Safe Delivery application with facilitation increases knowledge and confidence of obstetric and neonatal care among frontline health workers in India

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ABSTRACT

Background: Digital learning tools have proliferated among healthcare workers in India. Evidence of their effectiveness is however minimal. We sought to examine the impact of the Safe Delivery App (SDA) on knowledge and confidence among frontline health workers (HW) in India. We also studied whether facilitation to address technical challenges enhanced self-learning. Methods: Staff nurses and nurse-midwives from 30 facilities in two states were divided into control and intervention groups through randomization. Knowledge and confidence were assessed at baseline and after 6 months. Three rounds of facilitation addressing technical challenges in downloading and usage along with reminders about the next phase of learning were conducted in the intervention group. A user satisfaction scale along with qualitative interviews was conducted in the intervention group at the endline along with qualitative interviews on facilitation. Results: The knowledge and confidence of the healthcare workers significantly increased from the baseline to endline by 4 percentage points (P < 0.001). The participants who received facilitation had a higher mean score difference in knowledge and confidence compared to those who did not receive facilitation (P < 0.001). The participants were highly satisfied with the app and video was the most-watched feature. They reported a positive experience of the facilitation process. Conclusion: The effectiveness and acceptability of the SDA indicate the applicability of mHealth learning tools at the primary healthcare level. In a time of rapid digitalization of training, facilitation or supportive supervision needs further focus while on-ground digital training could be invested in to overcome digital illiteracy among healthcare workers.

Keywords: Frontline healthcare workers, India, maternal and newborn health, mHealth, Safe Delivery App

Introduction

The time of childbirth poses the most risks for the mother and child. In 2019, 2.4 million children died in their first month while nearly 6,700 newborns died every day.¹ In the same year, approximately 2 million babies or one every 16 s died during childbirth.² An estimated 2,95,000 maternal deaths occurred worldwide out of which 94% were from low- and middle-income countries.³ The biggest contributor to these deaths is the lack of quality of skilled care around childbirth.⁴ It is estimated that investments in skilled care can prevent an estimated 1,13,000 maternal deaths, 5,31,000 stillbirths, and 1·325 million neonatal deaths annually.⁵
India accounts for a fifth of the annual global maternal deaths (32,000). Although neonatal mortality has reduced substantially to 24.9 in 2019–2021, it still accounts for more than a quarter of neonatal deaths. This urgently calls for a closure in quality gaps, especially in primary healthcare settings, where referrals are delayed or hampered due to distance, cost, and family apprehensions. The primary healthcare centers in both urban and rural areas were found to have low intrapartum care capacity. Nurses who take care of the bulk of deliveries in primary care settings are often unable to provide quality care due to inadequate infrastructure, poor training, limited access to continuing education, and professional support from experienced clinicians among others. Skill-based trainings for nurses are of short duration and are conducted away from the health facility which is not very effective. It, therefore, becomes important that a ready tool for the nurses to refer to continuously is available at their health facility after their training. The use of mHealth technology in educating the frontline workers is a commonly accepted strategy to improve healthcare practices. The Safe Delivery Application is a mHealth learning tool developed by the Maternity Foundation, the University of Copenhagen and the University of Southern Denmark. It has been used and tested in several countries and found to improve the knowledge of management of post-partum hemorrhage and neonatal resuscitation.

The safe delivery app (SDA) was designed to reinforce the professional competencies of skilled birth attendants on how to manage basic emergency obstetric and newborn care (BEmONC) using a mLearning platform made of animated instructional videos and a self-mapp uses simple, animated instruction videos, procedures, drug lists, and e-learning tools to guide health workers (HW) in basic emergency obstetric and newborn care. It includes a MyLearning feature, where users can test their knowledge and earn certification as Safe Delivery Champions. The Indian version of the SDA approved by the Government of India was launched in December 2017 in an English and Hindi version. The app is freely available for download in the Google Play App Store for Android users. So far, 91,335 downloads across India have been achieved. The app’s effectiveness among frontline HW is not known in India except for a study among nursing students.

We partnered with the Maternity Foundation to study the effect of SDA on the knowledge and confidence of HW of the Community Health Centers (CHC) in Aspirational Districts (AD) in managing complications of labor. Furthermore, given the technical challenges of using mHealth in poor network areas there was an interest in examining the role of facilitation in the overall effectiveness of the SDA.

### Methods

#### Study objectives

The objectives were to assess:

- Whether the SDA is effective in improving the knowledge and confidence of service providers?
- Whether the SDA is acceptable as a capacity-building tool to service providers?
- Which of the two implementation models—SDA alone or SDA with facilitation—is more effective in increasing the knowledge and confidence of service providers?

#### Study design

A quasi-experimental study with two arms was designed—one with facilitation and one without facilitation. By facilitation, we mean technical troubleshooting and reminders about the SDA learning material.

#### Selection of health facilities

Two AD of Uttarakhand were included in the facility selection. In Jharkhand, out of 19 AD, 3 were purposively selected based on the feedback of the State Maternal Health cell to represent districts that were poor performing and marginally remote from the state capital. A mix of six CHC and sub-divisional hospitals (SDH) in each district that cater to a high caseload (above 100 patients in a month) and having at least four staff nurses and auxiliary nurse midwife (ANM) were selected. A random table generator was used to randomly assign the facilities into the intervention and control arm.

#### Participants

The participants included staff nurses/ANMs from the selected facilities having access to a smartphone or tablet. A total of 118 such health providers were recruited at baseline which dropped to 105 (at endline) due to staff transfers and leaves as a result of the corona virus disease (COVID-19) pandemic [Figure 1].

#### Study tools

The tools, originally developed by the Maternity Foundation were adapted to include Indian standards. The questionnaire had seven questions under three domains: active management
of the third stage of labor (AMTSL), neonatal resuscitation, and management of maternal complications. A confidence scale in each domain was additionally used. A user satisfaction tool was used at the endline among the intervention group along with a qualitative guide on the usefulness of the app and the facilitation. The tools have been tested and used in other settings.

**Intervention**

In the control group, the participants were introduced to the SDA, instructed to work on the three modules, followed by a ‘dormant’ phase during which they received no further support. In the intervention group, the project team members conducted remote facilitation at the end of every 1–2 months, during which reminders about the topic for the following phase were done along with addressing technical glitches. The facilitation did not include an explanation about the content of the learning material.

**Procedure**

Baseline assessments were conducted onsite by project consultants. Following the assessment, an SDA orientation was conducted in both the control and intervention facilities. During the endline, assessments were conducted slightly differently. Due to the ongoing COVID-19 outbreak, the respondents had to be assessed remotely using a Google Form. It was ensured that the participants from the same facility were sent out the forms at different times to rule out consulting with each other. Qualitative interviews were conducted remotely by external consultants.

**Data management and data analysis**

Primary data was entered in an excel-based tool. Study outcomes included knowledge scores on three domains of delivery and newborn care, confidence scores, and user satisfaction level.

Correct knowledge was evaluated by 21 multiple-response questions on the domains of AMTSL, post-partum hemorrhage (PPH), and neonatal resuscitation. The confidence score based on the same domains used a 5-point Likert scale. The satisfaction level was measured using a 5-point Likert scale [Appendix A and B].

Descriptive statistics ((mean, standard deviation, percent) were performed. The differences in proportion for correct knowledge of safe delivery care at pre- and post-intervention were tested using the Chi-square test while significant differences between-group for mean on confidence score were attained through statistical t-test (analysis of variance).

**Method of evaluation**

Difference-in-Differences (DiD) measure was used to compare the changes in the outcomes over time between the intervention and the control groups. In the two-group two-period DiD design, the common trend assumption amounts to a simple statistical model of the treated and untreated potential outcomes. The DiD estimate is obtained as the $\beta$-coefficient in the following ordinary least squares (OLS) regression, in which $\beta_0$ is the constant term before intervention at both the study arm, $\beta_1$ is treatment/control ($A_2$) group fixed effects, $\beta_2$ before/after fixed ($B_1$) effects, $\beta_3$ is a dummy equaling 1 for treatment observations in the after period ($l_2$) (otherwise, it is zero) and $\epsilon$ the error term.

$$Y_{ist} = \beta_0 + \beta_1 A_{2st} + \beta_2 B_{1st} + \beta_3 l_2 + \epsilon_{ist}$$

The causative relationship between intervention implementation and outcomes was estimated by determining the interaction between the pre-post and treated-untreated variables. A significant change in the interaction coefficient was predicted statistically from the level of significance. Further, to test for potential confounding, between-group differences were calculated to examine the role of age, facility level, and years of experience on the outcome. The data were analyzed using STATA version 14.0 software.

**Ethical approval**

We obtained permission from the state health departments, state National health mission (NHM), and facility in charge. The study was not submitted to the ethical review board as the impending COVID pandemic slowed the process. We kept to the tenets of the principles for ethical research embedded in the Helsinki Declaration. Informed consent forms developed in Hindi and English contained information about the risks, benefits, and confidentiality. Identifiers were used which could not be traced back to the participants.

**Results**

**Demographic characteristics**

The age of the participants ranged between 22 and 59 years. The intervention study participants were slightly older. Participants having less than 10 years of experience were more (55%—control, 63%—intervention). Selected facilities were mostly from level 2 and level 3; this ratio was 2:3 in the control region and 4:1 in the intervention arm [Table 1].

| Characteristics | Control | Intervention |
|-----------------|---------|--------------|
| Age (Min-Max=22-59 years) | | |
| <35 years | 53.7 | 42.2 |
| >=35 years | 46.3 | 57.8 |
| Years of experience (Min-Max=0.3-40) | | |
| <10 Years | 57.4 | 60.9 |
| >10 Years | 42.6 | 39.1 |
| State | | |
| Uttar Pradesh | 25.9 | 35.9 |
| Jharkhand | 74.1 | 64.1 |
| Facility Level | | |
| L2 | 68.1 | 78.1 |
| L3 | 31.5 | 21.9 |
App-related characteristics among the study participants in the control and intervention facilities

The participants who had received orientation before the SDA study were slightly higher in the intervention (45%) than in the control area (43%) \( (P > 0.05) \). Almost all the participants had downloaded the mobile app on their phone at the endline in both study arms compared to the baseline \( (P < 0.001) \). More HW received safe delivery champion certificates and had a higher mean percentage of MyLearning in the intervention arm (40%) compared to the control arm [Table 2].

Knowledge and confidence

The aggregate mean score of correct knowledge of safe delivery care significantly improved among the HW on the maximum range of 0–43 \( (31.7–34.5, P \text{ value} < 0.001) \), and the overall confidence score was improved significantly by 4 percent points \( (64.2–66.9, P \text{ value} < 0.001) \) [Appendices 1 and 2]. The median value of the correct response shifted toward the maximum score with a lower inter-quartile range at the endline [Figure 2]. Similarly, the confidence of performing delivery care also reached its highest value with a reduced inter-quartile range [Figure 2].

Impact of intervention

The net intervention effect is shown in [Figure 3]. The result demonstrates a significant improvement in the outcomes at the endline \( (P < 0.001) \) when controlled for intervention phases and treatment groups \( (2 \times 2) \). In addition, the DiD estimates were obtained between the subgroup of facility level, age, and years of working experience of the HW for both the key outcomes. Improvement in knowledge was significant at the level 3 facility. The health workers with <10 years of experience had a significantly higher knowledge score than HW with more experience. Similarly, the confidence scores were also significantly enhanced among participants from the higher facility. The HW having lesser experience (<10 years) and younger ages (<35 years) had more confidence [Table 3].

User satisfaction

The feedback of SDA use was examined using a 5-point Likert scale. The internal consistency of the scale was moderately good \( (\text{Cronbach’s alpha} = 0.71) \). The majority were extremely satisfied with the information, content, and learning of the app. About 40% responded similarly on the ease of use, language, and use in delivery care [Table 4].

About 70% used all five features in the app [Figure 4]. The video was the most preferred feature.

Qualitative findings

HW had very positive views about the app. They appreciated the content, videos, and animation used to explain the concept.

“This is the most useful app for all of us, we have attended so many trainings but after training, we sometimes get confused or forget what we have learned, but this app helps us to review and revise all the things- it is like training on the go for us. (ANM #56)

The HW reported that the SDA helped them in delivery and newborn management. A few participants shared their experience of using the correct dose and administration of misoprostol if oxytocin was not available. They reported stabilizing the mother and child before referral.

The participants reported that while downloading initially, they were not aware of all the functions but the calls from facilitators helped in these issues. Whenever they faced any problem with the app, they consulted the facilitators. Facilitators asked about the issues with the app and encouraged them to achieve the champions’ certificate.

HW suggested additional content on cervical episiotomy and more details about newborn care. They also suggested including information about when and how to use the drugs apart from the drug list.

Discussion

We found an overall improvement in the knowledge and confidence scores among the HW in the study. The limitation in obstetric care capacity among Indian HW in primary and community care significantly improved among the HW on the maximum range of 0–43 \( (31.7–34.5, P \text{ value} < 0.001) \), and the overall confidence score was improved significantly by 4 percent points \( (64.2–66.9, P \text{ value} < 0.001) \) [Appendices 1 and 2]. The median value of the correct response shifted toward the maximum score with a lower inter-quartile range at the endline [Figure 2]. Similarly, the confidence of performing delivery care also reached its highest value with a reduced inter-quartile range [Figure 2].

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Discussion

We found an overall improvement in the knowledge and confidence scores among the HW in the study. The limitation in obstetric care capacity among Indian HW in primary and community
health facilities has been frequently observed.\textsuperscript{[8,18-20]} Nevertheless, competency-based training in emergency obstetric care improves clinical practices and neonatal outcomes.\textsuperscript{[21]} Mentoring and training programs in India among the ANM and staff nurses are found to increase their knowledge and skills.\textsuperscript{[22-24]} However, the practices are seen to decline after the intervention is over.\textsuperscript{[22,24]} With the rise in public health facility deliveries in rural areas (65.3% as per National family health survey (NFHS-5)), there is an urgent need to update the skills and continue the positive outcomes of training among primary care providers and it is in this context that a self-learning tool like the SDA which is constantly at the side of the provider becomes useful. A limitation of our study was that we did not assess the impact of the competency gained on actual practice. However, considering the evidence that competency increases with significant improvements in knowledge and skills,\textsuperscript{[21]} we could expect to see the same in the study facilities.

The difference in knowledge and confidence among the participants provided with periodic facilitation was higher than among those who were not provided facilitation and this is consistent with the studies that have found positive outcomes of mentoring on the skills of the health providers to handle complicated delivery.\textsuperscript{[22-24]} Technical problems related to downloading, password resetting, logging in, profile set-up, and refreshing past accounts among other issues were addressed by the facilitators. It has been found that the provision of technical support to address real-time problems helps HW to utilize mobile devices effectively.\textsuperscript{[25-29]} The timely resolution of
technical problems played a critical role in fostering adherence to the digital app among HW. It is seen that HW often give up when mobile apps are not easy to use and they face technical problems. While the SDA is easy to use, the handholding and encouragement were critical factors in utilizing the app, echoing another study among the non-specialists HW in India. In qualitative interviews, HW reported that the facilitators reminded them about completing MyLearning, and encouraged them to achieve the champions’ certificate, indicating that reinforcing messages about using the app was effective.

Due to the COVID-related travel restrictions, most of the facilitations in our intervention occurred telephonically which was perceived to be helpful consistent with another Indian study. A recent review of HW’s experience of using mHealth technology noted that having a strong technical infrastructure like network coverage and technical support is critical to the usage of mHealth applications. Network coverage was not an issue in our study areas and this perhaps explains the wide use of SDA in both the control and intervention facilities at the end of the study period.

Further analysis reveals that participants from a higher facility (level 3) had greater improvement in knowledge. Higher facilities are better equipped in terms of staff and equipment which perhaps creates an enabling environment for increased motivation to learn and apply knowledge. This may be due to having better-trained nurses in higher facilities and also higher caseload which allows them to practice and learn skills as has been found in other studies.

Table 4: Feedback of SDA from users of the intervention group reported on a 5-point scale at endline (n=55)

| Internal consistency (Cronbach’s alpha=0.71) | Extremely Important/ Satisfied/Agree | Important/ Satisfied/Agree | Uncertain | Somewhat important/ Satisfied/Agree | Least important/ Satisfied/Agree |
|-----------------------------------------------|-------------------------------------|---------------------------|----------|-------------------------------------|----------------------------------|
| How important is the information provided in the app? | 93.02 | 4.65 | 2.33 | 0 | 0 |
| How would you rate the selection of a topic in this app? | 93.02 | 4.65 | 0 | 0 | 2.33 |
| How suitable was the knowledge level provided in the app? | 83.7 | 16.2 | 0.0 | 0 | 0 |
| How would you rate my learning in terms of the appropriateness provided and difficulty level? | 69.7 | 30.3 | 0.0 | 0 | 0 |
| Is this app easy to download? | 41.8 | 55.8 | 0 | 0 | 2.3 |
| Can the Safe Delivery App be used in all maternal and neonatal health settings? | 32.56 | 65.1 | 2.3 | 0 | 0 |
| The language used in this app is simple and easy to understand | 41.86 | 55.8 | 2.3 | 0 | 0 |
| How well the objectives of your learning were served? | 51.16 | 41.86 | 0 | 4.6 | 2.3 |
| How was your overall satisfaction level toward the Safe Delivery App? | 46.51 | 51.2 | 2.3 | 0 | 0 |

Figure 3: Mean score difference of knowledge and confidence among the intervention and control groups

Figure 4: Features most preferred by healthcare workers (n = 55)

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failed to imbibe the updated standards and new learnings to the same extent.

**User satisfaction was high for the App.** This is encouraging as the study occurred in the backward areas of Jharkhand and Uttarakhand, which are generally found to have facilities of poor capacity. The video was the most seen feature and most liked by HW, consistent with the findings from other studies. Elsewhere, visual communication was shown to have an improved effect on skills.

The study has several limitations. The data collection methods had to be altered due to the pandemic which might have influenced the endline results as nobody was supervising the data collection process. A major limitation was that the facilitators were not blinded to the intervention arms which may have influenced the results. However, they were periodically supervised on the content of their facilitation which provided sufficient quality control over their communication.

In summary, the study highlights that a self-learning mHealth app is effective in increasing the capacity of the primary care providers especially when a mentor or peer facilitates the process by addressing technical challenges in using the app. While the network was not an issue, the availability of infrastructure and equipment within the facility would enhance learnings from the tool. Our study highlights the new finding that even with minimal effort, reminders and remote help with technical challenges increase utilization of mHealth tools.

**Conclusion**

The study findings are significant in the context of the greater focus on quality-skilled intrapartum care in the primary healthcare facilities. The SDA increases knowledge and skills among the frontline HW in the public health facilities in the districts which have historically experienced a lack of quality obstetric care. Findings from the study add to the state of knowledge on the mHealth application adoption among healthcare workers while also highlighting the role of technical support in the appropriate utilization of digital applications.

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**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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**Appendix A**

| Q.No. | QUESTIONS AND FILTERS | CODING CATEGORIES | REMARKS |
|-------|------------------------|-------------------|---------|
| 101   | Name of the ANM/STAFF NURSE  |                  |         |
| 102   | Mobile Number of the ANM/SN |                  |         |
| 103   | Age of the ANM/SN          |                  |         |
| 104   | Years of experience of the ANM/SN |                |         |
| 105   | Training Status of ANM/SN  |                  |         |
| 106   | Please enter details of the most recent training |          |         |
| 107   | Have you received Safe Delivery App orientation before this? |      |         |
| 108   | If the answer is yes, please mention date |              |         |
| 109   | Do you have Safe Delivery App in your phone? |            |         |
| 110   | Have you done the registration on MyLearning platform? |            |         |
| 111   | Have you received the Safe Delivery Champion Certificate? |        |         |
| 112   | If answer is yes, mention the date |                  |         |

Section A: ब्यक्तिगत जानकारी/Personal Information

| Q.No. | QUESTIONS AND FILTERS | CODING CATEGORIES | REMARKS |
|-------|------------------------|-------------------|---------|
| 101   | Name of the ANM/STAFF NURSE  |                  |         |
| 102   | Mobile Number of the ANM/SN |                  |         |
| 103   | Age of the ANM/SN          |                  |         |
| 104   | Years of experience of the ANM/SN |                |         |
| 105   | Training Status of ANM/SN  |                  |         |
| 106   | Please enter details of the most recent training |          |         |
| 107   | Have you received Safe Delivery App orientation before this? |      |         |
| 108   | If the answer is yes, please mention date |              |         |
| 109   | Do you have Safe Delivery App in your phone? |            |         |
| 110   | Have you done the registration on MyLearning platform? |            |         |
| 111   | Have you received the Safe Delivery Champion Certificate? |        |         |
| 112   | If answer is yes, mention the date |                  |         |
Imagine yourself in one of the situations listed below.

On a scale from 1 to 5, please indicate how confident you feel in managing these different situations. There are also response options if you are not permitted to manage the complication or have not been in the situation.

कृपया नीचे लिखी गयी परिस्थितियों में है।

1-5 के पैमाने पर ये बताये, की आप इन अवसर अथवा परिस्थितियों का परिचालन करने में कितने आश्वस्त है। अगर आपको ऐसे परिस्थितियों का परिचालन करने की अनुमति नहीं है या आपने कभी-कभी ऐसी परिस्थितियों नहीं देखी है तो उसका भी बिहार चुन सकते हैं।

पूजन करके ईमादारी से जवाब दे।

**Appendix B**

### B SAFE DELIVERY APP - CONFIDENCE LEVEL TEST

प्रसव की स्थिति का परिचालन या अवस्था का परिचालन (AMTSL - आम्ल या अप्सार)

How confident are you in providing active management of third stage of labor (AMTSL)?

प्रसव के बाद यूट्रोटॉनिक देने में आप कितने आश्वस्त है?

How confident are you in giving uterotonic drugs after delivery?

प्लेसेंटा की सेवन करने में आप कितने आश्वस्त है?

How confident are you in the delivery of the placenta?

नवजात का आकलन करने में आप कितने आश्वस्त है?

How confident are you in assessing the newborn?

प्लेसेंटा का परिच्छेद करने में आप कितने आश्वस्त है?

How confident are you in delivering the placenta?

नवजात का रिस्कटेशन/नेउनाटल रिस्कटेशन

How confident are you in performing neonatal resuscitation?

गाढ़े मयुक्तियों के साथ पैदा हुए नवजात का परिचालन करने में आप कितने आश्वस्त है?

How confident are you in performing neonatal resuscitation?

गाढ़े मयुक्तियों के साथ पैदा हुए नवजात का परिचालन करने में आप कितने आश्वस्त है?

How confident are you in providing observational care after resuscitation?

रिस्कटेशन के बाद नवजात का अवलोकन एवं देखभाल करने में आप कितने आश्वस्त है?

How confident are you in providing observational care after resuscitation?

Resuscitation कब रोकना है इसे लेकर आप कितने आश्वस्त है?

PPH- पीपीएच

How confident are you in performing bimanual compression?

बाई-मैन्युअल प्रमुखता करने में आप कितने आश्वस्त है?

How confident are you in performing bimanual compression?

How confident are you in administering uterotonic drugs?

यूट्रोटॉनिक देने में आप कितने आश्वस्त है?

How confident are you in administering uterotonic drugs?

How confident are you in removing retained placental tissue?

प्लेसेंटा के बर्ज हिस्सों को निकालने में आप कितने आश्वस्त है?

How confident are you in removing retained placental tissue?

How confident are you in identifying the location and the degree of a perineal trauma?

परिनेल के दर्द की जगह और इंजरी की पहचान करने में आप कितने आश्वस्त है?

How confident are you in identifying the location and the degree of a perineal trauma?

How confident are you in treating damage to the perineal muscles?

परिनेल मस्तिष्क के दर्द का परिचालन करने में आप कितने आश्वस्त है?

How confident are you in treating damage to the perineal muscles?
### Safe Delivery APP-जानकारी संबंध

| Section C: ज्ञान संबंधी प्रश्न |
|-----------------------------|

#### 201 When should oxytocin be given?
*Please select only one answer.*

- Within 1 min following the birth of the newborn
- Within 5 min following the birth of the newborn after ruling out second baby
- Within 3 min following the birth of the newborn after ruling out a second baby
- Within 1 min following the birth of the newborn and ruling out second baby

#### 202 How much oxytocin should be given?
*Please select only one answer.*

- Oxytocin 10 IU intravenous (IV)
- Oxytocin 10 IU intramuscular (IM)
- Oxytocin 10 IU intravenous bolus
- Oxytocin 10 IU deep intramuscular

#### 203 What should be done if there is no oxytocin to administer as a part of AMTSL?
*Please select only one answer.*

- Give 600 mcg of misoprostol sub-lingual
- Give 800 mcg of misoprostol orally
- Give 600 mcg of misoprostol orally
- Give 800 mcg of misoprostol sub-lingual

#### 205 How do you perform controlled cord traction? Select one answer.

- Apply counter traction on the cord downward and forward with traction on the pubic bone (uterus) upward
- Apply counter traction on the cord upward and forward with traction on the pubic bone (uterus) upward
- Apply counter traction on the cord downward and forward with counter traction on the pubic bone (uterus) upward
- Apply counter traction on the cord downward and forward with counter traction on the pubic bone (uterus) upward

#### 206 What are the benefits of early initiation of breastfeeding for mother and newborn?
*Select all answers that apply.*

- It strengthens the newborn immune system and provides nutrition
- It initiates breast milk
- Keeps the baby warm
- It helps the uterus to contract
### How should oxytocin be stored?

Select one answer.

| Option | Explanation |
|--------|-------------|
| A. Between -5 and -2°C | A loss of tone in the uterine musculature. |
| B. Between 2 and 8°C | Trauma to the birth canal like tears to the cervix, the vagina, or the perineum. |
| C. Between 25 and 30°C | Placental tissue retained in the uterus. |
| D. Between 10 and 25°C | Jumbo ball of maternal complications. |

### Which drug should not be given if the woman has hypertension?

Select only one answer.

| Option | Explanation |
|--------|-------------|
| A. Misoprostol | Hypertension. |
| B. Ergometrine/methergin | Heart disease. |
| C. Oxytocin | Allergy to steroids. |
| D. ... | Diabetes. |

### How do you correctly position a bleeding woman during PPH?

Select only one answer.

| Option | Explanation |
|--------|-------------|
| A. On the back, legs up, and head flat so that blood flows toward head | On the back, legs up, and head flat so that blood flows toward head. |
| B. On the back, legs down, and head up so that blood flows toward head | On the back, legs down, and head up so that blood flows toward head. |
| C. On the back, legs down, and head up so that blood flows toward head | On the back, legs down, and head up so that blood flows toward head. |
| D. ... | On the back, legs up, and head flat so that blood flows toward head. |

### What are the contraindications for ergometrine IV?

Select all answers that apply.

| Option | Explanation |
|--------|-------------|
| A. Hypertension | Hyperkalemia. |
| B. Heart disease | Allergy to steroids. |
| C. Allergy to steroids | Uterine atony. |
| D. Diabetes | Uterine atony. |

### What is the dose for misoprostol as part of PPH management?

Select only one answer.

| Option | Explanation |
|--------|-------------|
| A. 600 mg sub-lingual | 600 mg sub-lingual. |
| B. 800 mg sub-lingual | 800 mg sub-lingual. |
| C. 1600 mg sub-lingual | 1600 mg sub-lingual. |
| D. 1200 mg sub-lingual | 1200 mg sub-lingual. |

### What are the interventions involved in PPH management?

Select all answers that apply.

| Option | Explanation |
|--------|-------------|
| A. Uterus massage | Uterus massage. |
| B. Condom balloon tamponade | Condom balloon tamponade. |
| C. Bimanual compression | Bimanual compression. |
| D. Uterotonic drug | Uterotonic drug. |

### What is done in moderate bleeding management of PPH?

Select all answers that apply.

| Option | Explanation |
|--------|-------------|
| A. Check vital signs | Check vital signs. |
| B. Empty the bladder | Empty the bladder. |
| C. Uterotonic drug | Uterotonic drug. |
| D. IV fluids | IV fluids. |
| Question                                                                 | Answer                                                                                           |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| The “first golden minute” implies that all newborns should do the following by 1 min of age. Select all answers that apply. |                                                                                                  |
| पहले गोल्डन मिनट का मतलब सभी नवजात को एक मिनट के अन्दर निम्नलिखित काम करना चाहिए? उन सभी विकल्पों का चयन करें जो लागू हों। |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| अगर बच्चे की ह्रदय गति दर 100 बीपीएम से नीचे है या साँस नहीं लेता है तो, बेंटिलेशन की परक्रिया शुरू करें। कृपया केवल एक बेंटिलेशन का चयन करें। |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| The first five slow ventilations in neonatal resuscitation—each breath is sustained for 2‑3 s while the chest rises |                                                                                                  |
| कृपया केवल एक बेंटिलेशन का चयन करें।                                                                                                 |
| Spontaneous breathing on their own श्वास लेना A                              |                                                                                                  |
| Start breastfeeding                                                    B                                                                 |
| सूक्ष्म ग्लोस के बाद बच्चे को रिडियंट वार्मर में रखेंगे C                                                                                     |
Appendix 1: Knowledge of AMTSL, PPH, and newborn resuscitation at baseline and endline

| Question no. | Question                                                                 | n  | Maximum correct score | Baseline | Endline | % point change |
|-------------|--------------------------------------------------------------------------|----|-----------------------|----------|---------|----------------|
| Q201        | 1. When should oxytocin be given? Please select only one answer.          | 223| 1                     | 57.6     | 79.1    | 21.420         |
| Q202        | 2. How much oxytocin should be given? Please select only one answer.      | 223| 1                     | 86.4     | 88.6    | 2.130          |
| Q203        | 3. What should be done if there is no oxytocin to administer as a part of AMTSL? | 222| 1                     | 49.2     | 62.5    | 13.350         |
| Q204        | 4. What do you look for when you examine the placenta? Select all answers that apply. | 223| 3                     | 59.3     | 71.4    | 12.110         |
| Q205        | 5. How do you perform controlled cord traction? Select one answer.        | 223| 1                     | 19.5     | 41.9    | 22.410         |
| Q206        | 6. What are the benefits of early initiation of breastfeeding for mother and newborn? Select all answers that apply. | 223| 4                     | 54.2     | 65.7    | 11.470         |
| Q207        | 7. How should oxytocin be stored? Select one answer.                      | 222| 1                     | 76.3     | 93.3    | 17.000         |
| Q208        | 8. What are the causes of post-partum bleeding? Select all answers that apply. | 223| 3                     | 65.3     | 65.7    | 0.460          |
| Q209        | 9. Which drug should not be given if the woman has hypertension? Please select only one answer. | 215| 1                     | 74.4     | 82.7    | 8.290          |
| Q210        | 10. How do you correctly position a bleeding woman during PPH? Please select only one answer. | 223| 1                     | 86.4     | 88.6    | 2.130          |
| Q211        | 11. What are the contraindications for ergometrine IV. Select all answers that apply. | 216| 2                     | 26.5     | 47.5    | 20.970         |
| Q212        | 12. What is the dose for misoprostol as part of PPH management? Please select only one answer. | 222| 1                     | 49.6     | 73.3    | 23.760         |
| Q213        | 13. What are the interventions involved in PPH management? Select all answers that apply. | 223| 4                     | 55.9     | 81.0    | 25.020         |
| Q214        | 14. What is done in moderate bleeding management of PPH? Select all answers that apply. | 223| 4                     | 61.9     | 81.9    | 20.040         |
| Q215        | 15. The “first golden minute” implies that all newborns should do the following by 1 min of age. Select all answers that apply. | 223| 2                     | 54.2     | 61.9    | 7.660          |
| Q216        | 16. Immediately after birth, you find that the newborn is not breathing well. What do you do next? Please select all answers that apply. | 223| 3                     | 55.1     | 70.5    | 15.400         |
| Q217        | 17. How is ventilation initiated in a newborn who is not crying? Please select only one answer. | 220| 1                     | 67.8     | 71.7    | -50.150        |
| Q218        | 18. How many ventilation breaths should be given per minute? Please select only one answer. | 221| 1                     | 54.2     | 65.1    | 10.810         |
| Q219        | 19. After ventilation, the heart rate is more than 100 bpm and the breathing is regular. What do you do now? Please select all answers that apply. | 222| 3                     | 72.9     | 86.5    | 13.660         |
| Q220        | 20. What do you do if the chest is not rising at each ventilation? Select all answers that apply. | 222| 3                     | 50.9     | 49.0    | -1.810         |
| Q221        | 21. When should you stop the resuscitation? Select all answers that apply. Overall score (mean) | 220| 2                     | 33.3     | 30.1    | -3.230         |

Appendix 2: Confidence level of performing AMTSL, PPH management, and neonatal resuscitation

| Question                                                                 | Mean confidence score (5-point scale) | Baseline | Endline | P     | Baseline | Endline |
|--------------------------------------------------------------------------|---------------------------------------|----------|---------|-------|----------|---------|
| AMTSL                                                                    | 1. How confident are you in providing active management of the third stage of labor (AMTSL)? | 4.8      | 4.8     | 0.898 | 24.1     | 24.2    |
|                                                                          | 2. How confident are you in giving uterotonic drugs after delivery? | 4.9      | 4.9     | 0.683 |          |         |
|                                                                          | 3. How confident are you in the delivery of the placenta? | 4.9      | 4.9     | 0.413 |          |         |
|                                                                          | 4. How confident are you in assessing the newborn? | 4.8      | 4.8     | 0.363 |          |         |
|                                                                          | 5. How confident are you in examining the placenta? | 4.9      | 4.9     | 0.155 |          |         |
| Resuscitation/Neonatal Resuscination                                     | 1. How confident are you in performing neonatal resuscitation? | 4.5      | 4.7     | 0.014 | 18.0     | 18.9    |
|                                                                          | 2. How confident are you in performing neonatal resuscitation? | 4.5      | 4.7     | 0.026 |          |         |
|                                                                          | 3. How confident are you in providing observational care after resuscitation? | 4.7      | 4.8     | 0.206 |          |         |
|                                                                          | 4. How confident are you in when to stop the resuscitation? | 4.6      | 4.8     | 0.027 |          |         |
| PPH                                                                      | 1. How confident are you in performing bimanual compression? | 4.1      | 4.4     | 0.011 | 22.1     | 23.7    |
|                                                                          | 2. How confident are you in administering uterotonic drugs? | 4.8      | 4.9     | 0.073 |          |         |
|                                                                          | 3. How confident are you in removing retained placental tissue? | 4.6      | 4.8     | 0.001 |          |         |
|                                                                          | 4. How confident are you in identifying the location and the degree of a perineal trauma? | 4.3      | 4.8     | 0.000 |          |         |
|                                                                          | 5. How confident are you in treating damage to the perineal muscles? | 4.6      | 4.8     | 0.007 |          |         |
| Overall (mean score)                                                     | 64.2                                 | 66.9     | 0.000   |       |          |         |