

# Selecting Indicators for Assessing the Functionality of Basic Emergency Obstetric and Newborn Care Facilities in the Philippines: A Delphi Process

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## ABSTRACT

**Introduction.** To address the problem of high maternal death, the Department of Health implemented the Basic Emergency Obstetric and Newborn Care (BEmONC) services at the level of primary care health facilities. These are key life-saving interventions that treat obstetric emergencies. Over a decade later, we need to assess and improve the program's implementation.

**Objective.** The study aims to select indicators for assessing the functionality of BEmONC facilities.

**Methods.** Electronic Delphi process was used to select the indicators.

**Results.** The two-round Delphi process was accepted by 21 respondents, with a 100% response rate. All 30 proposed indicators were retained following the criteria.

**Conclusion.** Thirty indicators to assess the functionality of BEmONC facilities have been selected through the consensus of an expert panel using the Delphi process. These indicators help evaluate BEmONC facilities, formulate policy, and guide new programs that promote maternal health.

**Keywords:** BEmONC, maternal health, newborn care, Delphi process

## INTRODUCTION

The Philippines' perennial maternal health problem thwarted the achievement of the fifth Millennium Development Goal (MDG)—to reduce the Maternal Mortality Ratio (MMR) to 52 deaths per 100,000 live births.<sup>1</sup> Sustainable Development Goals (SDGs) were later created to finish what the MDGs started.<sup>2</sup> Under the third SDG,—“to ensure healthy lives and promote well-being for all at all ages,”—MMR was to be reduced to <70 deaths per 100,000 live births by 2030.<sup>3</sup> By 2017, however, the country was still way off-target.<sup>4</sup> Countries have implemented a mix of approaches to reduce maternal and neonatal mortalities.<sup>5</sup>

According to the 2003 National Demographic and Health Survey, maternal mortality in the Philippines is largely attributed to the predominance of home births and the high proportion of births assisted by traditional birth attendants (“hilots”).<sup>6</sup> Although most obstetric complications cannot be predicted, timely intervention drastically reduces the mortality from these.

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The Department of Health (DOH)<sup>7</sup> established the Basic Emergency Obstetric and Newborn Care (BEmONC)<sup>8</sup> protocols for basic obstetric emergencies at the primary level. The BEmONC facilities provide pregnancy package services, prenatal packages, childbirth, and post-natal/post-partum packages, and must be geographically accessible and staffed by trained personnel.<sup>8</sup> After more than a decade since BEmONC facilities were established, there is a need to assess their functionality and effectiveness.

There are two distinct ways of identifying factors that affect health service delivery. The first is to analyze each factor individually in the context of a single MDG. The second is to identify each system challenge and work it across the other MDGs. For example, to address neonatal morbidity and mortality, maternal care must also be optimized.<sup>5</sup>

A Delphi process produces a consensus to answer a research question. Its exploratory round identifies debatable issues while one or more iterative question-and-answer rounds let experts determine the level of supporting evidence and form a consensus. Delphi studies have been previously used to assess birthing facilities, and the indicators selected differ from existing monitoring tools. This discrepancy arises from the limited resources in the area.<sup>9</sup>

The Delphi process allows for the confirmation of indicators previously selected from already existing evaluation tools.<sup>10-13</sup> But the overwhelming number of metrics limits the ability of health personnel to perform all of them with consistency and regularity. In some instances, the paucity of patients can also prevent the performance of certain signal functions.

Thus, there is a need to determine the most essential indicators that can be incorporated into a scorecard for a quick assessment of BEmONC functionality. Functionality is the manifestation of a BEmONC facility's capacity to fulfill its mandate and implement the interventions and management. The present study utilizes the quantitative approach in order to obtain immediately measurable indicators for assessing the functionality of BEmONC facilities in the Philippines.

## METHODS

### The Delphi Process

A Delphi process was used to select our indicators. This provides a structured expert perspective. First, we reviewed the literature for existing indicators used to assess the functionality and efficiency of emergency obstetric care facilities. Second, we set up a panel of national technical experts in public health and maternal health. Third, we created a questionnaire containing the indicators from the first step. Finally, in a two-step Delphi process, we consulted the panel on the proposed indicators.

### Literature Review

A review of the literature was performed in May 2021. The advanced search was done in PubMed using the

keywords “emergency obstetric care,” “obstetric care,” “quality indicators,” “indicators,” “signal function,” and “functionality” with various combinations of these terms and queries. This yielded twenty-nine papers.

A review of the abstracts of these papers and related articles identified thirty-two articles that mentioned a set of indicators and/or signal functions. Of these, only twenty-nine were accessible. We explored their methodologies to identify the tools used, including:

- Monitoring Emergency Obstetric Care: A Handbook (2009) by the World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), United Nations Population Fund (UNFPA), and Averting Maternal Death and Disability (AMDD) Program<sup>10</sup>
- Needs Assessment of Emergency Obstetric and Newborn Care Data Collector's Manual (2010)<sup>11</sup>
- Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) Manual for Monitoring Birth Preparedness and Complication Readiness<sup>14</sup>
- Nesbitt et al. Quality Index Dimensions for Maternal and Neonatal Care<sup>15</sup>

We also searched for Philippine-made questionnaires and survey forms used by the DOH, which were heavily based on the joint WHO, UNICEF, UNFPA, and AMDD handbook, including:

- BEmONC Training Program Post-Training Evaluation: An Assessment of BEmONC Proficiency<sup>12</sup>
- Birthing Center Monitoring Form<sup>13</sup>

After excluding sources that were difficult to access or seldom used, four main sources were selected: the 2009 WHO Handbook, the 2010 AMDD Toolkit, and the two DOH Evaluation Forms.<sup>10-13</sup> We synthesized the indicators used and created a list of thirty indicators for our scorecard.

### Selection of Sources for the Indicators

The final set of indicators represents the core essentials of local and international guidelines and is appropriate for evaluating BEmONC functionality.

### WHO Handbook

This handbook's indicators monitor interventions that may improve maternal and neonatal outcomes. It is focused on the availability, accessibility, and quality of health services. These guidelines are based on “process,” “output,” and “outcome” indicators rather than the previously used “impact” indicators. These newer indicators are advantageous in that these can be repeatedly measured in short-term intervals and have direct use for implementing policies and guidelines in adjusting each program.<sup>10</sup>

### AMDD Toolkit

The AMDD Toolkit assesses the health facility at the community level. It considers infrastructure, supplies, equipment, health personnel availability and competency, and delivery of health services. The process of coming up with an AMDD Toolkit per country requires a group assessment and a three-step process of advocacy and planning, needs assessment, and implementation of plans into action.<sup>11</sup>

**Table 1.** Profile of Delphi process participants (n = 21)

Age Range (in years)	36-64
Mean Age (in years)	44
Mean Years of Experience	16
Sex, (% Female)	62
<b>Involvement in maternal health (% of participants)</b>	
Maternal health policy expert	0.20
Safe Motherhood Program manager	0.05
Academe	0.45
Officer of a professional society	0.45
Health facility/BEMONC staff	0.10
<b>Field/Discipline/Specialty (% of participants)</b>	
Public health administrator	0.30
OB-Gynecologist	0.55
Midwife	0.10
Nurse	0.05

**Table 2.** Regional distribution of Delphi process participants (n = 21)

Region I (Ilocos Region)	9.5%
Region II (Cagayan Valley)	14%
Region III (Central Luzon)	5%
Region IVA (CALABARZON)	5%
Region IVB (MIMAROPA)	9.5%
Region V (Bicol Region)	5%
National Capital Region (NCR)	52%

**Table 3.** Proposed indicators

Part 1: Institutional Capacity	Part 2: Service Capacity	Part 3: Personnel Capacity - Signal Functions
1. Availability of rooms: labor/delivery/postpartum/laboratory	1. BEmONC-trained personnel active	1. Administration of parenteral antibiotics
2. Availability of beds	2. Deliveries	2. Administration of uterotonic drugs
3. Availability of delivery tables	3. Live births	3. Parenteral administration of anticonvulsants
4. Availability of essential utilities (electricity and water)	4. Antenatal care based on the average over a 3- to 6-month period	4. Assisted imminent breech delivery, when needed
5. Presence of a pharmacy and drug inventory register	5. Postnatal care based on the average over a 3- to 6-month period	5. Parenteral administration of loading dose of maternal steroids during preterm labor
6. Availability of regular supply of meds	6. Referrals: high-risk pregnancies (total number of referrals/total number of high-risk pregnancies determined during ANC)	6. Newborn resuscitation, when needed
7. Presence of drug storage and refrigeration	7. Referrals: difficult deliveries (total number of referred deliveries/total number of deliveries initiated in the BEmONC center)	7. Other maternal and newborn-related activities
8. Presence of protocols	8. Maternal deaths	8. Referral to CEmONC, when needed
9. Presence of sterilizing room	9. Newborn deaths	9. Presence of partograph review
10. Presence of equipment list	10. Family planning services	10. Additional signal functions when needed (removal of retained placenta, instrumental vaginal delivery)

### DOH Instruments

The DOH instruments are the evaluation forms from its central office for use by the primary level facilities, including BEmONC-capable RHUs. These instruments are largely based on the WHO Handbook and guidelines.<sup>12,13</sup>

### Participants

The panel consisted of 21 national technical experts (13 women, 8 men) with relevant experience and knowledge in public health and maternal health. The panel members were chosen based on their preeminence in the field and/or at least ten years of significant experience/involvement in the development and implementation of maternal health programs (Table 1). They were involved in the study for two months.

Participants who did not provide consent were excluded and those who did not adhere to the guidelines were withdrawn.

All participants came from the island of Luzon. Their regional distribution is shown in Table 2.

### Questionnaire

The thirty indicators were divided into three main categories: institutional, service, and personnel capacities. The applicability of each indicator was rated using a Likert scale of 0 (strongly disagree) to 3 (strongly agree). An indicator was retained if > 70% of the panel members scored it 2 or 3.

The proposed indicators and their categories are shown in Table 3.

### Procedure

Participants of the expert panel were invited via email and those who accepted underwent two rounds of the Delphi process online for two months (because no face-to-face meetings were allowed during the COVID-19 lockdown period). Reminders were sent via email and phone

correspondence. The questionnaire was sent to the expert panel via a Google Form, which they answered as described above. They were allowed to specify indicators that needed additional metrics of measurement and add new indicators.

The same selection criteria were used for the first and second rounds. Quantitative and qualitative feedback through comments was given to the panel members after each round. The consensus was reached when a >70% rate of agreement among the respondents was achieved.

### Ethical Considerations

This study is part of a bigger study entitled “Assessment of the Philippine Emergency Obstetric and Newborn Care (EmONC) Initiative” supported by the Philippine Council for Health Research and Development under the Advancing Health through Evidence-Assisted Decisions - Health Policy and Systems Research (AHEAD-HPSR) program with project number DOH-FP 200017. The main research protocol was approved by the Single Joint Research Ethics Board with registration code SJREB-2020-75. All participants in the electronic Delphi process provided written informed consent.

## RESULTS

The response rate among the twenty-one members of the expert panel was 100% for both rounds.

All 30 indicators (10 each for the three categories) were given a score of either 2 or 3. All passed the 70% consensus mark. No indicator from the proposed list was dropped and no additional indicators were suggested. Thus, the initial list was retained until the end of the process (Tables 4-6).

## DISCUSSION

### Constraints in Health Delivery Systems

The highest number of maternal and neonatal deaths occur during labor and within the first twenty-four hours after delivery. Obstetric and neonatal complications are mostly preventable with access to skilled intrapartum and postnatal primary health care. Despite this, access remains lacking for life-saving interventions at the primary health care level in low- and middle-income countries, where maternal and neonatal morbidity and mortality are highest.<sup>16</sup>

Reviews have already assessed hindrances to the initiatives that reduce maternal and neonatal morbidity and mortality. The majority of the factors for low-income countries

**Table 4.** Mean and mode scores of indicators for Institutional Capacity

Responses	Mean	Mode
1. Availability of labor, delivery, postpartum, and laboratory rooms	2.6	3
2. Availability of beds specifically/solely for pregnant mothers	2.6	3
3. Availability of delivery tables	2.6	3
4. Availability of essential utilities (electricity and water)	2.5	3
5. Presence of a pharmacy and drug inventory register	2.4	3
6. Availability of regular supply of medications	2.4	3
7. Presence of drug storage and refrigeration	2.4	3
8. Presence of protocols	2.8	3
9. Presence of sterilizing room	2.6	3
10. Presence of equipment list	2.7	3

**Table 5.** Mean and mode scores of indicators for Service Capacity

Responses	Mean	Mode
1. Number of actively practicing BEmONC-trained personnel	2.6	3
2. Number of deliveries (based on the average over a 3 to 6-month period)	2.7	3
3. Number of live births (based on the average over a 3 to 6-month period)	2.7	3
4. Number of ante-natal care (ANCs) (based on the average over a 3 to 6-month period)	2.5	3
5. Number of post-natal care (PNCs) (based on the average over a 3 to 6-month period)	2.4	3
6. Number of referrals for high-risk pregnancies (total number of referrals / total number of high-risk pregnancies determined during ANC)	2.7	3
7. Number of referrals for difficult deliveries (total number of referred deliveries / total number of deliveries initiated in the BEmONC center)	2.7	3
8. Number of maternal deaths	2.3	3
9. Number of newborn deaths	2.3	3
10. Presence of family planning services	2.7	3

**Table 6.** Mean and mode scores of indicators for Personnel Capacity (Signal Functions)

Responses	Mean	Mode
1. Administration of parenteral antibiotics	2.6	3
2. Administration of uterotonic drugs	2.9	3
3. Parenteral administration of anti-convulsant	2.6	3
4. Number of assisted imminent breech delivery when needed	2.3	3
5. Parenteral administration of loading dose of maternal steroids during preterm labor	2.6	3
6. Number of newborn resuscitations performed when needed	2.5	3
7. Number of other maternal and newborn-related services	2.6	3
8. Number of referrals to CEmONC when needed	2.7	3
9. Presence of partograph review	2.1	3
10. Additional signal functions when needed	2.5	3

like the Philippines cover poor governance and low prioritization for primary health care.<sup>5</sup> Others are the inadequacies in human resources, financing, service delivery, and medical supplies and infrastructure. Other commonly neglected factors are environmental factors external to the health system, including political instability, geographic concerns, weather, and transportation.<sup>5</sup>

### Identification of Indicators

The major components for assessing BEmONC facilities include institutional, service, and personnel capacities (Table 7). According to a study on the readiness of BEmONC facilities in Kenya, institutional accessibility is one of the major concerns.<sup>17</sup>

Ideally, each BEmONC facility should be strategically located to provide access, especially in geographically isolated and disadvantaged areas. Access means that each facility must be thirty minutes away from its constituents. Transportation and communication systems must also make timely and quick referrals of obstetric and neonatal emergencies to higher-level facilities.

Assessment indicators should also be streamlined depending on the level of each facility, especially since BEmONC facilities range from enhanced barangay health stations to secondary hospitals. Assessment indicators should consider the availability of resources and personnel for the corresponding facility level.

Infrastructure is a crucial factor in providing adequate maternal and neonatal care.<sup>18,19</sup> Lack of physical space can make it difficult for health personnel to work effectively. There should be adequate space for patients and their companions in the labor and delivery rooms, as well as the consultation and waiting areas.<sup>20,21</sup> Basic utilities such as electricity and clean water supply are essential and should also be accounted for.<sup>17</sup>

Out-of-pocket expenses like user fees can affect indigent populations, while cost-sharing and cost for operations can limit the procurement of medical supplies and infrastructure enhancement, particularly among low-income local government units.<sup>17,22</sup>

Human resources are essential in providing health services.<sup>23,24</sup> They include barangay health workers, midwives, nurses, physicians, medical technologists, laboratory technicians, clinical clerks, and others in adequate complement, given that BEmONC facilities must provide 24/7 service.

Basic emergency medications, supplies, and equipment should always be readily available.<sup>25</sup> Infection prevention measures should be maintained.<sup>26,27</sup> Disinfection protocols to keep the facility and equipment at par with medical standards must be known to all personnel. A manual of operations containing protocols for running the BEmONC facility must be updated with the latest evidence-based guidelines.

### Significance of the Delphi Process

Signal functions reflect the responsiveness of the health services provided by a facility.<sup>10,28</sup> BEmONC functionality is measured through other aspects including the adequacy of the support infrastructure (institutional capacity) and the presence of support processes (service capacity). Both allow for the performance of core signal functions (personnel capacity). In this context, signal functions are a shortlist of key interventions and activities that the personnel of BEmONC facilities are expected to do.

The Delphi Process is employed to develop an expert-based consensus that answers a particular question. This approach maximizes a multitude of experts with varying perspectives, which creates an outcome more valid than that given by a single expert. Compared to other studies, however, it has the lowest level of evidence for making causal inferences. This is often employed for technical and natural sciences but may also be used for health sciences. There is the assumption that each expert has knowledge or expertise regarding the topic in question and can thereby contribute knowledge from other types of studies. The quality of evidence produced relies heavily on the inputs of each expert.<sup>29</sup>

There are four main methodological types of the Delphi Process: 1) a qualitative approach to aggregate ideas, 2) both qualitative and quantitative approaches for predictions, 3) a primarily quantitative approach to elicit expert opinion, and 4) a quantitative approach to reach a consensus.<sup>30</sup> In this



**Table 7.** Comparison of the Delphi-confirmed indicators and those from existing evaluation tools

Indicators	WHO Handbook (2009)	AMDD Toolkit (2010)	Birthing Center Monitoring Form	Assessment of BEmONC Proficiency	Delphi-confirmed indicators
<b>Institutional Capacity</b>					
Availability of labor, delivery, postpartum, and laboratory rooms		+			+
Availability of beds specifically/solely for pregnant mothers		+			+
Availability of delivery tables		+			+
Availability of essential utilities (electricity and water)		+			+
Presence of a pharmacy and drug inventory register		+			+
Availability of regular supply of medications		+			+
Presence of drug storage and refrigeration		+			+
Presence of protocols		+			+
Presence of sterilizing room		+			+
Presence of equipment list		+			+
<b>Service Capacity</b>					
Number of actively practicing BEmONC-trained personnel			+		+
Number of overall staff		+			
Availability of staff		+			
Number of deliveries (based on average over a 3 to 6-month period)	+	+	+		+
Number of live births (based on average over a 3 to 6-month period)		+	+		+
Number of assisted vaginal deliveries		+			
Number of ante-natal care (ANCs) (based on average over a 3 to 6-month period)			+		+
Number of post-natal care (PNCs) (based on average over a 3 to 6-month period)			+		+
Number of women with direct obstetric complications treated	+	+			

study, the last method was utilized since it provided indicators for a scorecard that would be easy to use for a quick assessment of BEmONC functionality.

Evaluating the effectiveness of BEmONC facilities is often limited to immediate operational concerns instead of identifying root causes. Substantial constraints that fall beyond the control of individual programs are rarely addressed. More commonly, factors that affect health service delivery are interdependent and have several causes.<sup>5</sup>

Studies on the functional capacity of BEmONC facilities in the country are scarce. These are integral for the development of health policies and the Philippine healthcare delivery system. Strategies that address immediate operational concerns should be evaluated for sustainability and effectiveness.

### Strengths and Limitations

The panel has a thorough knowledge of emergency obstetric care. They have an average of 16 years of experience in the field, longer than the period of implementation of BEmONC as an intervention in the Philippines. Their

excellent response rate is evidence of good panel selection and high appreciation of the subject and the study.

The concentration of panel members from the National Capital Region may have set lower expectations on BEmONC functionality as there are more higher-level facilities and referral centers in urban areas. This may inadvertently downplay the importance of BEmONC facilities in emergency obstetric care.

Nonetheless, the selected indicators still require further validation, including actual use, to fully gauge their accuracy and precision in estimating BEmONC functionality.

### CONCLUSIONS

This study reports on 30 indicators selected for evaluating the functionality of BEmONC facilities. The adequacy and applicability of these indicators have been established through a two-step Delphi process, which itself is a novel but reliable way of identifying and choosing indicators via consensus. These indicators will be incorporated into a scorecard that can be used for data collection in the

**Table 7.** Comparison of the Delphi-confirmed indicators and those from existing evaluation tools (*continued*)

Indicators	WHO Handbook (2009)	AMDD Toolkit (2010)	Birth Center Monitoring Form	Assessment of BEmONC Proficiency	Delphi-confirmed indicators
<b>Service Capacity</b>					
Number of referrals for high-risk pregnancies (total number of referrals / total number of high-risk pregnancies determined during ANC)		+	+		+
Number of referrals for difficult deliveries (total number of referred deliveries / total number of deliveries initiated in the BEmONC center)		+	+		+
Number of newborn cases referred		+	+		
Number of maternal deaths	+	+	+		+
Number of women who gave birth to a dead fetus	+	+	+		
Number of newborn deaths	+	+	+		+
Presence of family planning services		+			+
Are pregnant women tracked?			+		
Are pregnant women given Birth Plan (Mother-Baby book)			+	+	
<b>Personnel Capacity – Signal Functions</b>					
Administration of parenteral antibiotics	+	+	+	+	+
Administration of uterotonic drugs	+	+	+	+	+
Parenteral administration of anti-convulsant	+	+	+	+	+
Perform manual removal of placenta	+	+			
Perform removal of retained products	+	+			
Perform assisted vaginal delivery	+	+			
Number of assisted imminent breach delivery when needed			+	+	+
Parenteral administration of loading dose of maternal steroids during preterm labor			+	+	+
Number of newborn resuscitations performed when needed	+	+	+	+	+
Number of other maternal and newborn-related services			+	+	+
Number of referrals to CEmONC when needed			+		+
Presence of partograph review		+	+	+	+
Additional signal functions when needed				+	+

evaluation of BEmONC facilities in the Philippines, with the end goal of guiding policy and improving program implementation. This study introduces the Delphi process as an important method that can be used to create effective tools for the evaluation and monitoring of health policies, programs, and projects in the country. Such tools are integral to health reform and development. The Delphi process can be maximized to create locally applicable but globally comparable indicators for different kinds of assessments that are quick, reliable, and easy to use. This research does not address all factors affecting BEmONC facilities in the Philippines, but it provides an essential tool for enhancing service delivery through primary health care to reduce maternal and neonatal morbidity and mortality.

### Statement of Authorship

All authors contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising, and approved the final version submitted.

### Author Disclosure

All authors declared no conflicts of interest.

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