | --- | --- |
| Administer parenteral antibiotics (maternal) |    |    |
| Administer medications to treat post-partum-haemorrhage (PPH) |    |    |
| Administer magnesium sulfate for severe pre-eclampsia or eclampsia |    |    |
| Provide IV fluid replacement therapy (e.g. for shock or sepsis) |    |    |
| Perform manual removal of retained placenta and uterine exploration |    |    |
| Perform removal of retained products of conception (POC) for abortion or post-abortion care (e.g., vacuum aspiration, dilation and evacuation, medical management) |    |    |
| Perform assisted vaginal birth (e.g. vacuum extractor, ventouse, forceps) |    |    |
| Perform blood transfusion |    |    |
| Perform caesarean section |    |    |
| Provide intensive level organ support |    |    |
| Provide continued clinical care during interfacility transfer |    |    |

Comments:

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32. I agree with the placement of "Administer parenteral antibiotics (maternal)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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33. I agree with the placement of "Administer magnesium sulfate for severe pre-eclampsia or eclampsia" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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34. I agree with the placement of "Administer medications to treat post-partum-haemorrhage (PPH)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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35. I agree with the placement of "Provide IV fluid replacement therapy (e.g. for shock or sepsis)" at first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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36. I agree with the placement of "Perform removal of retained products of conception (POC) for abortion or post-abortion care (e.g., vacuum aspiration, dilation and evacuation, medical management)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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37. I agree with the placement of "Perform manual removal of retained placenta and uterine exploration" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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38. I agree with the placement of "Perform assisted vaginal birth (e.g. vacuum extractor, ventouse, forceps)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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39. I agree with the placement of "Perform blood transfusion" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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40. I agree with the placement of "Perform caesarean section" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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41. I agree with the placement of "Provide intensive level organ support" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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Newborn Care Signal Functions

An ideal EmONC signal function for the revised EmONC framework should meet these criteria:

CRITICAL: The signal function should represent a clinical intervention or service performed by health workers to manage one or more complication(s) that would otherwise result in major cause/s of maternal or newborn death and disability, or stillbirth.
a TRACER: Performance of the intervention or service ideally indicates that multiple other components of treatment or aspects of care are also present (e.g., performance of surgery generally indicates the availability of anaesthesia).
FREQUENT: The intervention or service should be performed often enough to reflect ongoing performance or functionality of the facility.
SIMPLE: Not necessarily simple to perform, but the intervention or service should be clearly and operationally defined and feasible to measure reliably across contexts.

Emergency obstetric and newborn care (EmONC) signal functions by three levels of care: A prototype


\*These signal functions are required at comprehensive and intensive EmONC levels, but they can (and often will) be part of service delivery at first line EmONC facilities.

42. Based on the above criteria, the following newborn signal functions should be included in the revised EmONC framework: \*

|  | Agree | Disagree |
| --- | --- | --- |
| Administer antenatal corticosteroids (ACS) to women at risk of preterm birth |    |    |
| Perform neonatal resuscitation with bag and mask |    |    |
| Initiate kangaroo mother care (for LBW/preterm newborns) |    |    |
| Administer oxygen therapy for respiratory support |    |    |
| Administer parenteral\* antibiotics (newborn) |    |    |
| Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding) |    |    |
| Administer phototherapy for hyperbilirubinemia (jaundice) |    |    |
| Provide thermal care (e.g. with radiant warmer, incubator) |    |    |
| Perform blood transfusion (newborn) |    |    |
| Administer continuous positive airway pressure (CPAP) (newborn) |    |    |
| Administer mechanical ventilation (newborn) |    |    |
| Perform services for retinopathy of prematurity |    |    |
| Provide continued clinical care during interfacility transfer |    |    |

Comments:

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43. I agree with the placement of "Provide continued clinical care during interfacility transfer" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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44. I agree with the placement of "Perform neonatal resuscitation with bag and mask" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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45. I agree with the placement of "Initiate kangaroo mother care (for LBW/preterm newborns)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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46. I agree with the placement of "Perform assisted feeding with expressed breastmilk (e.g. cup and/or nasogastric feeding)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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47. I agree with the placement of "Administer oxygen therapy for respiratory support" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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48. I agree with the placement of "Administer parenteral antibiotics (newborn)" at the first line level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at first line level |
|    | Disagree- should be placed at comprehensive level |
|    | Disagree- should be placed at intensive level |

Comments:

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49. I agree with the placement of "Provide thermal care (e.g. with radiant warmer, incubator)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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50. I agree with the placement of "Administer antenatal corticosteroids (ACS) to women at risk of preterm birth" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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51. I agree with the placement of "Administer phototherapy for hyperbilirubinemia (jaundice)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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52. I agree with the placement of "Perform services for retinopathy of prematurity" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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53. I agree with the placement of "Administer continuous positive airway pressure (CPAP) (newborn)" at the comprehensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at comprehensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at intensive level |

Comments:

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54. I agree with the placement of "Perform blood transfusion (newborn)" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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55. I agree with the placement of "Administer mechanical ventilation (newborn)" at the intensive level of care as proposed in the prototype. \*

|  |  |
| --- | --- |
|    | Agree with placement at intensive level |
|    | Disagree- should be placed at first line level |
|    | Disagree- should be placed at comprehensive level |

Comments:

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**8. Additional questions**

56. Beyond the signal functions included in the prototype, are there signal functions for interventions for preventing stillbirth that you consider meet the signal function criteria?

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57. ​​​​​​​Beyond the signal functions included in the prototype, are there signal functions that capture interventions that benefit women and newborns together that you consider meet the signal function criteria?

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58. Are there any other signal functions other than those shown on the prototype that you think are essential to include in the revised EmONC framework?

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9. Thank You

59. I would like to receive communications and information about the revised EmONC framework and indicators.

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|    | Yes |
|    | No |

60. I would be interested to provide feedback on other aspects of the EmONC framework and indicators as it develops.

|  |  |
| --- | --- |
|    | Yes |
|    | No |

Thank you for participating in all three rounds of this Delphi study on obstetric and newborn care signal functions and levels of care!

Best regards,
Dr Sarah Moxon, Dr Sudha Sharma and Dr Jalemba Aluvaala
On behalf of the Re-Visioning EmONC Project Steering Committee