Improving Care of Mothers and Babies®

A guide for improvement teams

A story about improving the care of mothers and babies

Nurse midwives Seetha and Nirmala work in small district hospitals. They meet at a conference.

"Seetha, I am sad today. Last week a mother bled so much after delivery that she died. Our staff are upset because this happens so often. When a mother dies, we are reminded of how serious bleeding can be. All of the staff are trained and know how to prevent bleeding, but often we just don't do the right things."

"Nirmala, I know how you feel. A year ago we had the same problem. But one of our midwives helped us improve our care. Together with the district health officer, she organized a team. The team found ways to make it easier for us to do all the right things after every birth to prevent bleeding. Now mothers rarely bleed, and a mother has not died in more than a year. The staff feel good about their care, and mothers want to deliver at our hospital. Perhaps our team can help you learn about this way to improve care. "

This guide will help you improve the care of mothers and babies at your facility.

Introduction

How can you improve the care of mothers and babies?

As a health care provider you want to give the best care possible to mothers and babies. Knowing the right thing to do is the first step. Having the skills to do the right thing is the next step. But, even when you have knowledge and skills, your care may not be the best it can be. Sometimes this happens when resources are lacking, but even then, care can be improved by using available resources creatively. By working together as a team, you can join with others in the health facility and with families to make important changes that improve the care of mothers and babies.

Health care facilities are almost always part of a health care system. Your efforts to improve care are more likely to be successful if your health care system supports and encourages your improvement efforts. In fact, some improvements may depend upon changes in the system. Try to link your efforts with ongoing improvement programs within your health care system. However, you can still improve care at your facility without support from the health system. Your efforts and successes might even encourage others in the system to change and improve their care.

How can you use this guide?

This guide describes six steps to improve care and tells a story of how staff in a facility followed these six steps to provide better care. In the story, the staff decided to form a team to improve care (Step 1). The team then looked at their data to decide what part of care they needed to improve (Step 2). They then used some simple tools to find the barriers to good care, and they chose which barriers to overcome (Step 3). The team planned changes that they could make to overcome these barriers and tested them to see which ones worked (Step 4). They regularly looked at their data to learn if the changes led to improvement (Step 5). After they had good results, they made improvement the norm in their facility (Step 6).

For each step, the following sections guide the user through learning, practice and action:

- **Objectives**
  highlight important learning points and actions for each step.

- **Key knowledge**
  presents essential facts and other information about each step.

- **Practice exercises**
  help learners build skills by using the key knowledge in an example case scenario involving the care of babies and an example involving the care of mothers.

- **Group discussion**
  prompts users to talk about how each step in the improvement process might be carried out in their facility.

- **Improvement team actions**
  assist teams in conducting improvement projects in their facility. This section includes tips and techniques for each action and worksheets to help organize and record the result of the action.

This guide can be used by a leader or facilitator to help others learn about improvement. It may also be used as a self-study manual by improvement teams.

Table of contents

APPENDICES

Step 1
Create an improvement team

OBJECTIVES

- *Understand the advantages of working in a team to improve care*
- *Create an improvement team*

Key knowledge

Understand the advantages of working in a team to improve care

A team has greater power than a single person to make change.

- Team members add to the knowledge and experience of a single person.
- A team of people with different roles in the care of mothers and babies will more easily understand problems and develop solutions that work.
- Team members share the work needed to improve care.
- Teams also create the enthusiasm necessary to encourage others to change.
- A team can lead the rest of a facility's personnel in the improvement process.

Create an improvement team

When creating an improvement team, consider the following:

1) **Obtain support for an improvement team from a manager or other leader at the facility.**

- An improvement team will be more successful if its work is supported by the facility's leadership.
- Involving leaders from the beginning of the improvement process often strengthens their support.
- Try to engage leaders early by making them part of the team or seeking their advice about strategies and resources for change.
- Make leaders aware of the staff's interest in making changes and improving care.

2) **Decide who should be on the improvement team.**

- An improvement team includes people who contribute to the care of mothers and babies in a variety of ways. Members of an improvement team can include:
  - Managers, health care providers and other workers at the facility such as pharmacists, security guards and housekeepers.
  - Individuals from the community who experience the care, such as pregnant women, mothers and their family members.
- Some facilities may have a core team—a small group that identifies areas for improvement and organizes improvement efforts. When the core team identifies specific care practices for improvement, additional persons involved in those practices may be added to the team (see Step 2).
- The goal is to include people who together know about all the activities involved in the care.

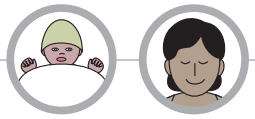
3) Organize the improvement team.

- Members of the improvement team take various roles. Below is a list of key team roles:
  - Team leader: guides team activities and delegates responsibilites.
  - Team mentor: provides assistance, materials and information needed to plan meetings and carry out the improvement project.
  - Record keeper: maintains written records of team discussions and decisions.
  - Facility reporter: communicates the work of the team to the rest of the staff at the facility.
  - Data manager: collects and analyzes data to determine if a change is is resulting in improvement (see Steps 4 and 5).

4) Choose a leader of the improvement team.

- An ideal team leader can invest time and resources, remove obstacles to improvement, and represent the work of the team to the facility's leadership.
- An ideal leader is an energetic champion of quality care at the facility. This might be a nurse manager, physician or other provider at the facility.

EXAMPLE:
As part of a national effort to reduce neonatal mortality, two midwives from a rural health center attend a training conference. They realize that several of their practices are not being performed as recommended. When they return to their facility, they obtain permission from the director to develop a team for improving these practices. On their advice, the director chooses members of the team, including a physician, nurse manager, nurse midwife, nurse, security guard and mother from the community. The team chooses the nurse midwife as the leader because she is a respected clinician who is enthusiastic about providing the best care possible. Although the physician has more training and authority, he is not selected because he is present at the facility only a few days per week.



Practice exercise

- *Read the case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A and discuss similarities and differences.*
- *In Steps 2 through 5, continue improving your skills by completing either the newborn or maternal exercises.*

Case scenario

After meeting with Seetha and hearing about the positive changes in her hospital, Nirmala returns to her own facility with new energy to improve care. Each year, approximately 1,000 babies are born in Nirmala's hospital. Nurse midwives provide prenatal, basic obstetric and postpartum care. Registered nurses and ward assistants help with postpartum care. A senior nurse manager supervises operation of the facility, including ordering supplies. There is a pharmacist on site. Nursing students are usually present in the facility. A physician manages the labor ward and is available for emergencies, but does not provide care for women without complications. Mothers and babies usually remain in the delivery area for one hour after a birth and are then moved to a postpartum room. They are typically discharged about 24 to 48 hours later.

Nirmala wants to become a champion for quality care and wants to create an improvement team.

1. *Discuss how Nirmala should organize a team to improve care of mothers and babies in this facility. List the members on the team and assign their roles.*

2. *Choose an ideal team leader. Describe why you chose this leader.*

Group discussion

Discuss the situations you might encounter in your facility.
Use the following questions to help you plan the actions of the improvement team.

- What will help make it possible for an improvement team to meet regularly in your facility?
- Will team members be assigned or volunteer? Will they be given time for these activities?
- How can families and other non-medical people be involved in the improvement process? Can they be members of the team?

Improvement team actions

Action	Tips & Techniques
Create an improvement team: • Get support from facility leaders to create an improvement team. • Invite interested people who are involved with care of mothers and babies. • Consider inviting mothers or other family members.	**A team can be any size, but:** • A team that is too small (less than 3 people) may not have enough creative ideas or time to get the work done. • A team that is too large (more than 10 or 12 people) may have trouble listening to all perspectives and making decisions. **The number is not as important as having the right people; the right people are:** • Enthusiastic – they want to make changes. • Involved – they are already doing the work that needs change. • Available – they can devote time to making changes. • Influential – other people listen to them.
Organize the improvement team: • Choose a team leader. • Assign other roles: - Coordination of data collection - Recording minutes of team meetings - Communicating with other staff • Decide on time (day and hour), duration, and location of meetings. • Decide how to communicate among team members. • Decide how to document meetings. • Discuss how to involve facility leaders.	• The people providing care usually have the best ideas of what the problems are and how to fix them. • A good team leader makes sure that all team members are able to contribute ideas. • In small facilities, one person can perform several roles. • Team members can switch their roles from project to project. This will help them be able to contribute in more ways in future improvement work. • Try to schedule meetings regularly to establish a routine.

WORKSHEET

Create an improvement team

Our improvement team members:

Team member	***Role (i.e. leader, recorder, data analyzer)***

Our schedule for improvement team meetings:

Date	***Time***	***Place***

Step 2
Decide what to improve

OBJECTIVES

- *Understand where gaps in quality can occur*
- *Identify gaps in quality*
- *Choose what to improve*
- *Perform a baseline assessment*
- *Write an aim statement*

Key knowledge

Understand where gaps in quality can occur

Improvement teams focus on gaps in the quality of outcomes or processes.

OUTCOMES

Outcomes describe the health of a person or group of people. A gap in quality exists when a good outcome occurs less frequently or a poor outcome occurs more frequently than is desired.

EXAMPLE:
A gap in quality exists when many mothers have postpartum hemorrhage (the poor outcome).

PROCESSES

Processes of care are the actions of providers during the care of mothers and babies. A gap in quality exists when a process of care is not performed correctly or consistently, particularly when this results in a poor outcome.

- A process of care may influence an immediate health outcome.

EXAMPLE:
Failing to treat with a uterotonic drug after birth (the process) increases the likelihood of postpartum hemorrhage (the immediate health outcome).

- A process of care may influence a future outcome.

EXAMPLE:
Failing to initiate breastfeeding soon after birth (the process) decreases the likelihood of exclusive breastfeeding at 3 months (the future outcome).

A good outcome depends upon **processes** of care being performed correctly and consistently. The processes of care depend upon **inputs**. Inputs are the resources necessary for delivery of health care. Lack of an essential input creates a **barrier** to the process of care. Inputs and barriers are further described in Step 3.

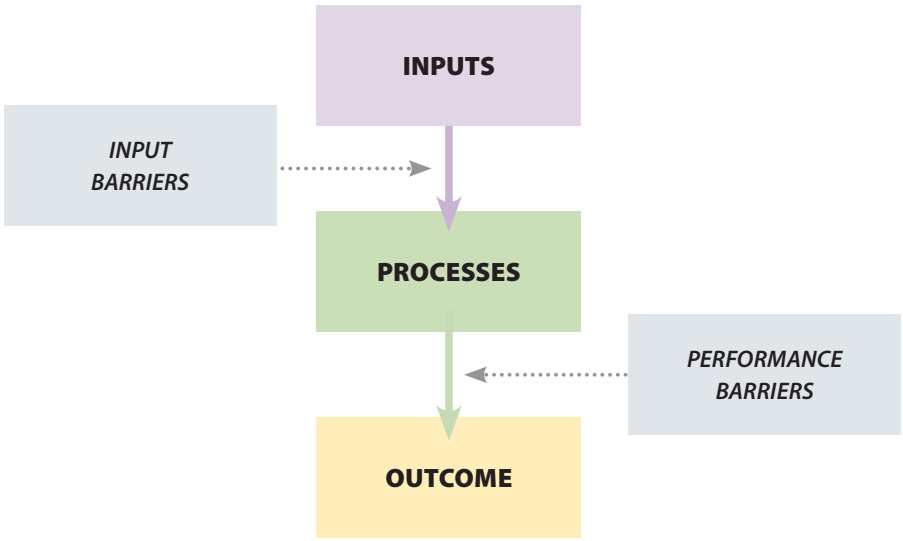


Figure 2.1.
This figure illustrates how an outcome is affected by processes of care, and processes depend upon inputs. Inputs will be discussed in Step 3.

Identify gaps in quality

A quality gap may be identified in the following two ways (see also figure 2.2 below):

1) A gap is obvious to the team based on their knowledge and experience.

- They recognize that a bad outcome occurs frequently.

EXAMPLE:
The team knows that nearly half of all mothers in their facility have a large amount of bleeding after birth. They are told by colleagues in neighboring hospitals that bleeding occurs only once or twice per month in their hospitals.

- They know that a process of care is not being performed correctly (correct action, correct time, correct patient).

EXAMPLE:
The team knows that providers do not administer the uterotonic oxytocin until after delivery of the placenta. Their national guidelines recommend active management of the third stage of labor which includes the use of a uterotonic after delivery of the baby but prior to delivery of the placenta.

- They know that a process of care is not being performed consistently (it may be performed correctly, but not for every patient).

EXAMPLE:
The team knows that vitamin K is frequently out of stock in the delivery room. When it is not stocked, babies do not receive vitamin K.

Ways to identify gaps in quality:

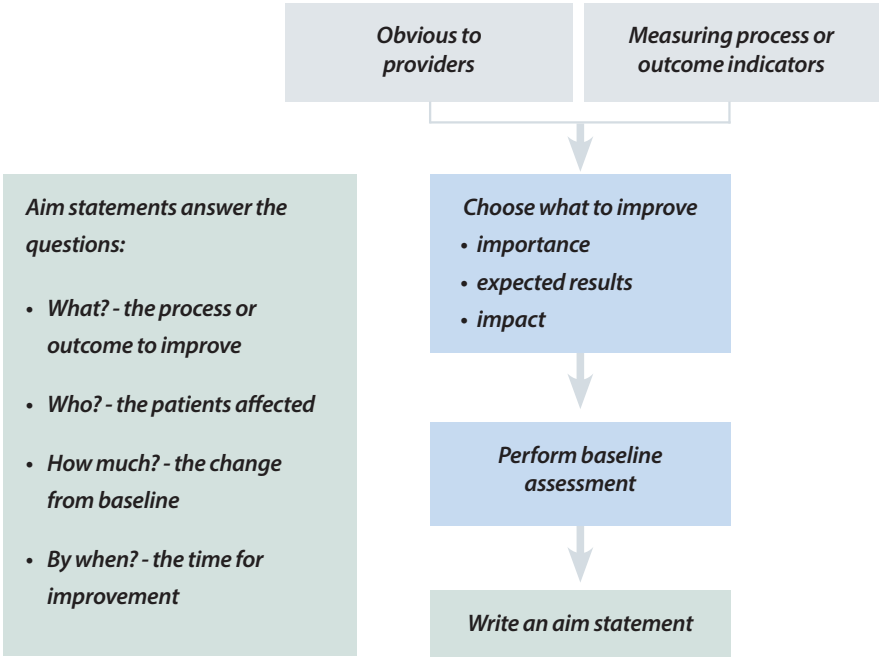


Figure 2.2:
The figure illustrates the two ways teams identify a gap in quality and the actions that follow identifying gaps: choosing what to improve, performing a baseline assessment and writing an aim statement (see below).

2) A gap is identified by measuring processes of care and outcomes.

Measures of processes of care and outcomes are called process and outcome indicators

- Indicators can be compared to expected or desired rates for a certain process or outcome.
- Indicators measure how frequently mothers or babies have an outcome or how frequently a process is performed.
- Indicators may be expressed as proportions or percentages.
  - When expressed as proportions, the numerator of an indicator is the number of mothers or babies who have the outcome or receive the process of care in a certain period of time. The denominator is the number who have the outcome or who should experience the process of care during the same period of time.
  - When indicators are expressed as percentages, they give the number of outcomes or processes for every 100 mothers or babies.
  - Mortality indicators use larger numbers in the denominator, such as 1,000 or 100,000.

EXAMPLE:
The outcome indicator neonatal mortality rate is the number of babies who die in the first 28 days after birth during a period of time (numerator) compared to the number of live births in the same period of time (denominator), expressed as the number of deaths per 1,000 live births. The outcome indicator maternal mortality ratio is the number of maternal deaths (numerator) divided by the number of live births (denominator), expressed as the number per 100,000 live births. Table 2.1 lists examples of process and outcome indicators.

Individual pieces of information used to calculate indicators are called data.

- Data may be collected continuously or for a designated period of time, and may come from:
  - Existing records (for example, the birth register or maternal and newborn medical records)
  - Directly observing a process of care

Outcome	**Indicator**	**Numerator**	**Denominator**	**Usual source of data**
Maternal death	Maternal mortality ratio	# of maternal deaths	Per 100,000 live births	Delivery register/ facility statistics
Neonatal death	Neonatal mortality rate	# of neonatal deaths	Per 1,000 live births	Delivery register/ facility statistics
Postpartum hemorrhage	% of postpartum hemorrhage	# of women with postpartum hemorrhage	Per 100 women giving birth	Maternal record
Process	**Indicator**	**Numerator**	**Denominator**	**Usual source of data**
Uterotonic treatment to prevent postpartum hemorrhage	% of women who were treated with a uterotonic	# of women who were treated with a uterotonic immediately after delivery of the baby	Per 100 women giving birth	Maternal record
Early skin-to-skin care	% of babies who received skin-to-skin care	# of babies who received skin-to-skin care for the first hour after birth	Per 100 live births	Newborn record

Table 2.1 Examples of outcome and process indicators Note: See Appendix C for additional indicators

Choose what to improve

There may be a gap in the quality of more than one outcome. Even when only one outcome needs improvement, there may be many processes that affect that outcome. It is usually best to improve only one outcome or one process at a time, and the team will need a way to choose one.

EXAMPLE:
The team chooses to reduce the number of deaths from postpartum hemorrhage. They know that treatment of mothers with a uterotonic immediately after birth of the baby and monitoring for bleeding after delivery of the placenta are important processes of care that affect the outcome of postpartum hemorrhage. They also know that neither of these processes are performed consistently. They need to decide whether to improve one or both of these processes to prevent deaths from postpartum hemorrhage.

Several factors influence the choice of what to improve, including:

- The **importance** of the outcome or process
  - How important is the outcome or process to families or the health authority?
- The **expected amount** of improvement
  - How much improvement is expected from a change in care?
- The **impact** of the improvement
  - How many mothers or babies experience the outcome or receive the process of care?

After choosing what to improve, consider adding other members to the team.
Choose persons who have special knowledge about the outcome or participate in the process identified.

EXAMPLE:
The team decides to improve the process of uterotonic administration. They invite persons who are involved in administering these drugs to join the team. This includes the pharmacist responsible for ordering the medication.

Perform a baseline assessment

A baseline assessment describes the gap in quality, including the size of the gap before the team begins activities to improve care. A baseline assessment counts how often the outcome occurs or how often the process is being performed correctly and consistently.

To define how often the outcome occurs:

- Review facility statistics.
- Review medical records.

To define how often the process is being performed correctly and consistently:

- Observe the process and record the observations – if the process is not documented in the medical record.
- Collect data from registers or other medical records – if the process is already documented.
- Estimate how often the process is performed – if the team knows that a process is rarely (or never) performed.

Write an aim statement

An improvement team defines its goals by writing an aim statement. An aim statement describes the improvement goal clearly and in a way that can be measured. The aim statement is the first step in planning changes for improvement.

An aim statement answers the questions *what, who, how much* and *by when*.

- **What** – identifies the outcome or process that needs improvement.
- **Who** – identifies the persons who will be affected.
- **How much** – describes the change from baseline to the desired result.
- **By when** – indicates a time frame for change.

The baseline assessment provides a starting value for "how much".

EXAMPLE:
An aim statement for improving treatment with a uterotonic might be: "Increase the number of mothers receiving a uterotonic immediately after birth of the baby from 30% to 95% by six months from now." In this example, the "what" is immediate uterotonic treatment, the "who" is all mothers, the "how much" is from 30% to 95% and the "by when" is six months from now.

Newborn practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.1 and discuss similarities and differences.*

Newborn case scenario

During a meeting of the improvement team at Nirmala's hospital, gaps in quality of newborn care are discussed. Team members are not aware of a serious gap in quality. The leader suggests reviewing recent Delivery Register data to determine if a gap in quality exists.

1. *Using the sample Delivery Register (on pg. 19), list processes of care and outcomes that might be used as indicators of the quality of newborn care.*

Processes of care	*Outcomes*

2. *Calculate the frequency of the following process of care: vitamin K administration.*
3. *Calculate the frequency of two outcomes: low newborn temperature and death.*
4. *Choose the gap in quality to improve and record why you have chosen this gap.*
5. *Write an aim statement for improving low newborn temperature.*

What	
Who	
How much	
By when	

Sample delivery register

DELIVERY REGISTER

Name	Date of Birth	Time of Birth	Delivery Route	Oxytocin	Post-partum Blood Loss	Apgars 1,5 min	Wt	Temp	Vit K	Discharge Date	Baby Disposition	Notes
MSaidou	15-06	00:45	vag	✓	250	8,9	3400	35.4	✓	15-06	Home	
C Bidi	15-06	06:30	c/s	✓	450	7,8	2460	34.5	✓	17-06	Home	
A. Baucar	15-06	14:30	vag	✓	200	8,9	2350	35.2		16-06	Home	
S. Rashad	16-06	09:20	vag	✓	200	6,8	3310	36.8	✓	17-06	Home	
Z. Saloy	16-06	17:50	vag		350	6,8	2670	37.1	✓	17-06	Home	
H. Alai	17-06	02:42	vag		750	5,7	2740	37.9	✓	19-06	Referred	
C. Sidi	18-06	08:16	vag	✓	150	8,9	2851	36.8		19-06	Home	
R Abou	18-06	12:25	vag		400	8,9	2780	37.1	✓	19-06	Home	
B. Azara	18-06	13:11	vag	✓	300	7,8	3500	34.4	✓	20-06	Referred	
Z. Halifa	19-06	11:13	vag	✓	200	9,9	3215	35.2	✓	20-06	Home	
B. Bayou	20-06	04:07	vag		750	7,8	2720	37.8		20-06	Home	
M. Seclak	20-06	11:48	vag		150	7,8	1900	34.2		20-06	Died	mother died
D. Djibri	21-06	07:38	vag		350	8,9	2995	36.8		21-06	Home	
S. Binton	21-06	14:26	vag		1000	7,8	3620	36.4		22-06	Home	
S Bevaca	21-06	21:15	c/s	✓	250	8,9	2780	36.7	✓	22-06	Home	
M. Bonou	22-06	18:20	vag	✓	200	8,9	2618	35.8	✓	23-06	Home	
R. Youyou	22-06	22:10	vag	✓	250	8,9	2651	37.8	✓	24-06	Home	

Maternal practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.2 and discuss similarities and differences.*

Maternal case scenario

During a meeting of the improvement team, gaps in the quality of maternal care are discussed. Team members are not aware of a serious gap in quality. The leader suggests reviewing recent Delivery Register data to determine if a gap in quality exists.

1. *Using the sample Delivery Register (on pg. 19), list processes of care and outcomes that might be used as indicators of the quality of maternal care.*

Processes of care	*Outcomes*

2. *Calculate the frequency of two processes of care: oxytocin administration and measurement of blood loss.*
3. *Calculate the frequency of the following maternal outcome: postpartum hemorrhage (blood loss >500 mL).*
4. *Choose the gap in quality to improve and record why you have chosen this gap.*
5. *Write an aim statement for improving administration of oxytocin after birth to prevent postpartum hemorrhage.*

What	
Who	
How much	
By when	

Group discussion

Discuss the situations you might encounter in your facility.
Use the following questions to help you plan the actions of the improvement team.

- Has your health authority identified any gaps in quality as a priority?
- Have you and your colleagues noticed any obvious gaps in quality?
- At your facility, where can you find data to calculate indicators?
- What indicators does your facility routinely report?
- How difficult would it be for your improvement team to continuously measure some process and/or outcome indicators? Why?

Improvement team actions

Actions	Tips & Techniques
Identify gaps in the quality of care using one of the following: • Team's knowledge and experience • Review of data for process and outcome indicators **Prepare for next activity:** • Gather documents and/or data related to gaps the team has identified. • Talk with staff and facility leaders about gaps.	• Find out whether there are national or regional improvement goals. • At this point, focus only on identifying the gaps in quality. Do not consider reasons for the gap or solutions to the gap. These will be considered later.
Choose what to improve based on the following questions: • How important will improvement in this gap be: - To mothers? - To babies? - To providers at your facility? - To the health authority? • Can you improve the gap enough to make a difference? • How many mothers or babies will this improvement affect? **Prepare for next activity:** • Gather facility statistics that might help determine a baseline rate of the process or outcome chosen for improvement.	• Encourage the participation of all team members because individuals may represent different groups (providers, other staff, families) and have different ideas and opinions. • It is best for new teams to choose a gap that they are very likely to improve. Consider the following: - Frequency – start with common events. This gives opportunities for rapid learning. - Simplicity – improve routine care (things that all women and babies need) rather than working on complex care (required by only a few). - Objective, existing data – avoid projects that need a new data system or require observation for data. Use objective data closely linked to an outcome. - Close link between change and the result – the result of a change should occur soon after the change and be obvious. - Control of system - work on projects that are under the control of the team or colleagues leading the work. • Be patient; this is a critical step. Recognize that it may take more than one meeting to decide what to improve.
Perform a baseline assessment of the outcome or the process chosen for improvement. • Review data from indicators if appropriate; or • Plan to collect additional data if necessary.	• Consider involving a "coach" or someone with experience in improvement methods in this activity.

WORKSHEET

Decide what to improve

Our current gaps in quality:

Processes of care	*Outcomes*

The gap we will improve and why:

Gap:	
Why:	***How important is the outcome or process to families or the health authority?***
	How much improvement in outcome is expected from a change in care?
	How many mothers or babies experience the outcome or receive the process of care, and how much will their health improve?
	Other reasons:

Our baseline assessment:

Indicator (outcome/process)	
Source of data	
Person responsible	
Method to obtain data	
Incidence of outcome or rate of performance of process	

Improvement team actions

Actions	*Tips & Techniques*
Write an aim statement. • Discuss the results of the baseline assessment. • Define the elements of your aim statement: - **What** - the outcome or process that needs improvement. - **Who** - the patient group that will be affected. - **How much** - the change from baseline to the desired result. - **By when** – the time frame for change. **Prepare for next activity:** • Discuss your aim statement with other facility colleagues.	• Set a realistic goal for the aim; the goal should be meaningful but you want to succeed in meeting it. • Ask, *"Is it worth us spending our time trying to achieve this aim? Why?"* If there is any doubt, change your aim. • Consider making other staff aware of your aim by displaying the statement for all to see.

WORKSHEET

Decide what to improve

Our aim statement:

What	
Who	
How much	
By when	

Step 3
Choose the barriers to overcome

OBJECTIVES

- *Understand common reasons for gaps in the quality of care*
- *Identify barriers to the process or outcome chosen for improvement*
- *Select the barrier(s) to overcome*

Key knowledge

Understand common reasons for gaps in the quality of care

Quality of care is defined by the outcomes that mothers and babies experience. Good outcomes depend upon processes of care being performed correctly and consistently. In order for processes to be performed correctly and consistently, essential inputs must be available. Inputs are the resources necessary for delivery of health care (Figure 3.1). Lack of an essential input creates a barrier to the process of care.

INPUT BARRIERS	*DESCRIPTION*	*EXAMPLE*
Lack of knowledge and skills	Lack of knowledge may result from a poor understanding among providers about what should be done. Lack of skills may result from insufficient training or inconsistent practice of the skill.	The team determines that some babies are not treated with vitamin K because many of the older providers at the facility believe that only babies with birth weights > 2500 grams should be treated.
Staffing shortage	May result from lack of availability of skilled providers or lack of funds to hire them.	The team wants to reduce a high rate of postpartum hemorrhage. They know that oxytocin is nearly always administered after delivery of the baby. However, nurses have so many patients that they rarely monitor for uterine tone or bleeding after delivery.
Insufficient supplies	May result from inadequate funds to purchase supplies, not purchasing the right supplies, or a problem with the distribution of supplies.	The team discovers that the new national recommendation for applying chlorhexidine to umbilical cords is not being done because the correct dosing form is not available.
Unfavourable infrastructure	May result from poorly designed or maintained buildings, or other aspects of the physical environment in which care is delivered.	The team choosing to reduce a high rate of low newborn temperatures may discover that the delivery area is cold; drafts cannot be eliminated because there are many missing window panes.
Inadequate financial resources	May impact other inputs such as supplies and staffing.	The team choosing to reduce a high rate of postpartum hemorrhage discovers that oxytocin is available from a regional pharmacy. However, the facility does not have enough money to buy oxytocin for all patients. Therefore, only mothers who can buy the medication are treated.
Traditions and cultural beliefs that interfere with recommended care	May result from strong community traditions that interfere with processes of care.	The team advises mothers not to place anything on the umbilical cord except chlorhexidine. They discover that a paste made from herbs is placed on the umbilicus of infants whose mothers reside in one village. This practice is recommended by a local traditional healer.

Even when essential inputs are available, a gap may occur because of barriers to the correct and consistent performance of the process.

PERFORMANCE BARRIERS	*DESCRIPTION*	*EXAMPLE*
Poorly organized processes	May occur when actions taken do not result in correct or consistent performance of the process.	The team wants to improve the low rate of bag/mask ventilation of infants who have been stimulated but do not breathe within one minute after birth. They discover that the ventilation bag is stored in a locked cabinet, the head nurse has the only key, and she is not always available at the time of a birth.
Misaligned incentives	May occur when an incentive for a desired action or outcome results in an unintended outcome and actually interferes with the performance of a process.	The team wants to increase the number of mothers who provide one hour of continuous skin-to-skin care after birth. The facility manager wants the delivery room to be available for new admissions and encourages the rapid transfer of postpartum mothers to a ward room. Each month, the nurse midwife who transfers the most mothers within an hour of delivery receives a small cash bonus. The transfer interrupts skin-to-skin care.
Challenges with leadership and management	May result from competing demands on leaders and managers. Such demands may come from other service providers or the health authority. Challenges may also result from leaders and managers who lack competency, experience or training.	The team wants to improve the low rate of breastfeeding counselling. The staff understands how to counsel mothers but they are discouraged from doing this by the facility manager because counselling takes time and would prolong the hospitalization of mothers.
Providers' convenience	May adversely affect a process of care, especially when providers are unaware of the consequences on the health of the mother or baby.	The team wants to improve early skin-to-skin care. Some birth attendants provide eye treatment, administer vitamin K and weigh the baby immediately after birth so that they will not have to interrupt their break to provide this care at a later time.

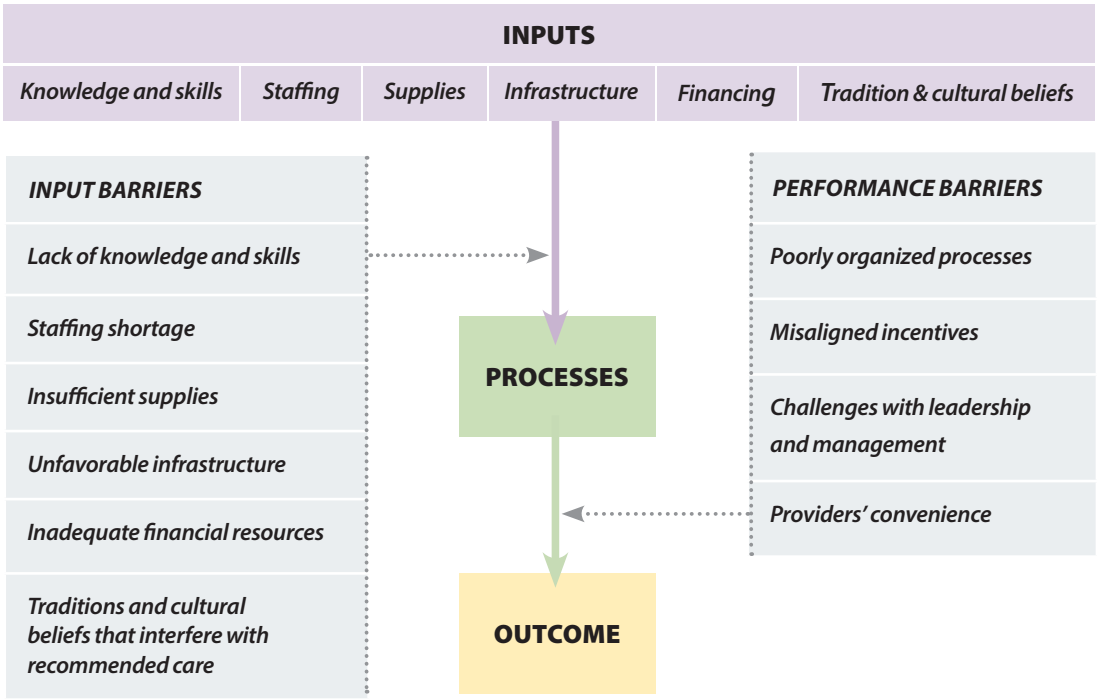


Figure 3.1:
The figure illustrates how an outcome depends upon all the important processes that affect it, and how inputs and input barriers can negatively affect processes and thus outcomes.

Identify barriers to the process or outcome chosen for improvement

Create an environment in which staff can express their thoughts freely.
It may be difficult for providers to talk openly about problems with infrastructure, resources or management of a facility. They may be fearful of losing their jobs. The team leader and supervisors at the facility must create an environment in which staff can speak freely and openly about all barriers to quality care.

Consider using the following methods to identify barriers:
The barrier may be obvious to the team because of their knowledge of practices and resources at the facility. If the barrier is not obvious, tools or visual aids can be used to help determine the root cause or causes of the gap in quality.

1) **Use Figure 3.1 to identify the cause of a gap in quality by:**
- Identifying all inputs that are critical to the process and determining if each is adequate.
- Determining if there are barriers to performance of the process.

2) **Use a flow chart to identify all processes of care or events that lead to and might influence the outcome chosen for improvement.**
- The flow chart may reveal a poorly organized process. Flow charts can be created using the team's knowledge of the practices in their facility. It is often useful to observe the care of patients and record actions as they are performed.

EXAMPLE:
The team wants to reduce the high rate of postpartum hemorrhage (PPH) at their hospital. To help understand the cause of this gap in quality, they create the following flow chart describing the activities from the time of admission of the mother to the immediate postpartum period (Figure 3.2).

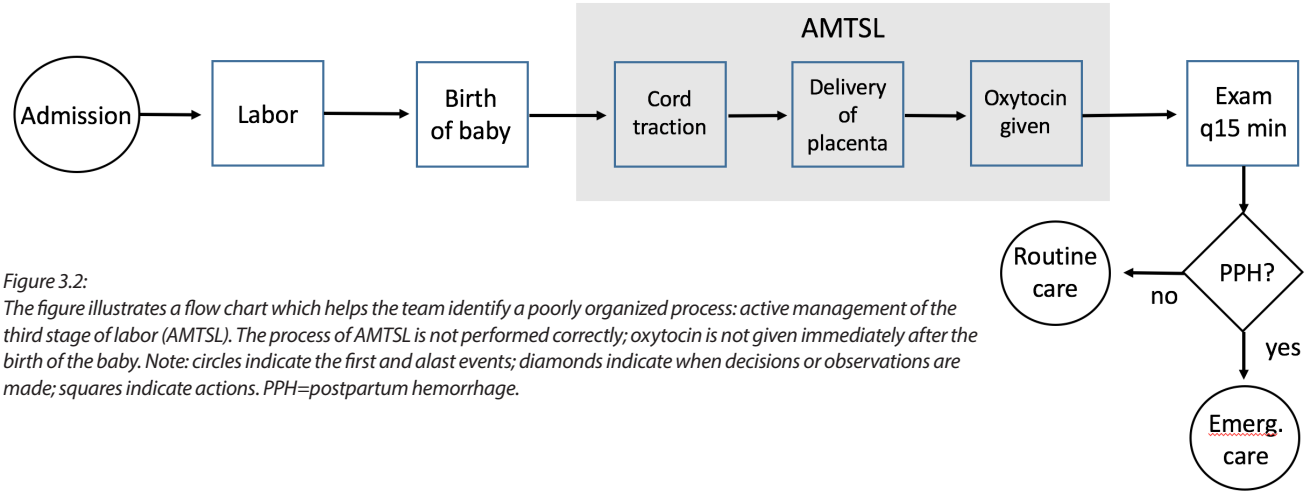


Figure 3.2:
The figure illustrates a flow chart which helps the team identify a poorly organized process: active management of the third stage of labor (AMTSL). The process of AMTSL is not performed correctly; oxytocin is not given immediately after the birth of the baby. Note: circles indicate the first and alast events; diamonds indicate when decisions or observations are made; squares indicate actions. PPH=postpartum hemorrhage.

Examples of additional tools to identify barriers, such as the Fishbone diagram and the Five Whys, are included in Appendix B.

Select the barrier(s) to overcome

When more than one barrier exists, select the barrier or barriers to overcome. Select more than one barrier to overcome if multiple barriers contribute significantly to a gap in quality.

When more than one barrier is chosen, the time to accomplish change and see results may be different for each.

Several factors may influence the choice of which barrier to overcome, including:

1) The **effect** of overcoming the barrier
- How much will the process or outcome improve by overcoming the barrier?

2) The **cost** of overcoming the barrier
- Will the cost of overcoming the barrier be within the resources of the facility?

3) The **feasibility** of overcoming the barrier
- What is the likelihood that the barrier can be overcome?

EXAMPLE:
The Ministry has asked facilities to ensure that all newborns receive chlorhexidine cord care. The team knows that one barrier to this process of care is an inadequate supply of chlorhexidine. A survey of providers reveals that only one-half know how and when to apply chlorhexidine. The team decides that they must overcome the barrier of an insufficient supply of chlorhexidine and overcome the barrier of lack of knowledge about this process.

Newborn practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.1 and discuss similarities and differences.*

Newborn case scenario

The team has chosen to improve the outcome of low newborn temperature. To help them understand why babies get cold, they consider all of the actions of providers and/or processes of care that occur in the first hour following a birth that might influence a baby's temperature.

1. *List the processes of care that might affect the outcome of low newborn temperature.*

Newborn case scenario (continued)

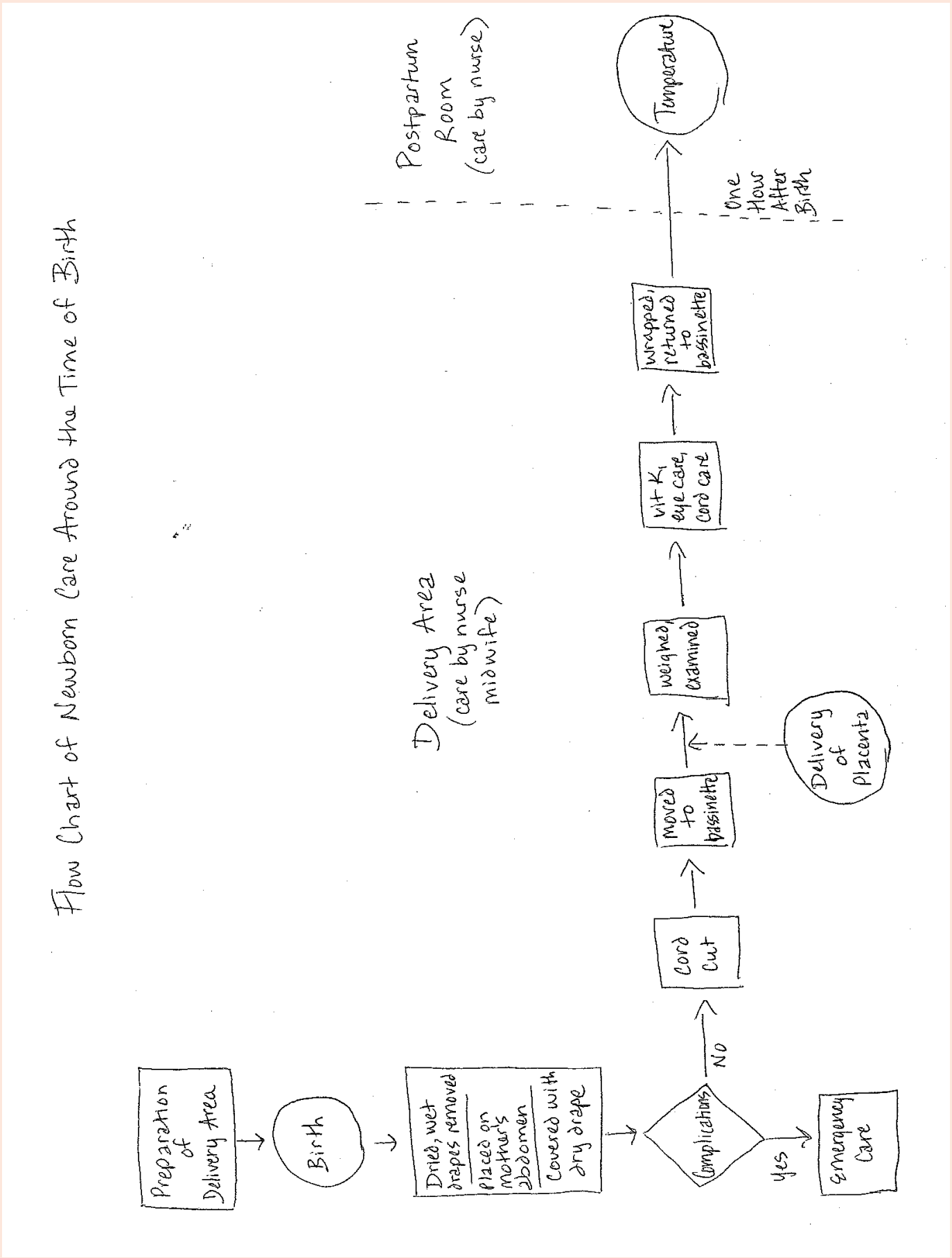
To determine whether the processes of care that affect a baby's temperature are being performed correctly and consistently, the team gathers more information. First, they attend several births to observe the care provided to mothers and babies. They draw a flow chart (see pg. 32) and record other information.

They learn the following:

- *The room where mothers deliver is prepared properly.*
- *Immediately after birth, the baby is dried, the wet cloths are removed, the baby is placed on the mother's abdomen and covered with a dry cloth.*
- *A cart that holds an infant scale, vitamin K, eye ointment and chlorhexidine for cord care is in the delivery area.*
- *After the placenta is delivered, the baby is taken from the mother, weighed, given vitamin K and eye care, and examined. The baby is then wrapped and placed in a bassinette, usually about 30 minutes after birth.*
- *At about one hour of age, the baby and mother are moved to the postpartum room. The baby's first temperature is taken in the postpartum area.*
- *All care in the delivery area is provided by nurse midwives. Care in the postpartum room is provided by nurses.*

Next, the team reviews the Ministry guidelines for intrapartum and newborn care and compares the guidelines to the care outlined in their flow chart.

2. *List the potential cause of low newborn temperature.*


Flow Chart of Newborn Care Around the Time of Birth
Preparation of Delivery Area
Birth
Dried, wet drapes removed
Placed on mother's abdomen
Covered with dry drape
Complications
No
Yes
Emergency Care
Cord Cut
Moved to bassinette
Delivery of Placenta
Delivery Area (care by nurse midwife)
weighed, examined
Vit K, eye care, cord care
wrapped, returned to bassinette
Postpartum Room (care by nurse)
Temperatur
One Hour After Birth

Newborn case scenario (continued)

The team determines that the process of continuous skin-to-skin care for one hour after birth is not being performed correctly because it is interrupted by other newborn care practices. This is a gap in quality of care that may be causing low newborn temperatures. The team decides to improve this process of care. They must now determine the barriers to performing skin-to-skin care correctly.

They interview nurses, nurse midwives and two mothers. They learn the following:

- *Some providers are not aware of the Ministry's recommendation for continuous skin-to-skin for the first hour after birth.*
- *The responsibility for weighing, providing eye and cord care, treating with vitamin K, and examining the baby is assigned to the nurse midwives. They want to complete these tasks immediately after birth because of the large number of deliveries and the need to attend to other laboring mothers.*
- *Skin-to-skin care is allowed only when nurse midwives are available to assist.*
- *Mothers want to hold their babies skin-to-skin immediately after delivery.*

The facility administrator will support changes that agree with the Ministry recommendations, but the team is told there are no funds to hire additional staff.

3. *Using the table on pg. 34, identify the barriers to care that might interfere with placing babies skin-to-skin with mothers immediately after birth and continuing for at least one hour.*

INPUT BARRIERS	*IDENTIFIED INPUT BARRIERS TO SKIN-TO-SKIN CARE*
Lack of knowledge and skills	
Staffing shortages	
Insufficient supplies	
Unfavorable infrastructure	
Inadequate financial resources	
Traditions and cultural beliefs that interfere with recommended care	

PERFORMANCE BARRIERS	*IDENTIFIED PERFORMANCE BARRIERS TO SKIN-TO-SKIN CARE*
Poorly organized processes	
Misaligned incentives	
Challenges with leadership and management	
Provider's convenience	

4. *Choose the barriers to overcome.*
   Consider the expected effect, cost and feasibility of overcoming the barrier(s).

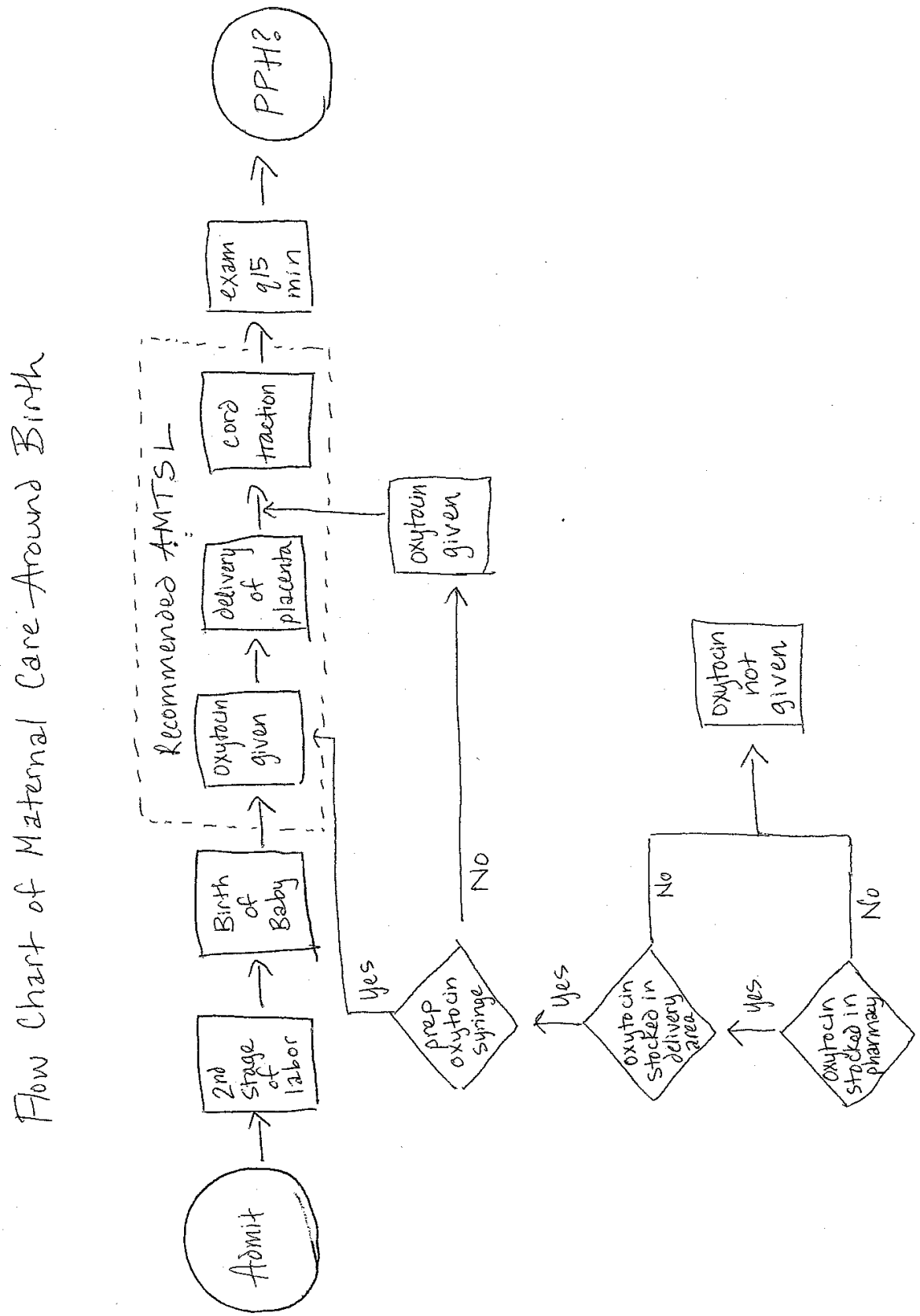
Maternal practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.2 and discuss similarities and differences.*

Maternal case scenario

The team has chosen to improve the administration of oxytocin after birth for prevention of postpartum hemorrhage. To help them understand why this does not occur after every birth, they observe several births and make a flow chart of the care mothers receive around the time of delivery (see pg. 36). The flow chart shows two things: 1) the events and actions that involve the mother before and around the time of delivery; and 2) the actions involved in making sure that oxytocin gets to the bedside and is given to women soon after delivery. They also review the Ministry's guidelines for maternal care during birth.

1. List the actions that might affect the recommended administration of oxytocin.


Flow Chart of Maternal Care Around Birth
Recommended AMTSL
Admit
2nd Stage of labor
Birth of Baby
oxytocin given
delivery of placenta
cord traction
exam q15 min
PPH?
prep oxytocin syringe
Yes
NO
oxytocin given
oxytocin stocked in delivery area
Yes
No
oxytocin stocked in pharmacy
Yes
No
oxytocin not given

Maternal case scenario (continued)

The team gathers more information about administering oxytocin. They interview two midwives, the senior nursing officer and the pharmacist.

They learn the following:

Supply of oxytocin in the facility

- *Oxytocin is provided by the Ministry at no charge to the hospital and is always available in the pharmacy.*

Supply of oxytocin in the delivery area

- *Oxytocin and syringes are stored in a cabinet in a room adjacent to the delivery room. It is re-stocked by the nurse-in-charge when there are no vials in the cabinet.*

Preparation of syringe for administration

- *During the second stage of labor, the midwife prepares a syringe of oxytocin.*
- *If the medication is prepared before the delivery, it is almost always given immediately after the birth of the baby.*
- *Only the midwives are permitted to prepare oxytocin for administration. At times, the ward is so busy that they are unable to walk to the cabinet and prepare the syringe before a birth.*

Other issues

- *Some midwives are not aware of the Ministry's recommendation for administration of oxytocin immediately after birth.*
- *At times, particularly during the night, the midwife does not have time to prepare an oxytocin syringe because she is the only provider covering the labor and delivery area.*
- *Ward assistants are assigned to the labor and delivery area at all times, day and night.*
- *The facility administrator will support changes that agree with Ministry recommendations, but there are no funds to hire additional staff.*

2. Using the table below, identify the barriers to care that might interfere with immediate administration of oxytocin after birth.

INPUT BARRIERS	*IDENTIFIED INPUT BARRIERS TO ADMINISTRATION OF OXYTOCIN*
Lack of knowledge and skills	
Staffing shortages	
Insufficient supplies	
Unfavorable infrastructure	
Inadequate financial resources	
Traditions and cultural beliefs that interfere with recommended care	

PERFORMANCE BARRIERS	*IDENTIFIED PERFORMANCE BARRIERS TO ADMINISTRATION OF OXYTOCIN*
Poorly organized processes	
Misaligned incentives	
Challenges with leadership and management	
Provider's convenience	

3. Choose the barriers to overcome. Consider the expected effect, cost and feasibility of overcoming the barrier(s).

Group discussion

Discuss the situations you might encounter in your facility.
Use the following questions to help you plan the actions of the improvement team.

- Why can your improvement team understand barriers to high quality care better than people who do not work in the facility?
- How can your improvement team create an environment in which team members feel comfortable discussing barriers to quality care?
- What are the most frequent and important input and performance barriers in your facility?

Improvement team actions

Actions	Tips & Techniques
Identify barriers to the process(es) chosen for improvement. • Use Figure 3.1 in this Unit (or one of the tools in Appendix B) to help identify barriers. • Consider these input barriers: - Lack of knowledge and skills - Staffing shortage - Insufficient supplies - Unfavorable infrastructure - Inadequate financial resources - Traditions and cultural beliefs interfering with care • Consider these performance barriers: - Poorly organized processes - Misaligned incentives - Challenges with leadership and management - Providers' convenience **Prepare for next activity:** • Collect data on cost of overcoming barriers.	• Involve all team members in identifying barriers. Because their roles in care may vary, their ability to understand and identify barriers may be unique. • At the beginning of the meeting, the team leader should encourage members to "speak up" with their ideas about barriers without feeling threatened or vulnerable. • Discuss problems objectively and avoid blaming people. Most barriers result from problems in systems of care rather than from the actions of persons. • Consider barriers over which the team has control, such as poorly organized processes, rather than focusing only on barriers that may be difficult to control, such as lack of supplies or staffing shortages.
Select the barrier(s) to overcome. Is more than one barrier critical to the process or outcome? If yes, consider: • Effect – will overcoming the barrier have a large effect on the process or outcome? • Cost – are the resources available to cover the estimated cost of overcoming the barrier? • Feasibility – is it likely that the barrier can be overcome? **Prepare for next activity:** • Try to find other facilities that have overcome similar barriers.	• Ask "why" when stating that one barrier has greater importance than others. • When choosing a barrier, consider the "how much" (in new resources) will be required to overcome the barrier. A barrier that requires few new resources may be chosen over a barrier that requires many (several new providers or twice as many supplies) even if overcoming the larger barrier would result in greater improvement. • Focus on the barriers that are the main contributors to the problem. You can mark the main barriers on the tool you are using (Appendix B, Figure 2). • Choose only one or two barriers for the first improvement effort. • Try to find a barrier that all team members want to overcome. If this is not possible, have the team vote.

WORKSHEET

Choose the barriers to overcome

Input and/or performance barriers that we identified:

Input barriers	***Description***
Performance barriers	***Description***

Attach tool(s) used for identifying barriers (Figure 3.1, a flow diagram, a fish bone diagram and/or a 5 Whys chart).

The barrier(s) we will overcome and why:

Barrier(s):	
Why:	***Will overcoming the barrier have a large effect on the process or outcome?***
	Are there resources available to cover the estimated cost of overcoming the barrier?
	Is it likely that the barrier can be overcome?

Step 4
Plan and test change

OBJECTIVES

- *Identify and select changes that may improve care*
- *Develop a plan for change*
- *Test the changes in the plan*

Key knowledge

Identify and select changes that may improve care

Consider solutions that will best fit the situation at your facility. Teams may draw on their experiences and also on the experiences of providers at other facilities with similar barriers.

It is important that the team create an open environment where all members feel free to express their thoughts about changes. An open environment allows a team to use all their capacity to be creative in thinking of solutions.

Consider the following to overcome input barriers:

INPUT BARRIERS	*EXAMPLES OF CHANGES*
Lack of knowledge and skills	Ensure that correct guidelines for practice exist and educate staff about these guidelines. Develop a system for frequent real or simulated practice of the skill by all providers.
Staffing shortage	It may not be possible to hire additional personnel. The change may involve re-distributing tasks or combining responsibilities so that processes of care can be performed correctly and consistently.
Insufficient supplies	If a lack of supplies is due to improper purchases or poor distribution, the change may involve working with the persons responsible for managing the supplies to: • Seek out fairly priced equipment and supplies • Explore collaborative large-volume purchasing • Educate persons who purchase supplies about the type and number of items needed • Improve the distribution system
Unfavourable infrastructure	Large changes, such as new buildings, may be beyond the resources of the facility. Smaller changes and routine maintenance of equipment and structures, such as replacing broken window panes, may be relatively simple and inexpensive. Reorganizing care to take best advantage of the existing environment may provide a more immediate and economical solution. Removing clutter, organizing equipment and supplies, and re-routing patient flow may overcome this barrier.
Inadequate financial resources	Finding new funds can be difficult, but gathering data describing the need may be the first step to get new funds or redistribute existing funds.
Traditions and cultural beliefs that interfere with recommended care	Overcoming barriers from traditions and cultural beliefs may mean involving persons in the community who influence community beliefs (e.g. a village elder or experienced mothers in the community).

Consider the following to overcome performance barriers:

PERFORMANCE BARRIERS	*EXAMPLES OF CHANGES*
Poorly organized processes	The change may involve re-designing the process to follow the recommended practice, informing providers and documenting the change in a new or revised guideline.
Misaligned incentives	Incentives are usually created by managers or supervisors, so correcting this type of barrier to performance will require their involvement. The change may involve making the manager aware of the unintended consequence of the incentive. Changes should promote the desired behavior without undesirable outcomes.
Challenges with leadership and management	The change may involve communicating the staff's interest in improving care, and the team's proposed solution. Making higher-level supervisors aware of poor decisions made by managers may improve care by improving the manager's decisions, or may result in the dismissal of managers who are unwilling to change their bad habits.
Providers' convenience	The change may include educating providers about the consequences of their choices and involving them in a plan to change their performance. The example of a peer changing his or her behavior can be powerful motivation to change.

In prioritizing changes, the team should consider the same factors used to prioritize barriers:

- The **expected effect** of the change – will the change make a real difference in performance of the process?
- The **cost** of the change - will the cost of change be within the resources of the facility?
- The **feasibility** of change - what is the likelihood that the change will happen?

The team may decide to select one or more changes to overcome a particular barrier. However, it is easier to make one change at a time. Teams with limited experience in improvement should consider beginning with one change that is easy to make in a short period of time. An early success will encourage future efforts.

Develop a plan for change

When developing a plan for change to improve care, consider the following five points:

1) Describe how to make the change by developing a plan that will include:

- **What actions** to take
- **Who** is responsible for completing each of the actions
- **Where** the actions take place
- **When** the plan begins and ends
- **What resources** are necessary to execute the change

EXAMPLE:
The team wants to improve the process of vitamin K treatment. They observe that on most days there are fewer than 5 vials of vitamin K in the delivery area at the end of the day. The pharmacy is notified to restock the supply only when there are no vials available. This typically occurs at night when the pharmacy is closed. The improvement team concludes that the barrier to this practice is a poorly designed process. They develop a plan for the staff to notify the pharmacy whenever only 5 vials of vitamin K remain. They post a reminder on the drawer that holds the vials of vitamin K (*what actions* and *where*). The nurse manager and the birth attendants will be responsible for carrying out this plan (*who*). They will start at the beginning of the month (*when*). No additional resources will be required except for the time required to monitor and evaluate the plan (*what resources*).

2) Develop a plan for measuring the change, and decide what data to collect.

- Collect data to show if the plan is being properly carried out.
- These data are often not in the medical record; additional data collection will usually be required.

EXAMPLE:
The team has chosen to improve treatment of all newborns with vitamin K. Their change is a plan to replace vials of vitamin K in the delivery area before the supply is gone. To determine if the change is being carried out, they collect data on the number of vials available in the delivery area before and after the change. This information is not routinely recorded. Several team members are assigned the responsibility of counting the vials at the end of each day and recording the number on special data collection forms.

3) Collect data to determine if the change produces the desired effect.

- If a gap in quality was chosen based on the measurement of an indicator, continue to measure the indicator after the change. The team will compare the results of the process or outcome to the baseline rate in their aim statement (see Step 5).
- If a process of care was chosen because it was known to be performed incorrectly or inconsistently, collect data to determine how frequently the process is performed correctly after the change.

EXAMPLE:
In addition to counting the number of vials of vitamin K (in the previous example), they must also know if babies receive vitamin K to determine if the change has resulted in improved care.

4) Decide how data will be collected and who will collect it.

- Consider factors that affect the ease and accuracy of collecting information. Many processes of care and outcomes will be documented in medical records. Data on some actions in the plan will typically not be available in the record.
- If the data are already being recorded, the team may want to consider how often these records are incomplete or inaccurate. If the team discovers that information on the process of interest is often missing or inaccurately recorded, the team may need to supplement these records with their own collection of data.
- If additional data collection is required, consider starting with a small sample of mothers or babies that may represent the performance of the process in all mothers and babies. Data can also be collected at specific time points or for short periods of time.
- Assign the responsibility of compiling and analyzing data to one or more team members.

5) Decide how long each test of change will last.

- Each test of change should be long enough to determine if the change has occurred and whether it is having an effect.
- Avoid tests over long periods of time early in the improvement process. This avoids wasting time on changes that cannot be made or that do not improve care.
- Early tests may be very brief, as short as one shift or one day, and may involve one or only a few providers.

Test the changes in the plan

When testing the changes:

1) Begin by determining if the change is feasible.

- This test can be on a very small scale.
- The goal is to estimate whether making the change on a larger scale will be possible. This small test is not to determine if improvement occurs.
- By testing the change first on a small scale, the team does not risk wasting too much time or too many resources if the change is not possible.

2) If the change is feasible, test the change on a larger scale by involving more health workers or trying it out for a longer period of time.

- If the test on a small scale demonstrates that the change is possible, then testing of the change can continue on a larger scale.
- Larger scale tests involve more providers, mothers or babies, or may even involve all providers and mothers or babies in small facilities.

EXAMPLE:
The team determines some mothers are not treated with oxytocin because the drug is often not available in the delivery area. To increase the number of mothers treated, they plan to reorganize the process of re-stocking oxytocin in the delivery area. They test the plan on a small scale by involving the pharmacist and nurse midwives who will be working during the next Monday. They review data describing the number of oxytocin vials in the delivery area and discover that at least 5 vials were available at all times. Because the plan was successful on a small scale, they expand the plan to include all pharmacists and midwives.

3) Seek support for the changes.

- Discuss with supervisors and other managers the reasons for the changes and the critical parts of the plan (*what actions*, *who*, *when*, *where*, and *what resources* will be required).
- Make sure that leaders agree on what resources will be required and who will provide these resources, and that they understand the impact the changes will have on other services at the facility.
- Communicate the details of the plan to everyone involved in, or affected by, the change.

EXAMPLE:
Because the small test occurred on a Monday, the team is still not certain if the change will work every day. They are particularly worried about the change on the weekends. Before they test the change for a long period of time, they first test the change for one week and involve all of the midwives.

Newborn practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.1 and discuss similarities and differences.*

Newborn case scenario

The team decides to overcome two barriers to improve the performance of skin-to-skin care. First, they decide to reorganize routine newborn care practices so that the process of skin-to-skin care can be performed correctly. Second, they decide to educate all staff who care for mothers and babies about the importance of keeping babies skin-to-skin with their mothers for one hour after birth.

1. *List changes that might overcome these barriers to performing skin-to-skin care correctly. Select one or more changes to test.*

Newborn case scenario (continued)

The team plans to reorganize this process by leaving babies skin-to-skin with their mothers for at least an hour after birth. Care during this hour will be supervised by the nurse midwife, with assistance from nursing students. Newborn care will be performed after the first hour and after transfer to the postpartum room by the nurses there. The team plans to improve knowledge about early skin-to-skin care by discussing the recommendations at a staff meeting and hanging guidelines for care on the wall in the delivery area.

These proposed changes are presented to the staff; several nurse midwives express concern. They do not think that mothers really want to have their babies skin-to-skin immediately after birth, and they are not confident that nursing students can assist with this care. Also, they are not confident that the postpartum nurses will perform newborn care practices properly and for all babies.

Before testing this change on a large scale, the team wants to make sure that the change is possible. They decide to test the change on a small scale.

2. *Describe a small test that would help determine if this plan for change is feasible.*

Newborn case scenario (continued)

The team tests the change on a small scale with one nurse midwife during one shift. They make the following observations:

- *One nursing student assisted mothers after two births, and both mothers had one hour of uninterrupted skin-to-skin care.*
- *A second nursing student assisted mothers after three births, and two of the mothers had one hour of uninterrupted skin-to-skin care.*
- *The nursing students appreciated having additional responsibility and provided adequate assistance of skin-to-skin care.*
- *All mothers were enthusiastic about holding their babies skin-to-skin.*
- *All babies born during this shift received vitamin K, eye and cord care, and were examined.*
- *Three babies received this care from the nurse midwife in the delivery area because she happened to be available at one hour after the births.*
- *The other two babies received this care from the nurse in the postpartum room.*

From this small test, the team concludes that the change seems possible and should be tested among all staff, but should be modified slightly. They believe that all newborn care practices should be performed in the postpartum room, so they move the cart holding the scale and supplies out of the delivery area and into the postpartum room. They now need to develop a plan for testing the change on a larger scale.

3. *Develop a plan to test the change on a larger scale. Identify what actions, who, when, where and what resources are required.*

What actions	
Who	
When	
Where	
What resources	

4. *List what data to collect to understand the effects of reorganizing the skin-to-skin care process.*
   - What data will show the actions in the change have occurred? How will the team collect this data?
   - What data will show the change has resulted in improvement? Assuming this data is not in the medical record, how will the team collect it?

Maternal practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.2 and discuss similarities and differences.*

Maternal case scenario

The team decides to overcome two barriers to improve oxytocin administration. First, they decide to reorganize the process of administering oxytocin by making certain that the medication is in the delivery room and prepared for injection before every birth. Second, they decide to improve the knowledge among providers about the Ministry's recommendation for administration of oxytocin immediately after birth.

1. *List changes that might overcome these barriers to oxytocin administration. Select one or more changes to test.*

Maternal case scenario (continued)

The team plans to reorganize this process. The nurse-in-charge will be responsible for assessing the supply of oxytocin and requesting the vials and syringes needed for each day. Based on a review of the Delivery Register, the team estimates that there are about 3 births per day. Therefore, they recommend that the cabinet be stocked with 4 vials and 4 syringes each morning. The ward assistant who is assigned to the labor and delivery area will place a vial of oxytocin and syringe by the delivery pack of every mother upon her admission. The nurse-in-charge will meet with the ward assistant at the beginning of each shift to review his/her responsibility for making sure that the vial and syringe are placed with the delivery packs. The team plans to improve knowledge about administration of oxytocin by discussing the recommendations at a staff meeting and hanging guidelines for care on the wall in the delivery area.

These proposed changes are presented to the staff; several nurse midwives express concern. They worry that oxytocin may not be available for women who are experiencing postpartum hemorrhage if it is given to all women. They also are concerned that the ward assistants may not be available, particularly at night, and will resent having additional responsibilities.

Before testing this change on a large scale, the team wants to make sure that the change is possible. They decide to test the change on a small scale.

2. *Describe a small test that would help determine if this plan for change is feasible.*

Maternal case scenario (continued)

The team tests the change on a small scale with two midwives during one day. They make the following observations.

- ***This was an unusually busy day with 6 births.***
- ***Oxytocin was available at the bedside and administered to 4 mothers.***
- ***One birth took place almost immediately after another birth. The midwife was able to prepare the syringe and administer oxytocin because it was available at the bedside.***
- ***The team interviewed the ward assistants. The ward assistants were pleased with their new responsibilities.***

From this small test, the team concludes that the change seems possible and should be tested among all staff, but first they want to modify the plan slightly. They know that they must increase the supply of oxytocin in the cabinet to allow for times when there are many births, but they do not want to over-stock the cabinet. Because it is not refrigerated, vials that remain in the cabinet for more than 24 hours must be discarded. They plan to increase the daily supply to 5 vials, and the supply in the cabinet will be checked twice per day by the nurse-in-charge. The date and time that the vial is placed in the cabinet will be written on each vial. They now need to develop a plan for testing the change on a larger scale.

3. ***Develop a plan to test the change on a larger scale. Identify what actions, who, when, where and what resources are required.***

What actions	
Who	
When	
Where	
What resources	

4 ***List what data to collect to understand the effects of reorganizing the process of administering oxytocin.***

- What data will show the actions in the change have occurred? How will the team collect this data?
- What data will show the change has resulted in improvement? Assuming this data is not in the medical record, how will the team collect it?

Group discussion

Discuss the situations you might encounter in your facility.
Use the following questions to help you plan the actions of the improvement team.

- What support do you need from your local health authority to make changes, and how can you obtain this support?
- What are the best ways to reduce resistance to change among providers in your facility?
- What benefits do you see in involving management and families in change?

Improvement team actions

Actions	Tips & Techniques
Identify changes that may improve care. **Select the changes to test on the basis of:** • Expected effect – will the change make a significant difference in the process? • Cost – is the likely cost of the change within the resources potentially available to the facility? • Feasibility – can it be done? **Prepare for next activity:** • Find out about changes for similar barriers tested by other facilities.	• Be creative! Don't be afraid to propose new ideas. • Do not think of training, adding new staff or additional resources as the only possible changes. • Consider changes that focus on: - Eliminating unnecessary actions, time, diagnostic tests, medications, inventory, human or financial resources - Standardizing the actions of all providers - Improving patients' experiences • The first change selected should be: - Likely to succeed! - Easy to do! - Not resource-intensive!
Develop a plan for change. • Determine: - What actions will need to occur to test the change? - Who will be involved in the change? - Where the change will take place? - When will the change begin and end? - What resources will be needed to test the change? **Prepare for next activity:** • Assign tasks for the actions that will occur. • Plan what data will be collected.	• Make changes on a small scale so that time and resources are not wasted if the change does not work. • Testing should not begin before a plan for data collection is in place. • The initial small test can be very short, as little as one day. • The ending date does not signify the end of the improvement process, but it gives a stopping point so that the team can analyze and evaluate the data collected by that date.
Collect data to: 1) measure whether the actions in the plan have occurred; and 2) determine if the change has resulted in improvement. • Determine how to collect data: - What data will be collected? - Where can the data be found? - Who will collect the data? - How often will the data be collected? - Where will the data be recorded? • If data is not available in existing facility records, develop an alternate data collection tool. **Prepare for next activity:** • Assign responsibility for data collection.	• Seek useful, rather than perfect measures. • Use data that are already recorded whenever possible. • Keep measurement simple. Focus only on important indicators. More data are not necessarily better data. • Build the recording of data into the daily work routine of providers and their job descriptions. • If data is not in existing records, consider adding a small data entry area to the record so that providers can record additional information. • The person collecting data should periodically review data for consistency and accuracy. • Consider collecting data from a sample of records if the sample is representative all records.

WORKSHEET

Plan and test change

Change(s) that might overcome the barrier(s) we have chosen:

Description of the change:	
Why was it chosen:	***Will the change make a significant difference in the process?***
	Is the likely cost of the change within the resources potentially available to the facility?
	Can it be done?

Our plan for change:

What actions will be completed?	
By whom?	
Where will it happen?	
How long will the change be tested?	
What resources will be required?	

Our plan to collect data to measure whether the actions in the plan have occurred:

What data will be collected?	
Where can the data be found?	
Who will collect the data?	
How often will the data be collected?	
Where will the data be recorded?	

Our plan to collect data to determine if the change resulted in improvement:

What data will be collected?	
Where the data can be found?	
Who will collect the data?	
How often the data will be collected?	
Where the data will be recorded?	

Improvement team actions

Actions	*Tips & Techniques*
Test the changes on a small scale. **Determine if the plan should be tested on a large scale.**	• Initial small-scale tests will focus on learning: - If the new idea is possible in your situation; - If it needs to be adapted to your situation; or - If your situation needs to be adapted to support the new idea.
Test changes on a larger scale. • Seek support from administrators and managers. • Describe the plan to those who will be involved in or affected by the plan. **Prepare for next activity:** • Assemble data for analysis. • Display the data for the process chosen for improvement (and outcome if chosen).	• As you move to larger tests, the question changes from '*is it possible?*' to '*is it effective?*'

WORKSHEET

Plan and test change

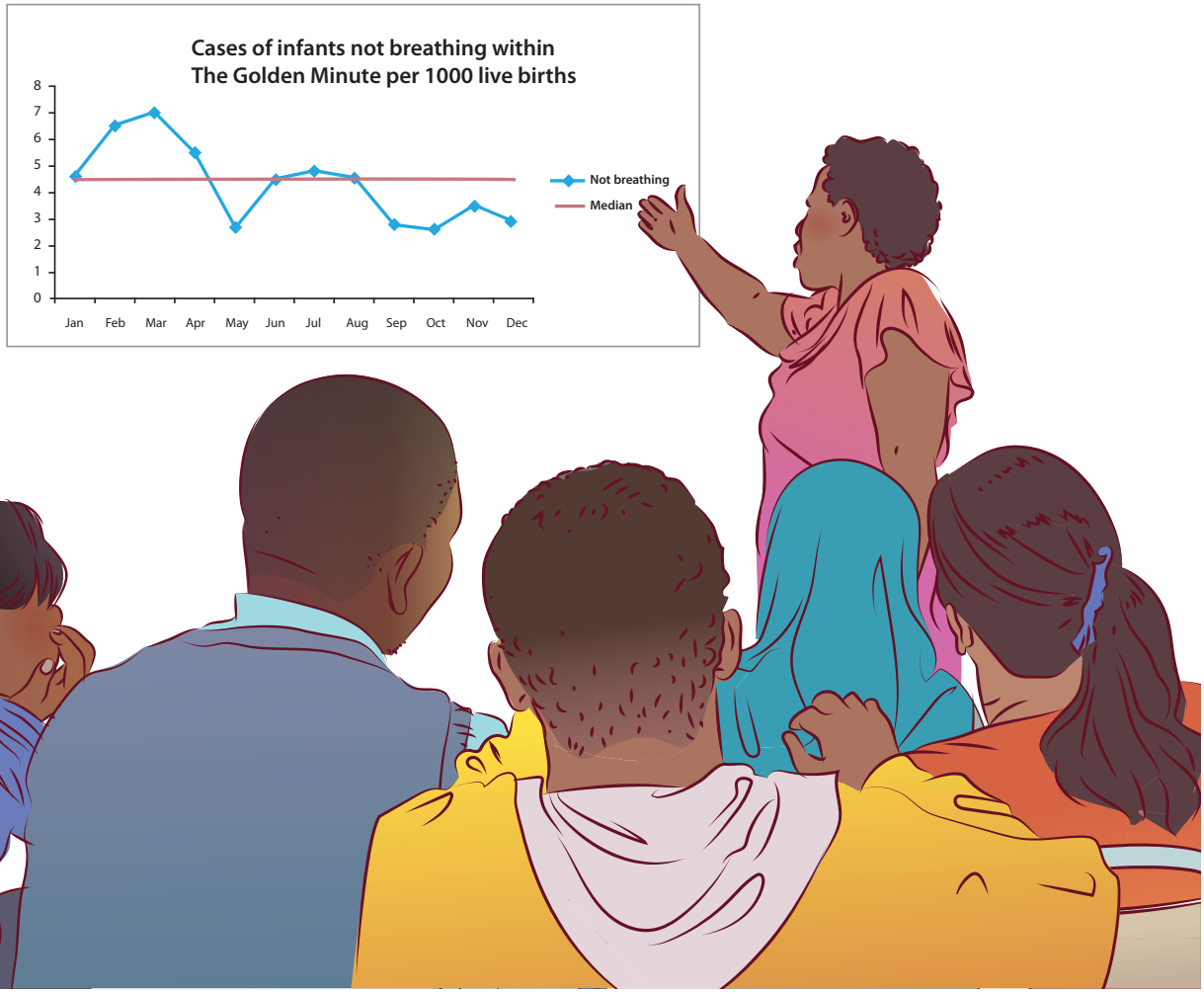
Our plan to test the changes on a small scale:

What actions will be completed?	
By whom?	
When will it begin and end?	
Where will it happen?	
What resources will be required?	
What was the result of this small test of change?	
Should the change be tested on a large scale? With any adaptations?	

Our plan to test the changes on a larger scale:

What actions will be completed?	
By whom?	
When will it begin and end?	
Where will it happen?	
What resources will be required?	
What was the result of this large scale test of change?	

Step 5
Determine if the change resulted in improvement



OBJECTIVES

- *Determine if the actions in the change have occurred*
- *Determine if the change produced improvement*
- *Decide on next steps*
- *Start the next cycle of improvement*

Key knowledge

Determine if the actions in the change have occurred

Use the data describing actions in the change to determine if they really occurred.

EXAMPLE:
The team has reorganized the process to make vitamin K available in the delivery area. They educated all pharmacists and birth attendants about the change. The team reviews the number of vitamin K vials in the delivery area every Monday for 6 weeks following the change. They find that at least 5 vials were available every Monday except one. They conclude that the change has occurred.

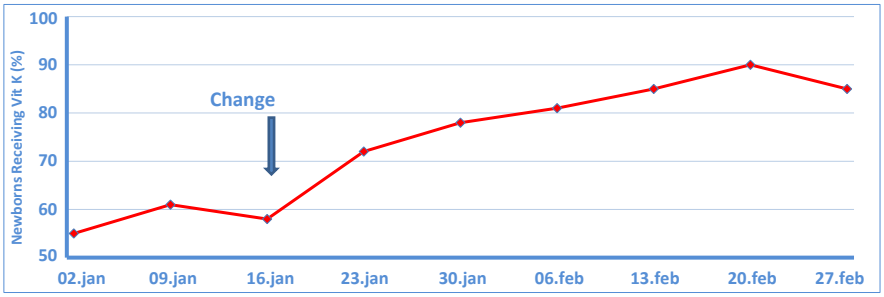
Determine if the change produced improvement

To determine if improvement occurred, consider the following:

1) **Determine if there is an improvement in the performance of the process or outcome after the change.**
- Compare the process or outcome selected for improvement before and after the change.

EXAMPLE:
Since the change of increasing the availability of vitamin K in the delivery area occurred, the team reviews whether the change has resulted in more babies receiving vitamin K. A team member calculates the percentage of babies who receive vitamin K each week by dividing the number of babies who received vitamin K by the total number of live born babies at the facility and then multiplying by one hundred. Data collection begins 3 weeks before the change and continues for 6 weeks after the change.

2) **Display the data in a chart or graph to determine if change has occurred.**
- Graph the data with time on the horizontal axis (dark line on the bottom) and the number or percentage of mothers or babies treated with the process (or experiencing the outcome) on the vertical axis (dark line on left).
- Frequent events can be graphed as percentages over a short time period, such as days or weeks.
- Less frequent events can be graphed as whole numbers by counting each event over longer periods of time, such as a months.
- Above each time point on the horizontal axis, make a dot at the height that corresponds to the percentage or number (indicated on the vertical axis). Connect these points with a line.
- These graphs are often called run charts.



EXAMPLE:
This run chart shows the percentage of babies treated with vitamin K on the vertical axis and weeks on the horizontal axis (Figure 5.1).

Figure 5.1:
Percentage of newborns receiving vitamin K during January and February (the blue arrow indicates when the change for improvement occurred).

Analyze the run chart.

- First, examine the chart to determine if there is a difference after the large-scale test of change started.
  - Compare points on the chart before and after the change started. Marking the time of the change on the chart helps.
- If there appears to be improvement, examine the chart to determine if the improvement is real or random variability.
  - Random variability means that movements of the line up or down are the result of random chance and not the result of changes made by the team.
  - Statistical methods can be used to determine whether there has been real improvement or random variability.
  - There are also easy ways to confirm if the change resulted in real improvement, such as by identifying shifts and trends.

Shift (Figure 5.2):

- Improvement can be demonstrated by a shift in the line on the run chart. A shift occurs when a line consists of 6 or more consecutive data points that are all located either above or below the median.
- The median is the number separating the higher half and the lower half of a set of data points.
- The blue arrow indicates the time that the change occurred.
- Before the change, 55, 61 and 58 percent of newborns received vitamin K. The team arranges these numbers from low to high and finds that the median is 58. They show the median by drawing black dashes on the run chart.
- After the change, there are 6 consecutive data points above the median, representing a shift in the percentage of infants receiving vitamin K.
- This indicates that the improvement was real, and not random variability.

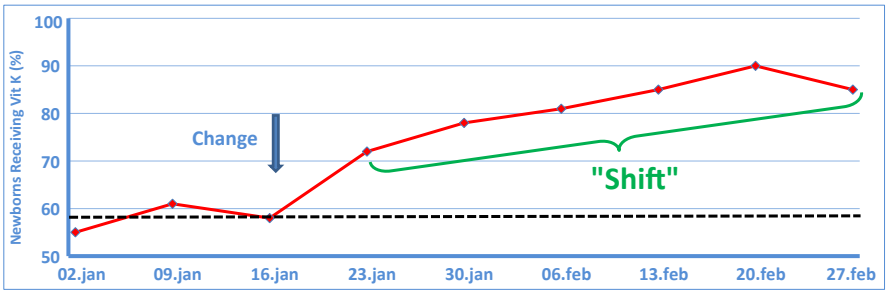


Figure 5.2 Improvement in the percentage of newborns receiving vitamin K demonstrated by shift.

Trend (Figure 5.3):

- A trend on the run chart is when five or more consecutive points all go up. A trend shows real improvement.
- In Figure 5.3, there are 5 consecutive data points all going up compared to the previous point.
- This indicates a trend and confirms that improvement has occurred.

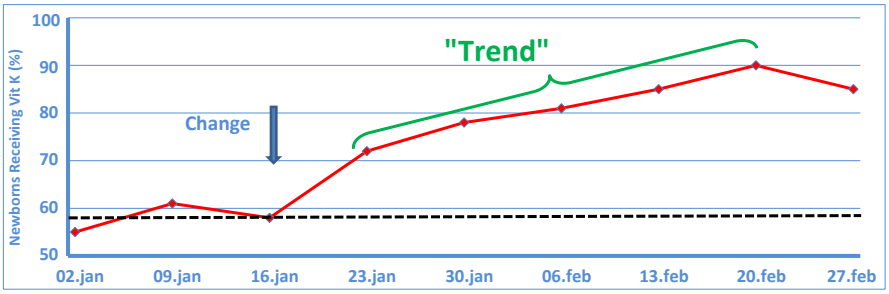


Figure 5.3: Improvement in the percentage of newborns receiving vitamin K demonstrated by trend.

Decide on next steps

Consider whether to adopt, adapt or abandon the change.

- If the change resulted in improvement, the team may **adopt** the change, and implement the change on an even larger scale. For example, the team may include more health providers, more units in the hospital, or more days of the week.

> ***EXAMPLE:***
> The team educated the daytime staff about administration of vitamin K. After analyzing the data before and after the change, they find that administration of vitamin K improved from 15% to 95% for births occurring during the day. They decide to adopt and implement this change on a larger scale with the night staff also.

- If the change did not result in improvement, the team may decide to **adapt** the change. Adapting the change may be necessary if the actions in the plan did not occur as expected, or the improvement was small.

> ***EXAMPLE:***
> Data collected before and after the change in restocking vitamin K show improved availability of vitamin K in the delivery area during the first week, but poor availability after that week. The team finds that the number of deliveries has doubled during recent weeks. When there were many deliveries, there were times when no vitamin K was available. The team decides that the amount of 5 vials of vitamin K in the delivery area was not enough during busy periods. They adapt the change; they plan to notify the pharmacist when there are 10 vials in the delivery area. They will now test this adapted change.

- **Abandon** the change if no improvement or an undesirable result occurred. Sometimes changes in one practice may have negative effects on other processes or outcomes, and the change may need to be abandoned.

> ***EXAMPLE:***
> The team decides to improve the rates of babies with low temperatures within one hour after birth. They build a special table with a heat lamp where babies will go immediately after birth. After two weeks of use, they discover that 50% of babies are too hot (temperature > 37.5°C). They decide to abandon the table and heat lamp because of the undesirable effect of overheating, and consider other ways to keep babies warm.

Start the next cycle of improvement

The desired improvement in a process or outcome might be achieved with a single change, but it is more likely that improvement will not reach the goal of the aim statement with only one change. This is true more often when an outcome is chosen for improvement.

Reasons for less than desired improvement include:

- The process or outcome is affected by more than one barrier, and only one barrier has been overcome.
- Change is adopted by some, but not all, providers.

The activities related to each change (planning, testing, determining the effect of change and deciding on next steps) are often called a "cycle of change" (Figure 5.4) or PDSA cycle (Plan Do Study Act cycle).

- After each cycle, decide whether the change should be adopted, adapted or abandoned.
- If a small change results in improvement, consider scaling up this change.
- If the team decides to adapt a change, begin a new cycle with the adapted change.
- If the change is abandoned, consider new ideas for change and begin the new cycle with a new change. Follow the steps outlined in Step 4 (plan and test change) for each cycle.

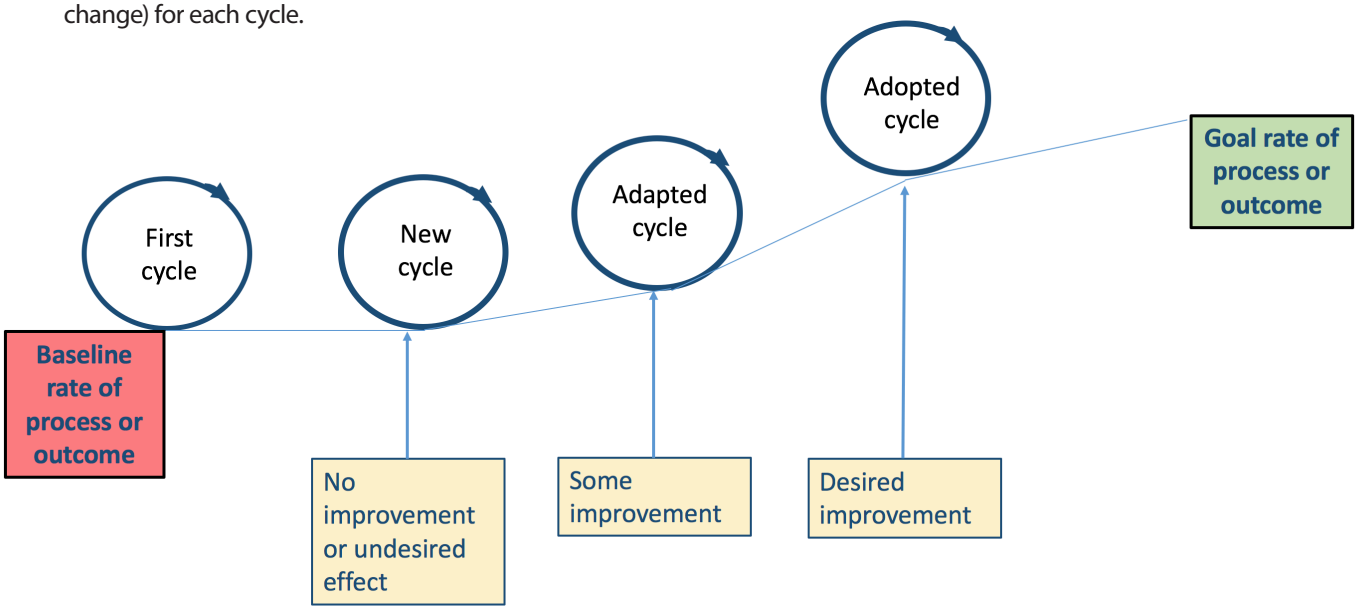


Figure 5.4:
The figure illustrates how a team might use four cycles of change to achieve the goal of their aim statement.

Newborn practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.1 and discuss similarities and differences.*

Newborn case scenario

The team has tested their changes. They find that changes occurred in the organization of care after birth and provider knowledge. Now they examine the data to decide if the changes have resulted in improvement. The team looks at the number of babies receiving skin-to-skin care and the number of babies with low temperature. A new column has been added to the Delivery Register where providers indicate if the mother provided skin-to-skin care. A member of the team records the number of babies in the Register who had skin-to-skin care and the number of babies with temperature <36.5 °C during a 9-week period (2 weeks before the change and 7 weeks after the change).

1. *Use the data collected by the team member (table below) to evaluate the effect of the changes to improve the process of skin-to-skin care and the outcome of low newborn temperature. What percentage of babies born at the facility each week received skin-to-skin care in the first hour? What percentage of babies born at the facility each week had a temperature <36.5 °C?*

Data for 9 consecutive weeks describing the number of babies receiving skin-to-skin care and their first temperature

Week	*Number of babies born alive in the facility*	*Number of babies with temperature <36.5 °C*	*Number of babies who received skin-to-skin care in the first hour*	*% babies with low temperature*	*% babies who received skin-to-skin care in the first hour*
1	*25*	*17*	*4*		
2	*18*	*12*	*3*		
3	*20*	*11*	*5*		
4	*24*	*12*	*13*		
5	*19*	*6*	*12*		
6	*16*	*5*	*11*		
7	*22*	*5*	*16*		
8	*24*	*4*	*18*		
9	*21*	*2*	*17*		

2. ***Create a run chart for the process of skin-to-skin care for the first hour.***
   - Label the time of the change on the chart.
   - Determine whether the change has resulted in real improvement in this process of care.
   - Consider whether there is a shift or a trend.

3. ***Create a run chart for the outcome of low newborn temperature.***
   Did the change of increased skin-to-skin care make progress toward achieving the goal in the aim statement?

4. ***Write a summary with the conclusions of the improvement project to share with staff at the facility.***

5. ***Decide whether the team should adopt, adapt or abandon the changes and why.***

6. ***Assume that less improvement resulted from this change. For example, assume the percentage of low newborn temperature after the change is 35%, but the performance of skin-to-skin care is 93%. What are possible explanations for the unsatisfactory improvement in low newborn temperature?***

Maternal practice exercise

- *Read the continued case scenario in a small group and complete the numbered activities that follow the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.2 and discuss similarities and differences.*

Maternal case scenario

The team developed a log sheet on which the nurses-in-charge recorded the availability of vials of oxytocin in the cabinet at the beginning of each shift. A review of these sheets confirmed that oxytocin was always available in the delivery area. The team also added a tick box for oxytocin vial and syringe to the delivery checklist. Review of the checklist confirms that oxytocin was available for nearly all deliveries. The team concludes that the changes occurred.

Now they examine the data to decide if the changes have resulted in improvement. The team must decide if more mothers received oxytocin and fewer mothers had postpartum hemorrhage. From the Delivery Register, a member of the team records the number of women who received oxytocin and the number who experienced postpartum hemorrhage during a 9-week period (2 weeks before the change and 7 weeks after the change) to determine whether improvement occurred.

1. *Use the data collected by the team member (table below) to evaluate the effect of the changes to improve the process of administration of oxytocin and the outcome of postpartum hemorrhage. What percentage of women giving birth at the facility each week received oxytocin? What percentage of women giving birth at the facility each week had a postpartum hemorrhage?*

Data for 9 consecutive weeks describing the number of women receiving oxytocin after birth and the number with postpartum hemorrhage

Week	*Number of women giving birth*	*Number of women receiving oxytocin*	*Number of women with PPH*	*Number of women receiving oxytocin*	*Percentage of women with PPH*
1	*25*	*13*	*4*		
2	*18*	*8*	*3*		
3	*20*	*12*	*3*		
4	*24*	*17*	*3*		
5	*19*	*15*	*2*		
6	*16*	*14*	*1*		
7	*22*	*20*	*1*		
8	*24*	*21*	*2*		
9	*21*	*20*	*1*		

2. ***Create a run chart for the process of oxytocin administration.***
   - Label the time of the change on the chart.
   - Determine whether the change has resulted in real improvement in this process of care.
   - Consider whether there is a shift or a trend.

3. ***Create a run chart for the outcome of postpartum hemorrhage.***
   Did the change result in fewer postpartum hemorrhages make progress toward achieving the goal in the aim statement?

4. ***Write a summary with the conclusions of the improvement project to share with staff at the facility.***

5. ***Decide whether the team should adopt, adapt or abandon the changes and why.***

6. ***Assume that less improvement resulted from this change. For example, assume the percentage of treatment with oxytocin only improved to 75%. What are possible explanations for the unsatisfactory improvement?***

7. ***Assume that the improvement in the administration of oxytocin occurred, but the percentage of women with postpartum hemorrhage did not decrease. What are possible explanations for this lack of improvement?***

Group discussion

Discuss the situations you might encounter in your facility. Use the following questions to help you plan the actions of the improvement team.

- Does the staff in your facility usually make decisions based on data? Why do you think this is so?
- How could the improvement team help providers understand the value of the clinical data they collect?
- Where could the improvement team get additional support to help with analyzing data?

Improvement team actions

Actions	Tips & Techniques
Determine if the test of the change was carried out as planned. • Use the data describing actions in the change to determine if they actually occurred. **Determine if the change produced improvement.** • Examine the run charts for improvement associated with the change. • Determine if there have been any unexpected bad outcomes associated with the change. • Estimate the progress towards the goal in the aim statement.	• Present the run charts so that all team members can see and understand more readily. • Mark the start of the change on the run-chart.
Decide on next steps. • Decide whether to adopt, adapt or abandon the change. • Write a summary statement with conclusions of the improvement cycle.	• If no improvement or inadequate improvement occurs, consider whether the change was carried out well enough or whether the change simply could not produce improvement. • Ask "why" the team wants to adopt, adapt or abandon the change that has been tested.
Start the next cycle of improvement. • If adapting a change, begin a new cycle with the adapted change. Go back to Step 4 activities, starting with "Develop a plan for change." • If abandoning a change, begin the next cycle with a new change. Go back to Step 4 activities, starting with "Identify changes that may improve care by overcoming the barrier you chose." • If adopting a small change that resulted in improvement, consider implementing this change on a large scale, for example with more providers. Go to Step 6 activities.	• Discuss and refine the roles of the team members based on their strengths identified during the first cycle of change.

WORKSHEET

Determine if the change resulted in improvement

Our review of data to measure whether the actions in the plan have occurred:

Did the actions in the plan happen?	
If not, why not?	

Our review of data to determine if the change resulted in improvement:

What was the baseline rate of the outcome or performance of the process chosen for improvement?	
Was there a shift or trend in the run chart? If yes, by how much?	
If there was improvement, how does this compare to the improvement in the aim statement?	
Should the change be adopted, adapted or abandoned? Why?	

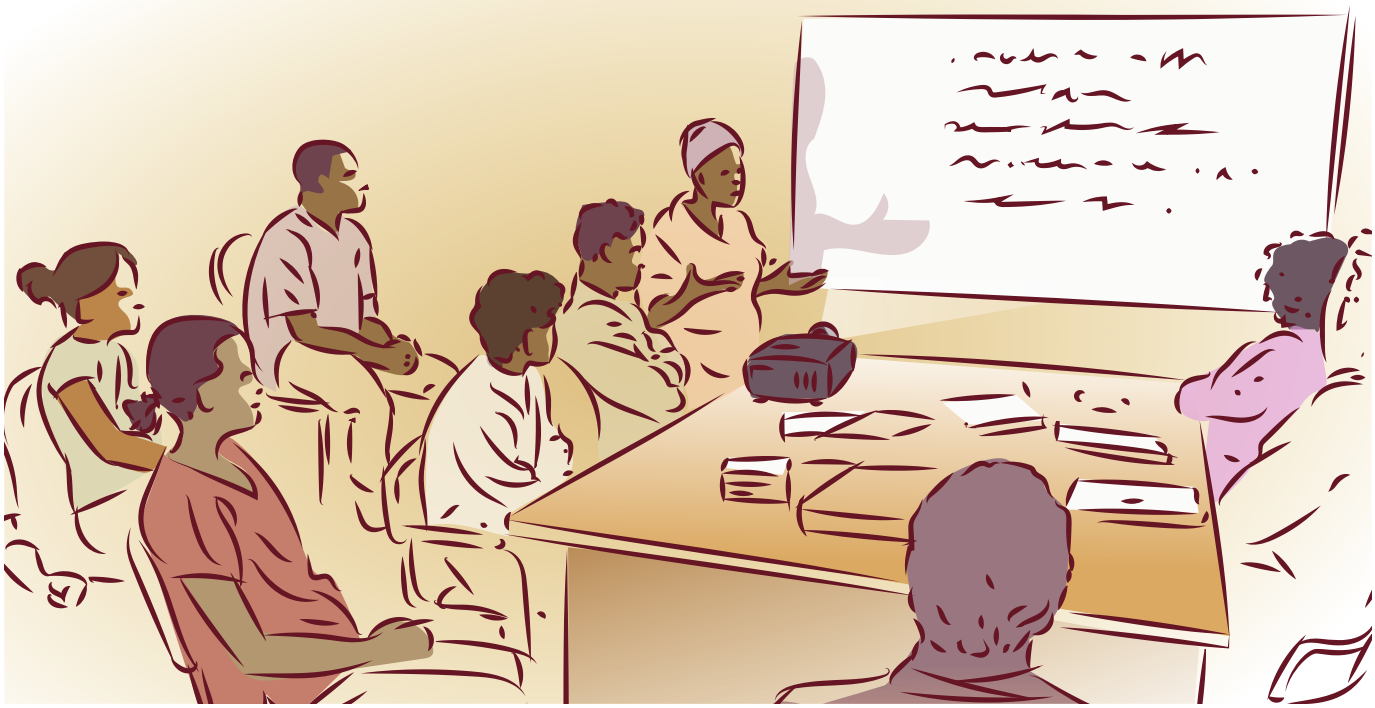
If abandoned or adapted, next change to be tested:

What actions will be completed?	
By whom?	
When will it begin and end?	
Where will it happen?	
What resources will be required?	

If adopted, scale up plan:

What actions will be comlpeted?	
By whom?	
When will it begin and end?	
Where will it happen?	
What resources will be required?	

Step 6
Make improvement the norm



OBJECTIVES

- ***Communicate changes that resulted in improvement***
- ***Facilitate practice of changes***
- ***Overcome objections to change***
- ***Make an improvement a permanent part of a facility's routine***

Key knowledge

In order for patients to benefit from an improvement, it is necessary to move from the small-scale experience of an improvement team to adoption of successful changes by all personnel in a facility. Making an improvement a permanent part of a facility's routine sustains the positive effect. Repeating and sharing the process of positive change builds a culture of improvement and quality care.

Communicate changes that resulted in improvement

Share what has been learned about changes that resulted in improvement with all providers, clinical leadership, administrators and the community.

- Providers need to understand what is changing and how the change benefits their patients and themselves.
- Display run charts where they can be viewed by all providers to show the progress being made.
- Sharing positive results can help future change.
- Discuss the results and describe how change will be expanded at staff meetings and in written messages.
- As the change expands, keep communicating about progress and any set-backs.
- Share the results with mothers, families and the community.
- Members of the improvement team from the community can help design posters for clinics and wards, and carry the message to groups outside the facility.

EXAMPLE:
The improvement team chose aims of administering vitamin K to all babies and a uterotonic to all mothers. They ask the nurse manager to discuss the run charts at a staff meeting and highlight how these changes will follow the new national guidelines. Other team members can describe the steps in the process for giving these medications to babies and mothers at the appropriate times. Clinical records that show how to correctly document administration of medications can be placed next to the stock of medication. A member of the team can share with women's groups in the community how the facility is protecting women and babies from bleeding.

Facilitate practice of changes

- Identify members of the improvement team who will lead other providers in practice of successful changes.
- Facilitate practice during ordinary duties by having improvement team members work alongside other providers as peer trainers.
- Take the opportunity to practice new skills as part of organized, frequent, regular practice of skills and knowledge.
- Make sure that all the supplies and forms needed to carry out a successful change are available.

EXAMPLE:
Members of the improvement team organize a skills corner highlighting the difference in vitamin K dose for a preterm infant (< 1500 grams) and a term infant. At the beginning of each shift on Mondays, providers practice drawing up the correct volume and recording the dose.

Overcome objections to change

Convince providers of the benefits to patients and themselves.

- Even the most successful change may cause some resistance.
- Listen carefully to the objections that providers raise. Refine the process further.
- It is helpful for providers to understand how a change saves them time or effort and benefits the patient.
- Celebrate good outcomes with stories and pictures, and recognize providers who are successfully changing behavior.
- Relate changes to the beliefs and values of providers. It is important that providers realize they are doing the right thing and experience satisfaction and accomplishment.

EXAMPLE 1:
One provider says that she understands the importance of vitamin K, but she does not want to provide care at the mother's bedside with the baby skin-to-skin. Discussing how skin-to-skin contact decreases pain for the baby shows her how the change benefits patients. Working alongside her to show how easy it is to have all the needed supplies in one place turns her into a champion for the new system. Babies cry less and providing the care takes less time.

Make an improvement a permanent part of a facility's routine

Once a change has been implemented on a broader scale, it must become a part of a facility's routine in order to last.

- The improvement team can lead the process of change, but to make improvement permanent the team has a responsibility to communicate recommendations to the management of the facility and the health system.
- When provided with the evidence for improvement and proven strategies for change, managers and administrators can help make the improvement last.
- Managers and administrators can incorporate the successful change into revised guidelines, policies and procedures, job descriptions, and training materials. They can include funds in the operating budget for needed staff and supplies to maintain the changes.
- Changing systems for ordering or charting makes it easier for providers to use the change rather than go back to old ways.
- Training new staff in the improved process serves as a reminder to all providers.
- Discarding out-of-date forms, stock numbers, equipment, or medications eliminates any possibility that the old system will be used.

EXAMPLE 2:
A different provider complains that because she is the only midwife in the facility at night, she often does not have time to prepare adequately for a birth. There is no time to find the uterotonic, draw it up, and have it ready. The team and the providers discuss how packing the oxytocin vial and syringe with the delivery kit means it is no longer necessary to leave a woman in labor to obtain the medication.

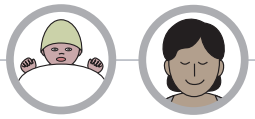
EXAMPLE:
Policies and procedures for care of the mother will need to be updated to reflect that all mothers receive a uterotonic. Administration of an intramuscular injection will be added to the job description of the nurses and midwives providing this care and to the orientation of new providers who rotate into the delivery area. Delivery checklists are printed with a tick box for oxytocin vial and syringe. New delivery records haves a space for the time of oxytocin administration. The old forms are recycled.

Continued monitoring is also important to demonstrate sustained change.

- The team may not collect data as frequently as during tests of change, but monitoring from time to time lets the team know that change is permanent.
  - Normal up and down changes occur in measurement.
  - Run charts are useful to tell normal variability from real changes during continued monitoring.
- If processes of care or outcomes return to old, undesirable levels, active promotion of the improvement may become necessary.
- Additional changes and improvement cycles may also be needed as guidelines are updated.

Share the results of an improvement project.

- The improvement team may also choose to share their results with others in the health system. Carefully documenting the path to an improved process and/or outcome and sharing the experience with other facilities in the region or country brings recognition and helps spread change.
- A group of facilities, such as the health centers and hospital in one district, may decide to form a learning collaborative. Facilities in the collaborative learn from one another and even work together on the same improvement aims.
- When improvement activities are part of a national system for promoting quality of care, the resources and possibilities for making sustained change increase.



Practice exercise

- *Read the continuing case scenario in a small group and complete the numbered activities following the case.*
- *Record the responses of the group for review.*
- *Compare your answers with those provided in Appendix A.1 or A.2 and discuss similarities and differences*

Case scenario

The team was excited about the improvements that resulted from their project. Most providers have easily adopted the changes, but others have resisted. The team meets to discuss their next steps.

1. *Discuss how the team might communicate changes that resulted in improvement.*
2. *If the team had selected a process for improvement that involved a difficult or challenging skill (for example, bag and mask ventilation), how might they facilitate practice of this skill?*
3. *What can the team do to engage individuals who have been resistant to the change? With a partner, role play how a team member would convince a provider who is resistant to change to participate with the other staff in the improvement activities.*
4. *What further actions can the team take to make the change permanent? What might they recommend to management of the facility in order to sustain the improvement?*

Group discussion

Discuss the situations you might encounter in your facility.
Use the following questions to help you plan the actions of the improvement team.

- How can the improvement team communicate effectively to the staff about successful changes?
- How can your facility recognize and provide motivation when improvement occurs?
- What are best ways to reduce resistance to change in your facility?
- What can the improvement team do to help sustain successful changes?

Improvement team actions

Actions	Tips & Techniques

Communicate changes that resulted in improvement.
• Communicate the changes to:
  - Other providers
  - Clinical leadership
  - Administrators
  - Community members
  - Collaborating facilities
• Share a summary with the conclusions of the improvement cycle with others not on the improvement team.
	• Use graphs and pictures for your summary.
	• Use existing opportunities, such as regular technical meetings, workshops, newsletters, conferences and other similar events, to promote improvement efforts.

Facilitate practice of changes. • Peer-to-peer mentorship • Frequent, short practice of skills	
Overcome objections to change. • Create opportunities to listen to providers. • Further refine the process to overcome objections. • Demonstrate benefit to patients and providers. • Reward providers who engage in change.	**To overcome objections and gain support for change:** • Give examples – describe why quality improvement is important. • Link improvement to outcomes – demonstrate how improvement affects the health of patients. • Make change public – acknowledge challenges and successes. Have quality champions meet with facility leaders and new staff. • Tell others beyond the facility – communicate results of successful changes to neighboring facilities.
Make an improvement a permanent part of the facility routine. • Communicate recommendations to management. • Promote improvement projects throughout the facility. • Help incorporate successful change into revised guidelines and policies.	• Use every opportunity to have management participate in the improvement efforts. • Develop job aids (posters, reminders) that include the successful changes from the projects. • Develop materials describing changes for new staff. • Once the improvement team has become more skilled in creating change in the facility, the team may consider advocating for change at a district or national level.

WORKSHEET

Make improvement the norm

Our plans to communicate changes:

To providers	
To clinical leadership	
To administrators	
To community members	
To other facilities	

Our plans for practice of changes:

Our plans to overcome objections to change:

Our plans to make the change a permanent part of our facility's routine:

Acknowledgements

Improving Care of Mothers and Babies was conceived and designed by an inter-disciplinary team of physicians, nurse midwives and educators from the Survive & Thrive Global Development Alliance.

Editor
Carl Bose, MD
University of North Carolina
Chapel Hill, NC

Associate Editor
Jorge Hermida, MD
University Research Co, LLC
Quito, Ecuador

Editorial Board
Jennifer Breads, MSN, MPH
Jhpiego
Baltimore, MD

Tamar Chitashvili, MD, MPH&M
University Research Co, LLC
Bethesda, MD

Cherrie Evans, DrPH, CNM
Jhpiego
Baltimore, MD

Tyler Hartman, MD
Dartmouth-Hitchcock Medical Center
Lebanon, NH

Beena Kamath-Rayne, MD, MPH
Cincinnati Children's Hospital
Medical Center
Cincinnati, OH

Nigel Livesley, MD, MPH
University Research Co, LLC
New Delhi, India

Susan Niermeyer, MD, MPH
University of Colorado
Denver Aurora, CO

Jackie Patterson, MD
University of North Carolina
Chapel Hill, NC

Suzanne Stalls, CNM, MA
American College of Nurse-Midwives
Silver Spring, MD

Illustrator/Art Director
Anne Jorunn Svalastog Johnsen
Laerdal Global Health
Stavanger, Norway

Illustrator
Bjørn Mike Boge
Laerdal Global Health
Stavanger, Norway

Managing Editor
Casey Lowman, MPH
American Academy of Pediatrics
Elk Grove Village, IL

Special Reviewer
Neena Khadka, MBBS, DCH, MA, MPH
Maternal and Child Survival Program/
Save the Children
Washington, DC

Survive & Thrive and the Improving Care of Mothers and Babies Editorial Board acknowledge with appreciation the following individuals for valuable time spent reviewing program materials.

Sheena Currie, RM, MEd
Jhpiego
Baltimore, Maryland

Santorino Data, MD
Mbarara University of Science and
Technology
Mbarara, Uganda

Ashok Deorari, MD, FAMS
All India Institute of Medical Sciences
New Delhi, India

Bernhard Fassl, MD
University of Utah
Salt Lake City, Utah

Brynjar Foss, PhD
Laerdal Global Health
Stavanger, Norway

Kathleen Hill, MD, MPH
Maternal and Child Survival Program/
Jhpiego
Washington, DC

Lily Kak, PhD
Mary Ellen Stanton, CNM, MSN, FACNM
US Agency for International Development
Washington, DC

Douglas W. Laube, MD, MEd
University of Wisconsin
Madison, WI

Jerker Liljestrand, MD, PhD
Bill and Melinda Gates Foundation
Seattle, WA

Arti Maria, MD
Dr. Ram Manohar Lohia Hospital
New Delhi, India

Rajesh Mehta, MD
World Health Organization,
Regional Office for South-East Asia
New Delhi, India

Edward Moses, MScPM
Maikhanda Trust
Lilongwe, Malawi

Magdalena Serpa, MD, MPH
PATH
Washington, DC

Kim Ethier Stover, MA
University Research Co, LLC
Bethesda, MD

Michael Visick, MD
LDS Charities
Logan, UT

Steve Wall, MD, MS, MSW
Saving Newborn Lives/
Save the Children
Washington, DC

Nabila Zaka, MBBS, PhD
UNICEF
New York, NY

This work was made possible through the collaborative efforts of the Survive & Thrive Global Development Alliance.
Special thanks is extended to those partners who provided lead guidance in the development of these materials: the American Academy of Pediatrics (AAP), the American College of Nurse Midwives (ACNM), Jhpiego, Laerdal Global Health, Save the Children, University Research Co., LLC (URC), and the US Agency for International Development (USAID).

Survive & Thrive *is an alliance of government, professional health association, private sector and non-profit partners working alongside country governments and health professionals to improve health outcomes for mothers, newborns and children through clinical training, systems strengthening and policy advocacy. By leveraging the combined resources and expertise of some of the most respected United States and global organizations in maternal and child health, Survive & Thrive is able to energize critical health care interventions during the time when mothers and their children are most vulnerable—from pregnancy through childbirth, and childhood through age five—thereby making a real impact in ending preventable maternal and child deaths worldwide.*

The Alliance consists of the following partner organizations: *USAID, AAP, ACNM, American College of Obstetricians and Gynecologists (ACOG), American Heart Association (AHA), Save the Children, International Pediatric Association (IPA), LDS Charities, Laerdal Global Health, Johnson & Johnson, Jhpiego, Project C.U.R.E., Millennium Villages, Global Health Media, Sigma Theta Tau International Honor Society of Nursing, and USAID's Applying Science to Strengthen and Improve Systems (ASSIST) Project and Maternal and Child Survival Program (MCSP).*

survive & thrive

professional associations, private sector and global health scholars
saving mothers, newborns and children

professional associations, private sector and global health scholars
saving mothers, newborns and children

APPENDICES

Improving Care of Mothers and Babies®

APPENDIX A.1

Newborn Practice Exercises – User's Guide

Step 1

Create an improvement team

Case scenario

After meeting with Seetha and hearing about the positive changes in her hospital, Nirmala returns to her own facility with new energy to improve care. Each year, approximately 1,000 babies are born in Nirmala's hospital. Nurse midwives provide prenatal, basic obstetric and postpartum care. Registered nurses and ward assistants help with postpartum care. A senior nurse manager supervises operation of the facility, including ordering supplies. There is a pharmacist on site. Nursing students are usually present in the facility. A physician manages the labor ward and is available for emergencies, but does not provide care for women without complications. Mothers and babies usually remain in the delivery area for one hour after a birth and are then moved to a postpartum room. They are typically discharged about 24 to 48 hours later.

Nirmala wants to become a champion for quality care and wants to create an improvement team.

1. ***Discuss how Nirmala should organize a team to improve care of mothers and babies in this facility. List the members on the team and assign their roles.***
   The improvement could include members who represent all providers of maternal and newborn care at the facility. A team with nurses, ward assistants, nursing students, nurse-midwives, the physician and the senior nurse manager might be too big to function well. A smaller core improvement team (4-6 individuals) could still include a representative of each type of provider. More team members could be added when specific care practices are chosen for improvement (see Step 3). A mother who has given birth at the facility or another community member could represent families' perspectives on care.

   Consider who will fill various roles on the team. One or more team members may be appointed or volunteer to collect data, another to take notes or document the improvement activities, and another to communicate the improvement process more widely.

2. ***Choose an ideal team leader. Describe why you chose this leader.***
   Nirmala may be an ideal team leader, because she wants to be a champion for improved care. One of the other medical professionals, such as the senior nurse manager, could lead the team. The physician might be less desirable because of his less frequent presence at the facility. A nurse midwife might be the best choice because she delivers care to mothers and babies. Whoever is chosen must be an individual respected by all, and must be given the time and resources to serve in this capacity.

Step 2

Decide what to improve

Newborn case scenario

During a meeting of the improvement team at Nirmala's hospital, gaps in quality of newborn care are discussed. Team members are not aware of a serious gap in quality. The leader suggests reviewing recent Delivery Register data to determine if a gap in quality exists.

1. ***Using the sample Delivery Register (see pg. 4), list processes of care and outcomes that might be used as indicators of the quality of newborn care.***

Processes of care	Outcomes
Weighing the baby	*Low birth weight*
Taking the temperature	*Low newborn temperature*
Administering Vitamin K	*Newborn death*

2. ***Calculate the frequency of the following process of care: vitamin K administration.***
   Eleven babies (11/17 or 65%) received vitamin K. You would expect all babies to receive vitamin K, so this indicates a gap in the quality of care.

3. ***Calculate the frequency of two outcomes: low newborn temperature and death.***
   Gaps in the quality of care can also be identified by calculating how frequently outcomes occur. Nine babies (9/17 or 53%) had a temperature <36.5 °C; one baby died (1/17 or 6%). The percentage of babies with low temperature is high, and probably avoidable. It represents a gap in the quality of care. One death among 17 births is high, but this may be misleading because of the small number of births. The single death may or may not have resulted from a gap in the quality of care.

4. ***Choose the gap in quality to improve and record why you have chosen this gap.***
   The team considers the importance, the expected outcome and the impact for each gap. The team chooses to improve low newborn temperature. They believe that is important because low temperature is associated with death and other serious complications, and they know that the rate of newborn death is high in their hospital. They believe that it will be possible to improve this outcome, and low temperature affects 1/2 of all babies. They also consider the importance and impact of improving the administration of vitamin K. Only 1/3 of babies do not receive vitamin K, and the result of not receiving vitamin K, bleeding in the newborn, is relatively rare.

5. ***Write an aim statement for improving low newborn temperature.***

The aim statement should include who (which patients), what (the process or outcome improved), how much (the amount of the desired improvement) and by when (the time period for improvement). One possible aim statement for reducing low temperature among babies born at the facility would be: **We will reduce the percentage of newborns with low temperature (<36.5^{0}C) from 53% to <10% within 6 months.**

"Who" is the group of interest (newborns). "What" is the outcome or process to be improved (low temperature in babies). "How much" is the change from the baseline rate of the outcome (53% based on the register) to a goal (in this case <10%). "By when" is the time over which the change will occur (within 6 months in this example).

DELIVERY REGISTER

Name	Date of Birth	Time of Birth	Delivery Route	Oxytocin	Post-partum Blood Loss	Apgars 1,5 min	Wt	Temp	Vit K	Discharge Date	Baby Disposition	Notes
MSaidou	15-06	00:45	vag	✓	250	8,9	3400	35.4	✓	15-06	Home	
C Bidi	15-06	06:30	cs	✓	450	7,8	2460	34.5	✓	17-06	Home	
A Baucar	15-06	14:30	vag	✓	200	8,9	2350	35.2		16-06	Home	
S. Rashad	16-06	09:20	vag	✓	200	6,8	3310	36.8	✓	17-06	Home	
Z. Saloy	16-06	17:50	vag		350	6,8	2670	37.1	✓	17-06	Home	
H Alai	17-06	02:42	vag		750	5,7	2740	37.9	✓	19-06	Referred	
C. Sidi	18-06	08:16	vag	✓	150	8,9	2851	36.8		19-06	Home	
R Abou	18-06	12:25	vag		400	8,9	2780	37.1	✓	19-06	Home	
B. Aboura	18-06	13:11	vag	✓	300	7,8	3500	34.4	✓	20-06	Referred	
Z Halifa	19-06	11:13	vag	✓	200	9,9	3215	35.2	✓	20-06	Home	
B. Bayou	20-06	04:07	vag		750	7,8	2710	37.8		20-06	Home	
M. Seidou	20-06	11:48	vag		150	7,8	1900	34.2		20-06	Died	mother died
D. Djibri	21-06	07:38	vag		350	8,9	2995	36.8		21-06	Home	
S. Binton	21-06	14:26	vag		1000	7,8	3620	36.4		22-06	Home	
S Bevaca	21-06	21:15	cs	✓	250	8,9	2780	36.7	✓	22-06	Home	
M. Bonou	22-06	18:20	vag	✓	200	8,9	2618	35.8	✓	23-06	Home	
R. Yaoya	22-06	22:10	vag	✓	250	8,9	2651	37.8	✓	24-06	Home	

Step 3

Choose the barriers to overcome

Newborn case scenario

The team has chosen to improve the outcome of low newborn temperature. To help them understand why babies get cold, they consider all of the actions of providers and/or processes of care that occur in the first hour following a birth that might influence a baby's temperature.

1. ***List the processes of care that might affect the outcome of low newborn temperature.***

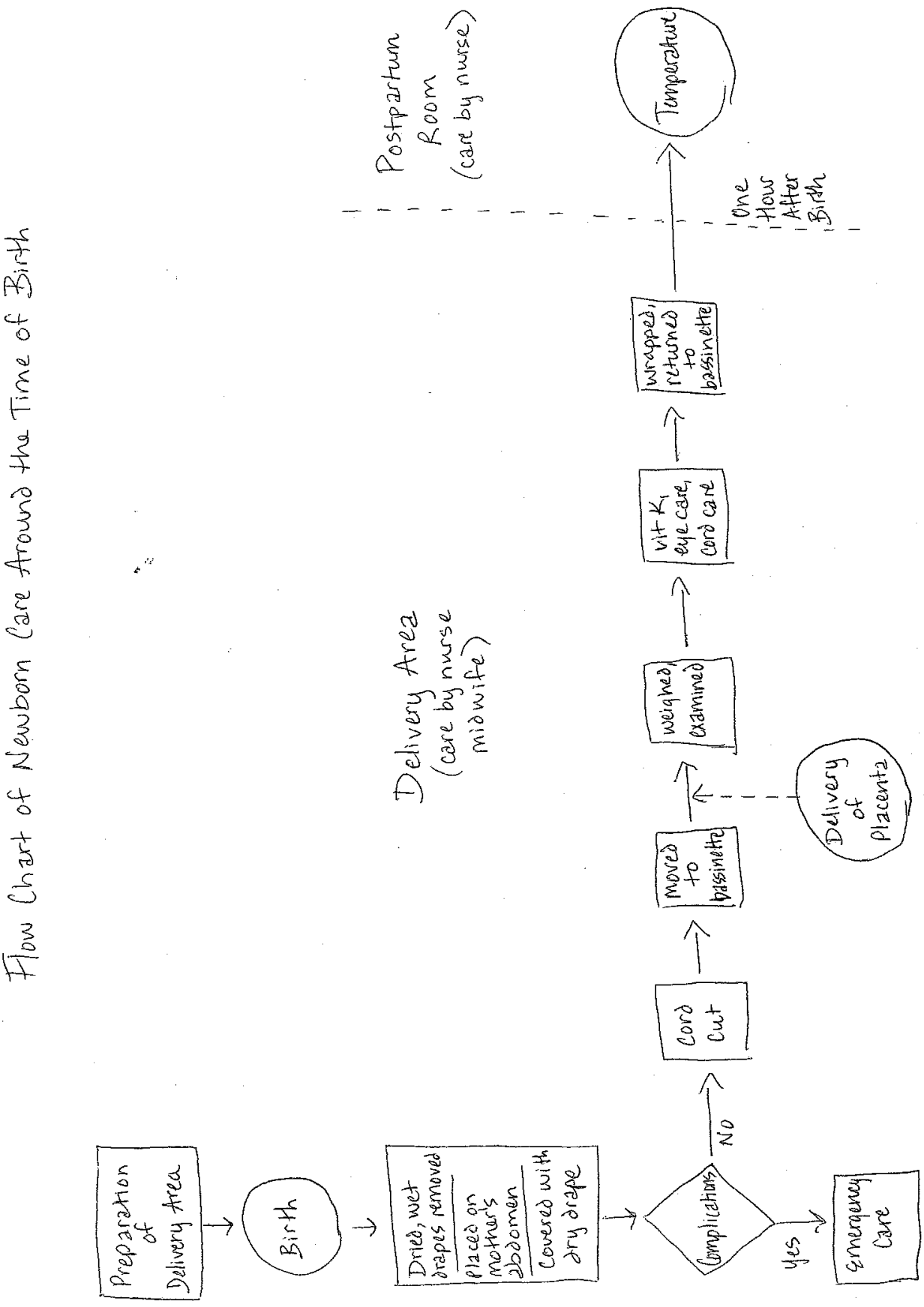
   The team thinks about the ways babies become cold, and identifies a number of possibilities. These include preparation of the delivery area (increasing room temperature, eliminating drafts), drying the baby immediately after birth and removing the wet cloth, covering the baby with a dry cloth and placing a hat on the baby, and keeping the baby skin-to-skin with the mother for the first hour after birth.

Newborn case scenario (continued)

To determine whether the processes of care that affect a baby's temperature are being performed correctly and consistently, the team gathers more information. First, they attend several births to observe the care provided to mothers and babies. They draw a flow chart (see pg. 6) and record other information. They learn the following:

- ***The room where mothers deliver is prepared properly.***
- ***Immediately after birth, the baby is dried, the wet cloths are removed, the baby is placed on the mother's abdomen and covered with a dry cloth.***
- ***A cart that holds an infant scale, vitamin K, eye ointment and chlorhexidine for cord care is in the delivery area.***
- ***After the placenta is delivered, the baby is taken from the mother, weighed, given vitamin K and eye care, and examined. The baby is then wrapped and placed in a bassinette, usually about 30 minutes after birth.***
- ***At about one hour of age, the baby and mother are moved to the postpartum room. The baby's first temperature is taken in the postpartum area.***
- ***All care in the delivery area is provided by nurse midwives. Care in the postpartum room is provided by nurses.***

Next, the team reviews the Ministry guidelines for intrapartum and newborn care and compares the guidelines to the care outlined in their flow chart.


Flow Chart of Newborn Care Around the Time of Birth
Preparation of Delivery Area
Birth
Dried, wet drapes removed
placed on mother's abdomen
Covered with dry drape
Complications
No
Yes
Emergency Care
Cord Cut
Moved to bassinette
Delivery of Placenta
weighed, examined
Vit K, eye care, cord care
wrapped, returned to bassinette
Delivery Area (care by nurse midwife)
Postpartum Room (care by nurse)
Temperature
One Hour After Birth

2. ***List the potential cause of low newborn temperature.***
   The team determines that skin-to-skin care is not being performed correctly because it is not being provided continuously for the first hour after birth. All other aspects of care seem to be provided correctly.

Newborn case scenario (continued)

The team determines that the process of continuous skin-to-skin care for one hour after birth is not being performed correctly because it is interrupted by other newborn care practices. This is a gap in quality of care that may be causing low newborn temperatures. The team decides to improve this process of care. They must now determine the barriers to performing skin-to-skin care correctly.

They interview nurses, nurse midwives and two mothers. They learn the following:

- ***Some providers are not aware of the Ministry's recommendation for continuous skin-to-skin for the first hour after birth.***
- ***The responsibility for weighing, providing eye and cord care, treating with vitamin K, and examining the baby is assigned to the nurse midwives. They want to complete these tasks immediately after birth because of the large number of deliveries and the need to attend to other laboring mothers.***
- ***Skin-to-skin care is allowed when nurse midwives are available to assist.***
- ***Mothers want to hold their babies skin-to-skin immediately after delivery.***

The facility administrator will support changes that agree with the Ministry recommendations, but the team is told there are no funds to hire additional staff.

3. Using the table below, identify the barriers to care that might interfere with placing babies skin-to-skin with mothers immediately after birth and continuing for at least one hour.

INPUT BARRIERS	***IDENTIFIED INPUT BARRIERS TO SKIN-TO-SKIN CARE***
Lack of knowledge and skills	*Some providers are unaware of the Ministry's ´recommendation for skin-to-skin care.*
Staffing shortages	*Midwives do not have time to attend deliveries, delay newborn care for one hour and supervise skin-to-skin care.*
Insufficient supplies	*None; skin-to-skin care in the first hour does not require supplies.*
Unfavorable infrastructure	*None*
Inadequate financial resources	*There are no funds to hire additional staff.*
Traditions and cultural beliefs that interfere with recommended care	*None*

PERFORMANCE BARRIERS	***IDENTIFIED PERFORMANCE BARRIERS TO SKIN-TO-SKIN CARE***
Poorly organized processes	*The organization of newborn care (the assignment of tasks) interferes with the correct performance of skin-to-skin care.*
Misaligned incentives	*None*
Challenges with leadership and management	*None*
Provider's convenience	*The nurse midwives do not always have the time to supervise skin-to-skin care for one hour.*

4. Choose the barriers to overcome. Consider the expected effect, cost and feasibility of overcoming the barrier(s).

The team recognizes that midwives may not always be available to assist with skin-to-skin care and cannot always delay performing newborn practices until one hour after birth. Hiring more midwives would overcome this barrier, but there are no funds to hire more staff. Therefore, the team chooses to reorganize the process of skin-to-skin care. They believe that reorganizing this process will have a big effect on skin-to-skin care, and it will cost very little. They believe that it will be feasible, but they must think creatively about how to do this.

Not all nurse midwives are aware of the benefits of skin-to-skin care and the Ministry's recommendation, so the team also chooses to improve knowledge about the benefits of skin-to-skin care.

Step 4

Plan and test change

Newborn case scenario

The team decides to overcome two barriers to improve the performance of skin-to-skin care. First, they decide to reorganize routine newborn care practices so that the process of skin-to-skin care can be performed correctly. Second, they decide to educate all staff who care for mothers and babies about the importance of keeping babies skin-to-skin with their mothers for one hour after birth.

1. ***List changes that might overcome these barriers to performing skin-to-skin care correctly. Select one or more changes to test.***

The team discusses options for reorganizing newborn care practices and skin-to skin care:

- Delay newborn care (weighing, eye and cord care, vitamin K and examination) until mothers and babies have been moved to the postpartum room. Reassign the responsibility for those practices to the nurses in the postpartum room.
- When the midwife is not available, reassign the responsibility of assisting with skin-to-skin care during the first hour to family members who attend the birth.
- When the midwife is not available, reassign the responsibility of supervising skin-to-skin care during the first hour after birth to nursing students.

Among these options, the team chooses the first and third because they will have a big effect and are also feasible. Family members may not always attend births. They may not know about skin-to-skin care or feel comfortable assisting.

The team discusses options for improving the knowledge of providers about the guidelines for skin-to-skin care:

- Discuss the guidelines for early skin-to-skin care at a monthly staff meeting.
- Hang a wall chart with the guidelines in the delivery area.
- Send a periodic reminder about skin-to-skin care to all providers of newborn care via an SMS text message.

The team decides the first and second options are best. Together, they will reach all of the providers of newborn care, and they are inexpensive. The third choice would be inexpensive and feasible, but is likely to be less effective because only a few providers have cell phones.

Newborn case scenario (continued)

The team plans to reorganize this process by leaving babies skin-to-skin with their mothers for at least an hour after birth. Care during this hour will be supervised by the nurse midwife, with assistance from nursing students. Newborn care will be performed after the first hour and after transfer to the postpartum room by the nurses there. The team plans to improve knowledge about early skin-to-skin care by discussing the recommendations at a staff meeting and hanging guidelines for care on the wall in the delivery area.

These proposed changes are presented to the staff; several nurse midwives express concern. They do not think that mothers really want to have their babies skin-to-skin immediately after birth, and they are not confident that nursing students can assist with this care. They are not confident that the postpartum nurses will perform newborn care practices properly and for all babies.

Before testing this change on a large scale, the team wants to make sure that the change is possible. They decide to test the change on a small scale.

2. ***Describe a small test that would help determine if this plan for change is feasible.***

The small test should address the concerns raised by some nurse midwives. This test could involve one nurse-midwife, who is an advocate for this change, during one shift. She would delegate the responsibility for assisting skin-to-skin care to the nursing students during that shift. After an hour of continuous skin-to-skin care, babies would be transferred to the postpartum room. The nurses there would be advised in advance about their responsibility to perform all newborn care practices.

The results of this small scale test of change would include whether: 1) an hour of skin-to-skin care occurred following each delivery, 2) the mothers were satisfied with skin-to-skin care, 3) the nursing students properly assisted this care and 4) newborn care practices were performed by the postpartum nurses. The success of this small test would not be determined by the number of babies with normal temperatures. The purpose of the small test would be only to determine if the change is feasible.

Newborn case scenario (continued)

The team tests the change on a small scale with one nurse midwife during one shift. They make the following observations:

- ***One nursing student assisted mothers after two births, and both mothers had one hour of uninterrupted skin-to-skin care.***
- ***A second nursing student assisted mothers after three births, and two of the mothers had one hour of uninterrupted skin-to-skin care. The nursing students appreciated having additional responsibility and provided adequate assistance of skin-to-skin care.***
- ***All mothers were enthusiastic about holding their babies skin-to-skin.***
- ***All babies born during this shift received vitamin K, eye and cord care, and were examined.***
- ***Three received this care from the nurse midwife in the delivery area because she happened to be available at one hour after the births.***
- ***The other two received this care from the nurse in the postpartum room.***

From this small test, the team concludes that the change seems feasible and should be tested among all staff, but should be modified slightly. They believe that all newborn care practices should be performed in the postpartum room, so they move the cart holding the scale and supplies out of the delivery area and into the postpartum room. They now need to develop a plan for testing the change on a larger scale.

3. ***Develop a plan to test the change on a larger scale. Identify what actions, who, when, where and what resources are required.***

What actions	Nursing students will assist mothers in providing skin-to-skin care during the first hour after birth if the nurse midwife is not available. One nurse midwife will educate all nursing students about how to assist with this care. After one hour mothers and babies will move to the postpartum room where the nurses will perform all newborn care practices. All staff will be educated about the changes at the next two staff meetings, and a reminder will be hung in the delivery area.
Who	All nurse midwives and postpartum nurses; one midwife will educate the nursing students.
When	Starting on the first of the month, and for the next 7 weeks.
Where	The labor and delivery area and postpartum room.
What resources	Expenses will be minimal. Support of the midwives and the facility administrator will be needed.

4. List what data to collect to understand the effects of reorganizing the skin-to-skin care process.

- What data will show the actions in the change have occurred? How will the team collect this data?
- What data will show the change has resulted in improvement? Assuming this data is not in the medical record, how will the team collect it?

The team must first determine whether the change occurred.
This will involve collecting information about nursing students assisting mothers with skin-to-skin care and the performance of newborn care practices by nurses in the postpartum room.

- Information about assistance with skin-to-skin care could be gathered by interviewing nursing students or having them complete a log of this activity.
- Information about when and where newborn care practices were performed is usually available in the medical record.
- Documentation of the weight, vitamin K administration, eye care, cord care and the examination is entered in the record with a time and name of the provider.
- One team member is assigned the responsibility of collecting these data for mothers and babies for the two weeks prior to the change and the 7 weeks after the change.

Then the team must determine whether the change resulted in improvement.

Did the change result in an improvement in the process of care? Did more mothers provide one hour of continuous skin to-skin care following birth?

If these data are not in the medical record, the team may consider collecting data in the following ways:

- Observe births and document whether skin-to-skin care is provided for the first hour after birth. Since it may not be possible to observe all births, the team might observe a representative sample of births, for example one day per week.
- Interview mothers before discharge and ask whether infants were placed skin-to-skin for one hour immediately following delivery.
- Add a column to the facility's delivery register for documentation of skin-to-skin care after birth, and ask the provider to enter the data.

Did the change result in an improvement in the outcome of fewer babies with low temperatures?
These data are in the Delivery Register.

Finally, the team must also determine whether there were negative effects of the change.
For example, they may want to determine whether babies continue to receive vitamin K, eye care, cord care and are examined and weighed. The team may decide to collect information on only one or two of these. To simplify data collection, these might be the practices that are documented in the Delivery Register.

Step 5

Determine if the change resulted in improvement

Newborn case scenario

The team has tested their changes. They find that changes occurred in the organization of care after birth and provider knowledge. Now they examine the data to decide if the changes have resulted in improvement. The team looks at the number of babies receiving skin-to-skin care and the number of babies with low temperature. A new column has been added to the Delivery Register where providers indicate if the mother provided skin-to-skin care. A member of the team records the number of babies in the Register who had skin-to-skin care and the number of babies with temperature <36.5 °C during a 9-week period (2 weeks before the change and 7 weeks after the change).

1. ***Use the data collected by the team member (table below) to evaluate the effect of the changes to improve the process of skin- to-skin care and the outcome of low newborn temperature. What percentage of babies born at the facility each week received skin-to-skin care in the first hour? What percentage of babies born at the facility each week had a temperature <36.5 °C?***

Data for 9 consecutive weeks describing the number of babies receiving skin-to-skin care and their first temperature

Week	*Number of babies born alive in the facility*	*Number of babies with temperature <36.5 °C*	*Number of babies who received skin-to-skin care in the first hour*	*% babies with low temperature*	*% babies who received skin-to-skin care in the first hour*
1	25	17	4	68.0%	16.0%
2	18	12	3	66.7%	16.7%
3	20	11	5	55.0%	25.0%
4	24	12	13	50.0%	54.1%
5	19	6	12	31.5%	63.1%
6	16	5	11	31.3%	68.8%
7	22	5	16	22.7%	72.7%
8	24	4	18	16.7%	75.0%
9	21	2	17	9.5%	81.0%

*To determine the effect of the **change** on the **performance** of the process of skin-to-skin care, divide the number of babies who received skin-to-skin care during each week by the total number of babies born alive in the facility during that week.*

*To determine the effect of the **change** on the **outcome** of low newborn temperature, divide the number of babies with a temperature <36.5 °C during one week by the total number of babies born alive in the facility during that week.*

2. Create a run chart for the process of skin-to-skin care for the first hour.

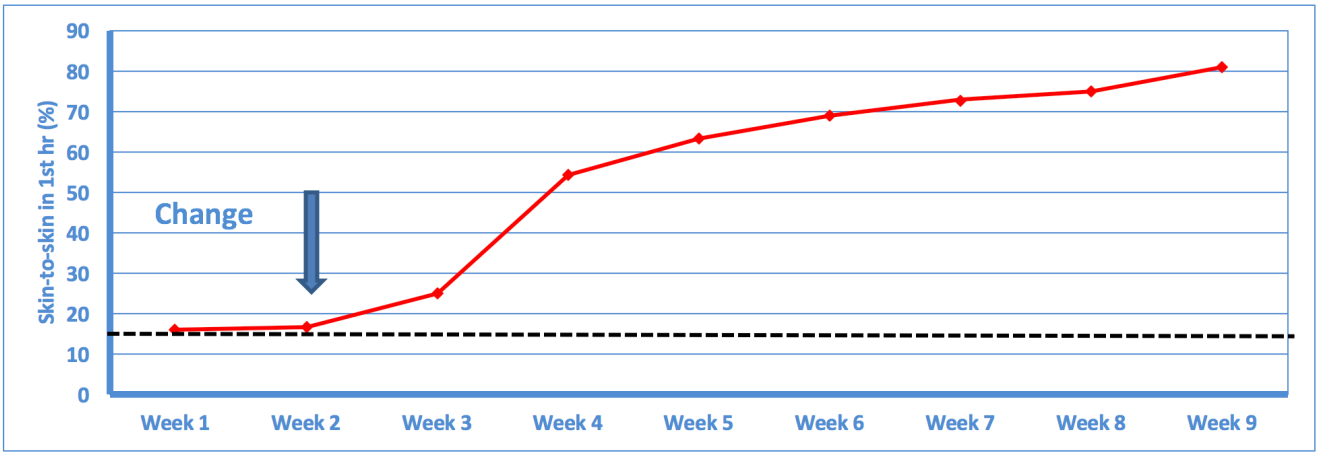
- Label the time of the change on the chart.
- Determine whether the change has resulted in real improvement in this process of care.
- Consider whether there is a shift or a trend.

Create the run chart by plotting the percentage of babies receiving skin-to-skin care on the vertical axis and weeks on the horizontal axis. Graph each number in the column labelled "% babies who received skin-to-skin care in the first hour" using a dot above the corresponding week on the horizontal axis, and connect the dots with a line. Indicate on the graph when the change occurred (after week 2). Notice that the line begins to rise with the third dot (the week after the change). This seems like a significant improvement in the process but the team wants to apply a test to confirm their belief.

Determine if there is a shift by calculating the median prior to the change and counting the number of points above the median. Since there are only two points before the change, a median cannot be accurately determined. However, a value of approximately 16% would be a reasonable estimate of the median. Draw a line at this level on the graph. There are more than 6 points above this line after the change. Therefore, an improvement has been documented by a shift in the line.

Determine if there is a trend after the change. A trend is present in this graph because there are 5 continuous points on the line that are higher than the point after the change. The team can conclude that there has been an improvement in the process of care.

Run Chart of the Percentage of Newborns Receiving Skin-to-skin Care



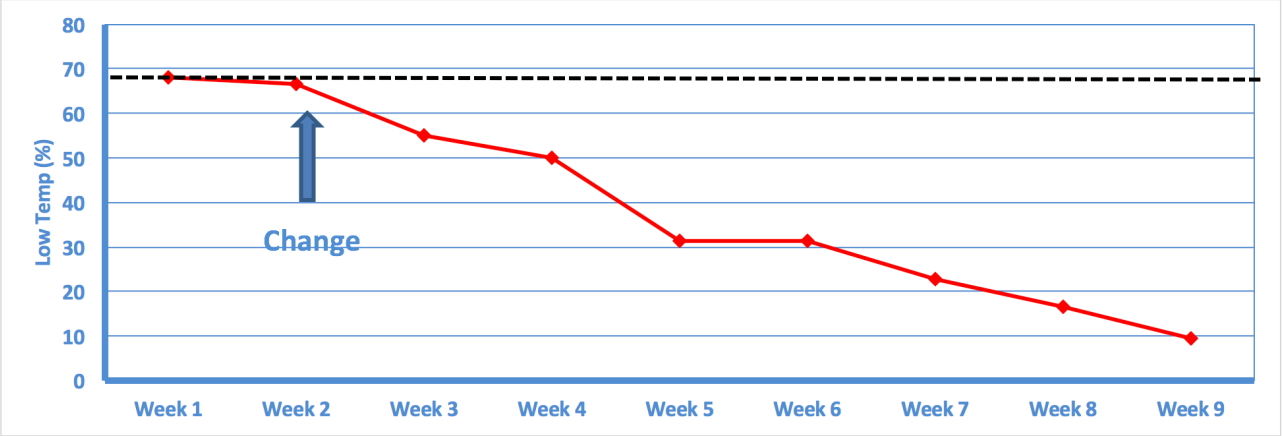
3. ***Create a run chart for the outcome of low newborn temperature.***
   Did the change of increased skin-to-skin care make progress toward achieving the goal in the aim statement?

Create the run chart by plotting the percentage of babies who had low temperatures on the vertical axis and weeks on the horizontal axis. Graph each number in the column labelled "% babies with low temperature" using a dot above the corresponding week on the horizontal axis, and connect the dots with a line. Indicate on the graph when the change occurred. Notice that the line begins to turn downward with the third dot (the week after the change). The timing of this improvement corresponds to the improvement in the process and also seems like a significant improvement in the outcome, but the team uses the same tests to confirm their belief.

Determine if there is a shift by calculating the median prior to the change and counting the number of points below the median. Use 67% as an estimate of the median. There are more than 6 points below the median after the change. Therefore, an improvement has been documented by a shift in the line.

Determine if there is a trend after the change. There are 5 continuous points on the line that are all going down after the change. Therefore, an improvement has been documented by a trend in the line. The team can conclude that there has been an improvement in the outcome.

Run Chart of the Percentage of Newborns with Low Temperature



4. ***Write a summary with the conclusions of the improvement project to share with staff at the facility.***

   The summary should highlight the important points about this improvement cycle, summarize what changes were made to improve skin-to-skin care, and tell how much improvement has occurred. The team decides to hang the run charts in the delivery area so that the facility staff can appreciate the improvement.

---

5. ***Decide whether the team should adopt, adapt or abandon the changes and why.***

   Organizing the process of skin-to-skin care and educating providers about its importance made a significant improvement in the number of infants receiving skin-to-skin in the first hour, and reduced the rates of low newborn temperatures at the facility. The team will adopt these changes since they improved the outcome and made progress towards the goal of the aim statement.

---

6. ***Assume that less improvement resulted from this change. For example, assume the percentage of low newborn temperature after the change is 35%, but the performance of skin-to-skin care is 93%. What are possible explanations for the unsatisfactory improvement in low newborn temperature?***

   It would not be unusual for a single cycle of change to result in some improvement but not the amount of improvement specified in the aim statement. Possible explanations include:

   - Data describing skin-to-skin care are inaccurate. Perhaps the mothers did not put the baby skin-to-skin as often as reported.
   - Nursing students are sometimes not available to assist mothers with skin-to-skin care.
   - Skin-to-skin care is interrupted for other processes of care such as weighing or examination.
   - Temperatures are not taken or recorded accurately.
   - Babies are becoming cold in other ways. For example, babies are not dried thoroughly or wet cloths are left covering the baby.

These possibilities should be explored. A new change can be planned and tested for improvement in the outcome.

Step 6

Make improvement the norm

Case scenario

The team was excited about the improvements that resulted from their project. Most providers have easily adopted the changes, but others have resisted. The team meets to discuss their next steps.

1. ***Discuss how the team might communicate changes that resulted in improvement.***
   The team decides to share the results of their improvement project with other providers at a staff meeting. They choose to display their run charts in a prominent place where the staff can see them. The team also shows their run charts to the facility administrator. They hope this will encourage the administrator to celebrate and acknowledge their success, and maybe find them additional resources for improvement work. The administrator may also want to publicize the improvement to the Ministry of Health. The Ministry may want to link the successful health facility with a facility that is struggling with this outcome so that the two facilities can collaborate and learn from each other.

2. ***If the team had selected a process for improvement that involved a difficult or challenging skill (for example, bag and mask ventilation), how might they facilitate practice of this skill?***
   Members of the improvement team can work alongside other providers at the facility and serve as role models for the process of care selected for improvement. The team can set up short, frequent skill practice sessions. For example, providers could practice bag and mask ventilation in pairs at the beginning of each shift. If providers have difficulty with the skill, the team might arrange supportive supervision of this activity by a more skilled provider once a week for a month.

3. ***What can the team do to engage individuals who have been resistant to the change? With a partner, role play how a team member would convince a provider who is resistant to change to participate with the other staff in the improvement activities.***
   Start by listening closely to why the provider does not support the changes Help the provider understand how the changes benefit mothers, babies, and providers themselves. Talk about how the changes save time and make the job easier. Slow adopters of change may also be persuaded by the number of other staff changing their practice. Celebrating good outcomes with stories and pictures and recognizing providers who are successfully changing behavior can help build support for the change. Mothers who benefited from the change may publicize this to other mothers in the community and encourage them to participate in the new activity.

4. ***What further actions can the team take to make the change permanent? What might they recommend to management of the facility in order to sustain the improvement?***
   The team will want to communicate the results of their improvement project and their recommendations to management of the facility. For example, to sustain the improvement, they may recommend adding new elements to the delivery checklist used by staff. The team may also recommend changing the job description of the nurse midwives, nurses and other personnel to reflect the change in their responsibilities. They may include education about these responsibilities for all new employees and trainees. The team can continue to follow their progress with run charts to make sure that improved rates do not decline.

APPENDIX A.2

Maternal Practice Exercises – User's Guide

Step 1

Create an improvement team

Case scenario

After meeting with Seetha and hearing about the positive changes in her hospital, Nirmala returns to her own facility with new energy to improve care. Each year, approximately 1,000 babies are born in Nirmala's hospital. Nurse midwives provide prenatal, basic obstetric and postpartum care. Registered nurses and ward assistants help with postpartum care. A senior nurse manager supervises operation of the facility, including ordering supplies. There is a pharmacist on site. Nursing students are usually present in the facility. A physician manages the labor ward and is available for emergencies, but does not provide care for women without complications. Mothers and babies usually remain in the delivery area for one hour after a birth and are then moved to a postpartum room. They are typically discharged about 24 to 48 hours later.

Nirmala wants to become a champion for quality care and wants to create an improvement team.

1. ***Discuss how Nirmala should organize a team to improve care of mothers and babies in this facility. List the members on the team and assign their roles.***

   The improvement could include members who represent all providers of maternal and newborn care at the facility. A team with nurses, ward assistants, nursing students, nurse-midwives, the physician and the senior nurse manager might be too big to function well. A smaller core improvement team (4-6 individuals) could still include a representative of each type of provider. More team members could be added when specific care practices are chosen for improvement (see Step 3). A mother who has given birth at the facility or another community member could represent families' perspectives on care.

   Consider who will fill various roles on the team. One or more team members may be appointed or volunteer to collect data, another to take notes or document the improvement activities, and another to communicate the improvement process more widely.

2. ***Choose an ideal team leader. Describe why you chose this leader.***

   Nirmala may be an ideal team leader, because she wants to be a champion for improved care. One of the other medical professionals, such as the senior nurse manager, could lead the team. The physician might be less desirable because of his less frequent presence at the facility. A nurse midwife might be the best choice because she delivers care to mothers and babies. Whoever is chosen must be an individual respected by all, and must be given the time and resources to serve in this capacity.

Step 2

Decide what to improve

Maternal case scenario

During a meeting of the improvement team, gaps in the quality of maternal care are discussed. Team members are not aware of a serious gap in quality. The leader suggests reviewing recent Delivery Register data to determine if a gap in quality exists.

1. ***Using the sample Delivery Register (below), list processes of care and outcomes that might be used as indicators of the quality of maternal care.***

Sample delivery register

DELIVERY REGISTER

Name	Date of Birth	Time of Birth	Delivery Route	Oxytocin	Post-partum Blood Loss	Apgars 1,5 min	Wt	Temp	Vit K	Discharge Date	Baby Disposition	Notes
MSaidou	15-06	00:45	vag	✓	250	8,9	3400	35.4	✓	15-06	Home	
C Bidi	15-06	06:30	c/s	✓	450	7,8	2460	34.5	✓	17-06	Home	
A. Baucar	15-06	14:30	vag	✓	200	8,9	2350	35.2		16-06	Home	
S. Rashad	16-06	09:20	vag	✓	200	6,8	3310	36.8	✓	17-06	Home	
Z. Saloy	16-06	17:50	vag		350	6,8	2670	37.1	✓	17-06	Home	
H. Alai	17-06	02:42	vag		750	5,7	2740	37.9	✓	19-06	Referred	
C. Sidi	18-06	08:16	vag	✓	150	8,9	2851	36.8		19-06	Home	
R Abou	18-06	12:25	vag		400	8,9	2780	37.1	✓	19-06	Home	
B. Asava	18-06	13:11	vag	✓	300	7,8	3500	34.4	✓	20-06	Referred	
Z. Halifa	19-06	11:13	vag	✓	200	9,9	3215	35.2	✓	20-06	Home	
B. Bayou	20-06	04:07	vag		750	7,8	2720	37.8		20-06	Home	
M. Seclah	20-06	11:48	vag		150	7,8	1900	34.2		20-06	Died	mother died
D. Djibri	21-06	07:38	vag		350	8,9	2995	36.8		21-06	Home	
S. Binton	21-06	14:26	vag		1000	7,8	3620	36.4		22-06	Home	
S Bevaca	21-06	21:15	c/s	✓	250	8,9	2780	36.7	✓	22-06	Home	
M. Bonou	22-06	18:20	vag	✓	200	8,9	2618	35.8	✓	23-06	Home	
R. Yaoyou	22-06	22:10	vag	✓	250	8,9	2651	37.8	✓	24-06	Home	

The sample page from the Delivery Register lists 12 pieces of information (data fields). From these, outcome and process indicators can be identified. The Register includes two processes of maternal care, administration of oxytocin and postpartum blood loss (indicating that an estimate of the volume of blood lost has been made). Two maternal outcomes are listed in the Delivery Register: maternal death and mode of delivery (vaginal or c-section). Mothers with postpartum hemorrhage can also be identified as those with postpartum blood loss >500 mL.

Processes of care	***Outcomes***
Administering oxytocin	Postpartum hemorrhage
Estimating postpartum blood loss	Mode of delivery
	Maternal death

2. ***Calculate the frequency of two processes of care: oxytocin administration and measurement of blood loss.***
   Gaps in the quality of care can be identified by calculating how frequently processes of care are performed properly. Ten mothers (10/17 or 59%) received oxytocin. All mothers should receive oxytocin, so these data suggest a gap in the quality of care.

3. ***Calculate the frequency of the following maternal outcome: postpartum hemorrhage (blood loss >500 mL).***
   Gaps in the quality of care can also be identified by calculating how frequently outcomes occur. Three mothers (3/17 or 18%) had an estimated blood loss >500 mL and therefore had postpartum hemorrhage. This percentage of mothers with postpartum hemorrhage is high, and this outcome is probably avoidable. Therefore, it represents a gap in the quality of care.

4. ***Choose the gap in quality to improve and record why you have chosen this gap.***
   The team considers criteria for choosing a gap in quality to improve: expected result, importance and impact. They choose to improve the administration of oxytocin immediately after birth because they believe that it will be possible to improve this process of care. It is important because oxytocin treatment is known to reduce postpartum hemorrhage, an outcome that may result in death and other serious complications. They also know that postpartum hemorrhage occurs more than once per week in their hospital and is the leading cause of maternal death.

5. ***Write an aim statement for improving administration of oxytocin after birth to prevent postpartum hemorrhage.***
   The aim statement should include the following elements: who (which patients), what (the process or outcome improved), how much (the amount of the desired improvement) and by when (the time period for improvement). One possible aim statement for improving the administration of oxytocin after all births would be:

   We will increase the percentage of women receiving oxytocin immediately after birth from 59% to 95% within 6 months.

   "Who" is the population of interest (women). "What" is the outcome or process to be improved (administration of oxytocin following birth). "How much" is the change from the baseline rate of the outcome (59% based on the sample described in the register) to a goal for administration (e.g. to 95%). "By when" is the time over which the change will occur (e.g. within 6 months in this example).

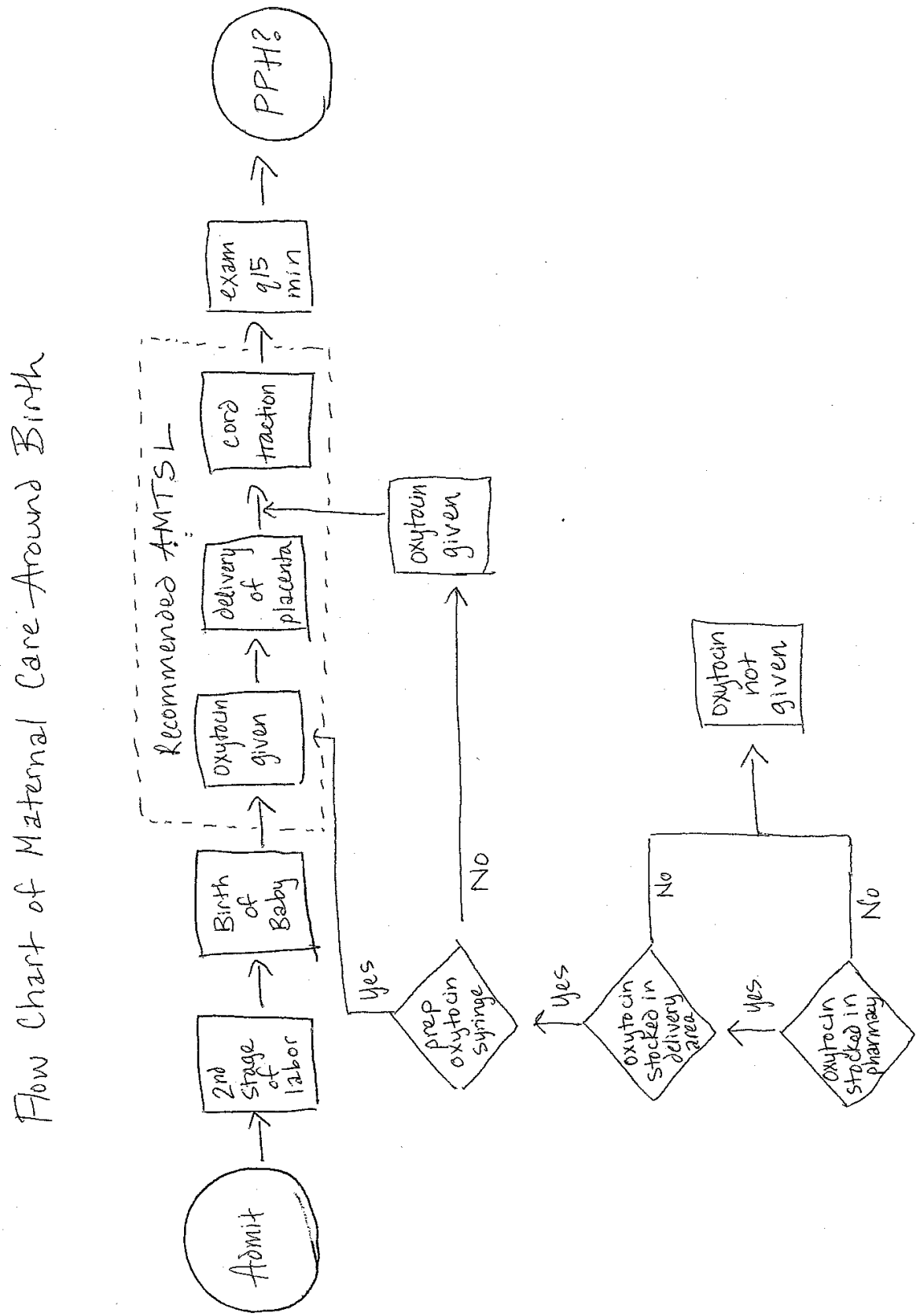
Step 3

Choose the barriers to overcome

Maternal case scenario

The team has chosen to improve the administration of oxytocin after birth for prevention of postpartum hemorrhage. To help them understand why this does not occur after every birth, they observe several births and make a flow chart of the care mothers receive around the time of delivery (see pg. 24). The flow chart shows two things: 1) the events and actions that involve the mother before and around the time of delivery; and 2) the actions involved in making sure that oxytocin gets to the bedside and is given to women soon after delivery. They also review the Ministry's guidelines for maternal care during birth.

1. ***List the actions that might affect the recommended administration of oxytocin.***
   Based on the care that is illustrated in the flow chart, the team might identify a number of actions that prevent all women from being treated with oxytocin at the right time. These include: 1) the availability of oxytocin in the pharmacy; 2) maintaining a supply of oxytocin in the delivery area; 3) preparing the oxytocin syringe in a timely manner; and 4) administering oxytocin immediately after the birth of a baby.


Flow Chart of Maternal Care Around Birth
Admit
2nd Stage of labor
Birth of Baby
Recommended AMTSL
oxytocin given
delivery of placenta
cord traction
exam q15 min
PPH?
prep oxytocin syringe
Yes
NO
oxytocin given
oxytocin stocked in delivery area
Yes
No
oxytocin not given
oxytocin stocked in pharmacy
Yes
No

Maternal case scenario (continued)

The team gathers more information about administering oxytocin. They interview two midwives, the senior nursing officer and the pharmacist.

They learn the following:

Supply of oxytocin in the facility

- ***Oxytocin is provided by the Ministry at no charge to the hospital and is always available in the pharmacy.***

Supply of oxytocin in the delivery area

- ***Oxytocin and syringes are stored in a cabinet in a room located adjacent to the delivery room. It is re-stocked by the nurse-in-charge when there are no vials in the cabinet.***

Preparation of syringe for administration

- ***During the second stage of labor, the midwife prepares a syringe of oxytocin.***
- ***If the medication is prepared before the delivery, it is almost always given immediately after the birth of the baby.***
- ***Only the midwives are permitted to prepare oxytocin for administration. At times, the ward is so busy that they are unable to walk to the cabinet and prepare the syringe before a birth.***

Other issues

- ***Some midwives are not aware of the Ministry's recommendation for administration of oxytocin immediately after birth.***
- ***At times, particularly during the night, the midwife does not have time to prepare an oxytocin syringe because she is the only provider covering the labor and delivery area.***
- ***Ward assistants are assigned to the labor and delivery area at all times, day and night.***
- ***The facility administrator will support changes that agree with Ministry recommendations, but there are no funds to hire additional staff.***

2. ***Using the table below, identify the barriers to care that might interfere with immediate administration of oxytocin after birth.***

INPUT BARRIERS	***IDENTIFIED INPUT BARRIERS TO ADMINISTRATION OF OXYTOCIN***
Lack of knowledge and skills	Some providers are not aware of the recommended use of oxytocin.
Staffing shortages	Because of other responsibilities, midwives sometimes do not have time to prepare oxytocin syringes before delivery.
Insufficient supplies	None; the pharmacy always has oxytocin.
Unfavorable infrastructure	None
Inadequate financial resources	There are no funds to hire additional staff.
Traditions and cultural beliefs that interfere with recommended care	None

PERFORMANCE BARRIERS	***IDENTIFIED PERFORMANCE BARRIERS TO ADMINISTRATION OF OXYTOCIN***
Poorly organized processes	Two aspects of oxytocin administration are poorly organized: stocking the delivery area and preparation of syringes before each birth.
Misaligned incentives	None
Challenges with leadership and management	None
Provider's convenience	None

3. ***Choose the barriers to overcome. Consider the expected effect, cost and feasibility of overcoming the barrier(s).***
   The team chooses two of the barriers: lack of knowledge and the poorly organized process. They believe that overcoming these barriers will have a big effect on the administration of oxytocin. These barriers will not be costly to overcome, and they believe that it will be feasible to overcome them. They know that more staff cannot be hired, so they will try to improve oxytocin treatment without changes in staffing.

Step 4

Plan and test change

Maternal case scenario

The team decides to overcome two barriers to improve oxytocin administration. First, they decide to reorganize the process of administering oxytocin by making certain that the medication is in the delivery room and prepared for injection before every birth. Second, they decide to improve the knowledge among providers about the Ministry's recommendation for administration of oxytocin immediately after birth.

1. *List changes that might overcome these barriers to oxytocin administration. Select one or more changes to test.*

The team discusses options for reorganizing the actions required to prepare a syringe of oxytocin for each birth, including:

- The nurse-in-charge will review the supplies in the cabinet each morning to ensure that enough oxytocin is available for that day and night. The improvement team will review the Delivery Register to estimate the average number of births per 24 hours to help understand the amount of oxytocin which would typically be required.
- The ward assistant assigned to the labor and delivery area will be tasked with placing a vial of oxytocin and syringe next to the delivery pack for each mother upon admission.
- The improvement team will review the Ministry guidelines and the evidence supporting the use of oxytocin at the next two staff meetings.

The team decides that each of these options is feasible.

Maternal case scenario (continued)

The team plans to reorganize this process. The nurse-in-charge will be responsible for assessing the supply of oxytocin and requesting the vials and syringes needed for each day. Based on a review of the Delivery Register, the team estimates that there are about 3 births per day. Therefore, they recommend that the cabinet be stocked with 4 vials and 4 syringes each morning. The ward assistant who is assigned to the labor and delivery area will place a vial of oxytocin and syringe by the delivery pack of every mother upon her admission. The nurse-in-charge will meet with the ward assistant at the beginning of each shift to review his/her responsibility for making sure that the vial and syringe are placed with the delivery packs. The team plans to improve knowledge about administration of oxytocin by discussing the recommendations at a staff meeting and hanging guidelines for care on the wall in the delivery area.

These proposed changes are presented to the staff; several nurse midwives express concern. They worry that oxytocin may not be available for women who are experiencing postpartum hemorrhage if it is given to all women. They also are concerned that the ward assistants may not be available, particularly at night, and will resent having additional responsibilities.

Before testing this change on a large scale, the team wants to make sure that the change is possible. They decide to test the change on a small scale.

2. Describe a small test that would help determine if this plan for change is feasible.

The plan to test the proposed changes on a small scale should address the concerns raised by some of the midwives and the feasibility of the changes. This test could involve two midwives who are advocates for this change, the nurses-in-charge and ward assistants during two shifts. The nurse-in-charge of the day shift would stock the cabinet with four vials of oxytocin and four syringes. She would review with the ward assistant her responsibility for placing a vial and syringe next to the delivery pack for each mother.

The result of this small scale test of change would be determined by noting: 1) whether the medication was available in the cabinet; 2) whether it was prepared and ready in the delivery room; and 3) whether it was administered. This small test is only to determine if the change is feasible, not if there was treatment following all births or whether there was a reduction in postpartum hemorrhage.

Maternal case scenario (continued)

The team tests the change on a small scale with two midwives during one day. They make the following observations:

- ***This was an unusually busy day with 6 births.***
- ***Oxytocin was available at the bedside and administered to 4 mothers.***
- ***One birth took place almost immediately after another birth. The midwife was able to prepare the syringe and administer oxytocin because it was available at the bedside.***
- ***The team interviewed the ward assistants. The ward assistants were pleased with their new responsibilities.***

From this small test, the team concludes that the change seems feasible and should be tested among all staff, but they first want to modify the plan slightly. They know that they must increase the supply of oxytocin in the cabinet to allow for times when there are many births, but they do not want to over-stock the cabinet. Because it is not refrigerated, vials that remain in the cabinet for more than 24 hours must be discarded. They plan to increase the daily supply to 5 vials, and the supply in the cabinet will be checked twice per day by the nurse-in-charge. The date and time that the vial is placed in the cabinet will be written on each vial. They now need to develop a plan for testing the change on a larger scale.

3. ***Develop a plan to test the change on a larger scale. Identify what actions, who, when, where and what resources are required.***

What actions	The nurse-in-charge each day will place the 5 vials and syringes in the delivery area cabinet each day; the evening nurse-in-charge will ensure that a sufficient supply is available for the night shift. She will inform the ward assistant of her responsibility to place a vial and syringe by the delivery pack of each new admission.
Who	All nurse midwives, nurses-in-charge and ward assistants.
When	Starting on the first of the month, and for the next 7 weeks.
Where	The maternity unit.
What resources	No new resources. Support will be sought from the midwives, the dispensary and the facility administrator.

4. ***List what data to collect to understand the effects of reorganizing the process of administering oxytocin.***

- What data will show the actions in the change have occurred? How will the team collect this data?
- What data will show the change has resulted in improvement? Assuming this data is not in the medical record, how will the team collect it?

The team must first determine whether the change occurred. This will involve collecting information about the availability of oxytocin vials and syringes in the cabinet and at the bedside at the time of delivery. These data are not in any existing records. They might decide to develop a log sheet that would be placed on the cabinet. The nurse-in-charge would indicate the number of vials present in the cabinet at the beginning of the shift, and how many vials were added to the stock. A checklist could be placed at the bedside along with the delivery pack on which the availability of oxytocin and a syringe could be added. One improvement team member would be assigned the responsibility of collecting these data for the two weeks prior to the change and the 7 weeks after the change.

Then the team must determine whether the change resulted in an increase in the percentage of mothers receiving oxytocin. These data exist in the Delivery Register.

The team will also want to know if the change resulted in a decrease in the percentage of mothers with postpartum hemorrhage. These data are in the Delivery Register.

Finally, the team must also determine whether there were negative effects of the change. For example, they may want to determine how much oxytocin has been discarded. They could obtain this information by comparing the total number of vials dispensed to the delivery area to the total number of women treated. They may also want to ensure that the treatment of all women has not exhausted the supply of oxytocin in the pharmacy, and that the increased use of oxytocin has not caused budgetary problems for the pharmacy.

Step 5

Determine if the change resulted in improvement

Maternal case scenario

The team developed a log sheet on which the nurses-in-charge recorded the availability of vials of oxytocin in the cabinet at the beginning of each shift. A review of these sheets confirmed that oxytocin was always available in the delivery area. The team also added a tick box for oxytocin vial and syringe to the delivery checklist. Review of the checklist confirms that oxytocin was available for nearly all deliveries. The team concludes that the changes occurred.

Now they examine the data to decide if the changes have resulted in improvement. The team must decide if more mothers received oxytocin and fewer mothers had postpartum hemorrhage. From the Delivery Register, a member of the team records the number of women who received oxytocin and the number who experienced postpartum hemorrhage during a 9-week period (2 weeks before the change and 7 weeks after the change) to determine whether improvement occurred.

1. *Use the data collected by the team member (table below) to evaluate the effect of the changes to improve the process of administration of oxytocin and the outcome of postpartum hemorrhage. What percentage of women giving birth at the facility each week received oxytocin? What percentage of women giving birth at the facility each week had a postpartum hemorrhage?*

Data for 9 consecutive weeks describing the number of women receiving oxytocin after birth and the number with postpartum hemorrhage

Week	Number of women giving birth	Number of women receiving oxytocin	Number of women with PPH	Number of women receiving oxytocin	Percentage of women with PPH
1	25	13	4	52.0%	16.0%
2	18	8	3	44.0%	16.6%
3	20	12	3	60.0%	15.0%
4	24	17	3	71.0%	12.5%
5	19	15	2	78.9%	10.5%
6	16	14	1	87.5%	6.2%
7	22	20	1	90.9%	4.5%
8	24	21	2	87.5%	8.3%
9	21	20	1	95.2%	4.7%

2. Create a run chart for the process of oxytocin administration.

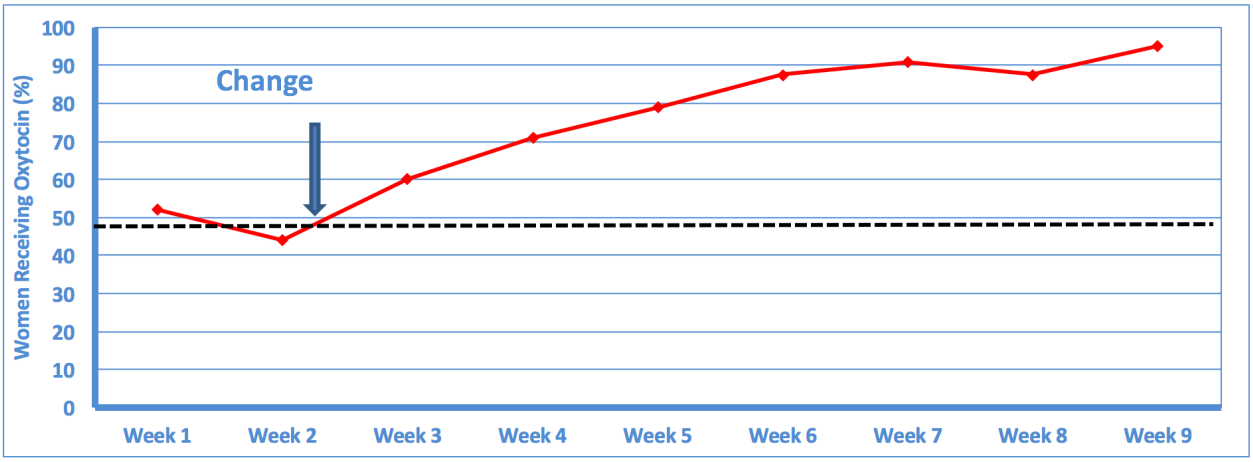
- Label the time of the change on the chart.
- Determine whether the change has resulted in real improvement in this process of care.
- Consider whether there is a shift or a trend.

Create the run chart by plotting the percentage of women receiving oxytocin on the vertical axis and weeks on the horizontal axis. Graph each number in the column labelled "% women receiving oxytocin" using a dot above the corresponding week on the horizontal axis, and connect the dots with a line. Indicate on the graph when the change occurred (after week 2). Notice that the line begins to rise with the third dot (the week after the change). This seems like a significant improvement in the process but the team wants to apply a test to confirm their belief.

Determine if there is a shift by calculating the median prior to the change and counting the number of points above the median. Since there are only two points before the change, a median cannot be accurately determined. However, a value of approximately 48% would be a reasonable estimate of the median, halfway between the two values. Draw a line at this level on the graph. There are more than 6 points above this line after the change. Therefore, an improvement has been documented by a shift in the line.

Determine if there is a trend after the change. A trend is present in this graph because there are 5 continuous points on the line that are higher than the point after the change. The team can conclude that there has been an improvement in the process of care.

Run Chart of the Percentage of Women Receiving Oxytocin



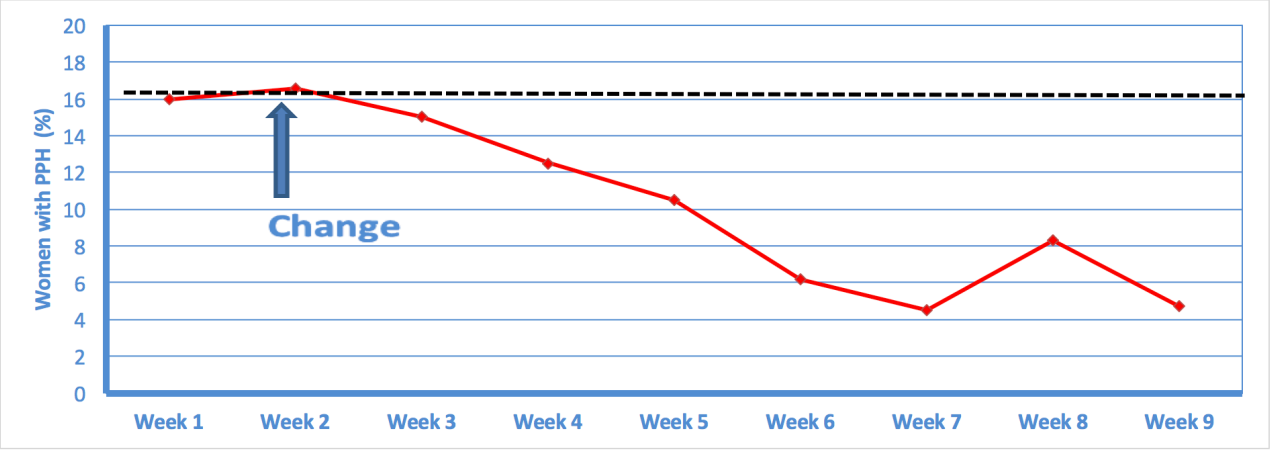
3. ***Create a run chart for the outcome of postpartum hemorrhage. Did the change result in fewer postpartum hemorrhages make progress toward achieving the goal in the aim statement?***

   Create the run chart by plotting the percentage of women with postpartum hemorrhage on the vertical axis and weeks on the horizontal axis. Graph each number in the column labelled "% women with postpartum hemorrhage" using a dot above the corresponding week on the horizontal axis, and connect the dots with a line. Indicate on the graph when the change occurred. Notice that the line begins to turn downward with the third dot (the week after the change). The timing of this improvement corresponds to the improvement in the process and also seems like a significant improvement in the outcome, but the team uses the same tests to confirm their belief.

   Determine if there is a shift by calculating the median prior to the change and counting the number of points below the median. Use 16% as an estimate of the median. There are more than 6 points below the percentage after the change. Therefore, an improvement has been documented by a shift in the line.

   Determine if there is a trend after the change. There are 5 continuous points on the line that are all going down after the change. Therefore, an improvement has been documented by a trend in the line. The team can conclude that there has been an improvement in the outcome.

Run Chart of the Percentage of Women with Postpartum Hemorrhage



4. ***Write a summary with the conclusions of the improvement project to share with staff at the facility.***
   The summary should highlight the important points about this improvement cycle, summarize what changes were made to improve administration of oxytocin after birth, and tell how much improvement has occurred. The team may decide to hang the run chart in the delivery area so that the staff can appreciate the improvement.

5. ***Decide whether the team should adopt, adapt or abandon the changes and why.***

   Organizing the process of oxytocin administration and educating providers about its importance made a significant improvement in the number of women receiving oxytocin, and decreased the rates of postpartum hemorrhage at the facility. The team will adopt these changes since they improved the outcome and made progress towards the goal of the aim statement.

---

6. ***Assume that less improvement resulted from this change. For example, assume the percentage of treatment with oxytocin only improved to 75%. What are possible explanations for the unsatisfactory improvement?***

   It would not be unusual for a single cycle of change to result in some improvement but not the amount of improvement specified in the aim statement. Possible explanations include:

   - Data documenting oxytocin administration are inaccurate.
   - A ward assistant may not have been available for all shifts.
   - Some but not all ward assistants understood their responsibility for placing a vial and syringe by the delivery pack.
   - Even when the supplies were at the bedside at the time of delivery, midwives sometimes did not have time to draw up and administer the medication.

---

7. ***Assume that the improvement in the administration of oxytocin occurred, but the percentage of women with postpartum hemorrhage did not decrease. What are possible explanations for this lack of improvement?***

   A single cycle of change is even less likely to improve an outcome. The following are possible explanations for the lack of improvement in postpartum hemorrhage:

   - Blood loss is over-estimated; fewer postpartum hemorrhages actually occurred than were reported.
   - Oxytocin was commonly administered more than one minute after birth.
   - Other practices that decrease the likelihood of postpartum hemorrhage (for example, uterine massage and monitoring uterine tone after birth) were not performed.

   These possibilities should be explored. A new change can be planned and tested for improvement in the outcome.

Step 6

Make improvement the norm

Case scenario

The team was excited about the improvements that resulted from their project. Most providers have easily adopted the changes, but others have resisted. The team meets to discuss their next steps.

1. ***Discuss how the team might communicate changes that resulted in improvement.***

   The team decides to share the results of their improvement project with other providers at a staff meeting. They choose to display their run charts in a prominent place where the staff can see them. The team also shows their run charts to the facility administrator. They hope this will encourage the administrator to celebrate and acknowledge their success, and maybe find them additional resources for improvement work. The administrator may also want to publicize the improvement to the Ministry of Health. The Ministry may want to link the successful health facility with a facility that is struggling with this outcome so that the two facilities can collaborate and learn from each other.

2. ***If the team had selected a process for improvement that involved a difficult or challenging skill (for example, bag and mask ventilation), how might they facilitate practice of this skill?***

   Members of the improvement team can work alongside other providers at the facility and serve as role models for the process of care selected for improvement. The team can set up short, frequent skill practice sessions. For example, providers could practice bag and mask ventilation in pairs at the beginning of each shift. If providers have difficulty with the skill, the team might arrange supportive supervision of this activity by a more skilled provider once a week for a month.

3. ***What can the team do to engage individuals who have been resistant to the change? With a partner, role play how a team member would convince a provider who is resistant to change to participate with the other staff in the improvement activities.***

   Start by listening closely to why the provider does not support the changes Help the provider understand how the changes benefit mothers, babies, and providers themselves. Talk about how the changes save time and make the job easier. Slow adopters of change may also be persuaded by the number of other staff changing their practice.

   Celebrating good outcomes with stories and pictures and recognizing providers who are successfully changing behavior can help build support for the change. Mothers who benefited from the change may publicize this to other mothers in the community and encourage them to participate in the new activity.

4. ***What further actions can the team take to make the change permanent? What might they recommend to management of the facility in order to sustain the improvement?***

   The team will want to communicate the results of their improvement project and their recommendations to management of the facility. For example, to sustain the improvement, they may recommend adding new elements to the delivery checklist used by staff. The team may also recommend changing the job description of the nurse midwives, nurses and other personnel to reflect the change in their responsibilities. They may include education about these responsibilities for all new employees and trainees. The team can continue to follow their progress with run charts to make sure that improved rates do not decline.

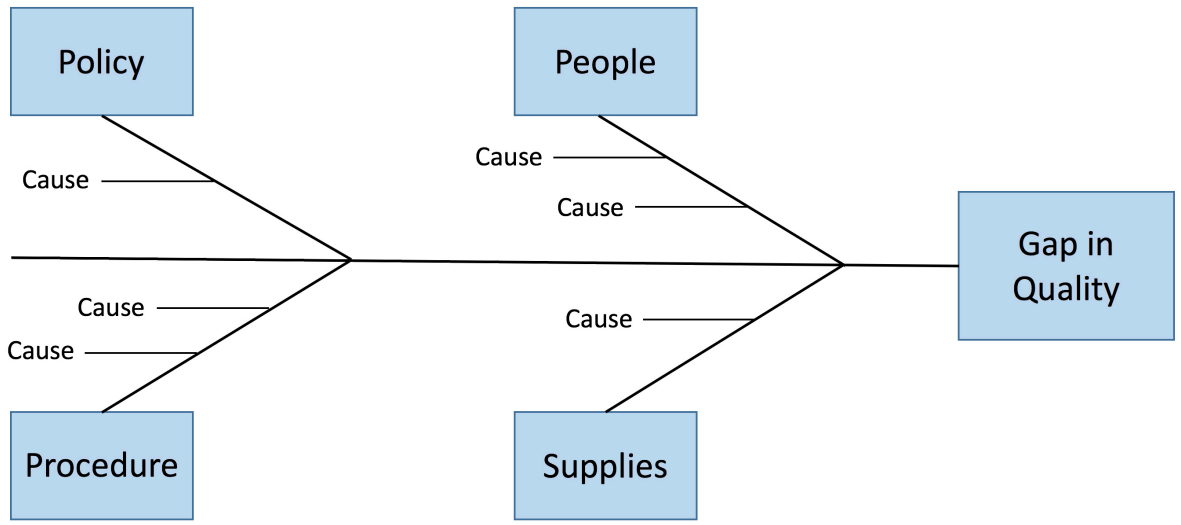
APPENDIX B

Appendix B. 1. The fishbone diagram

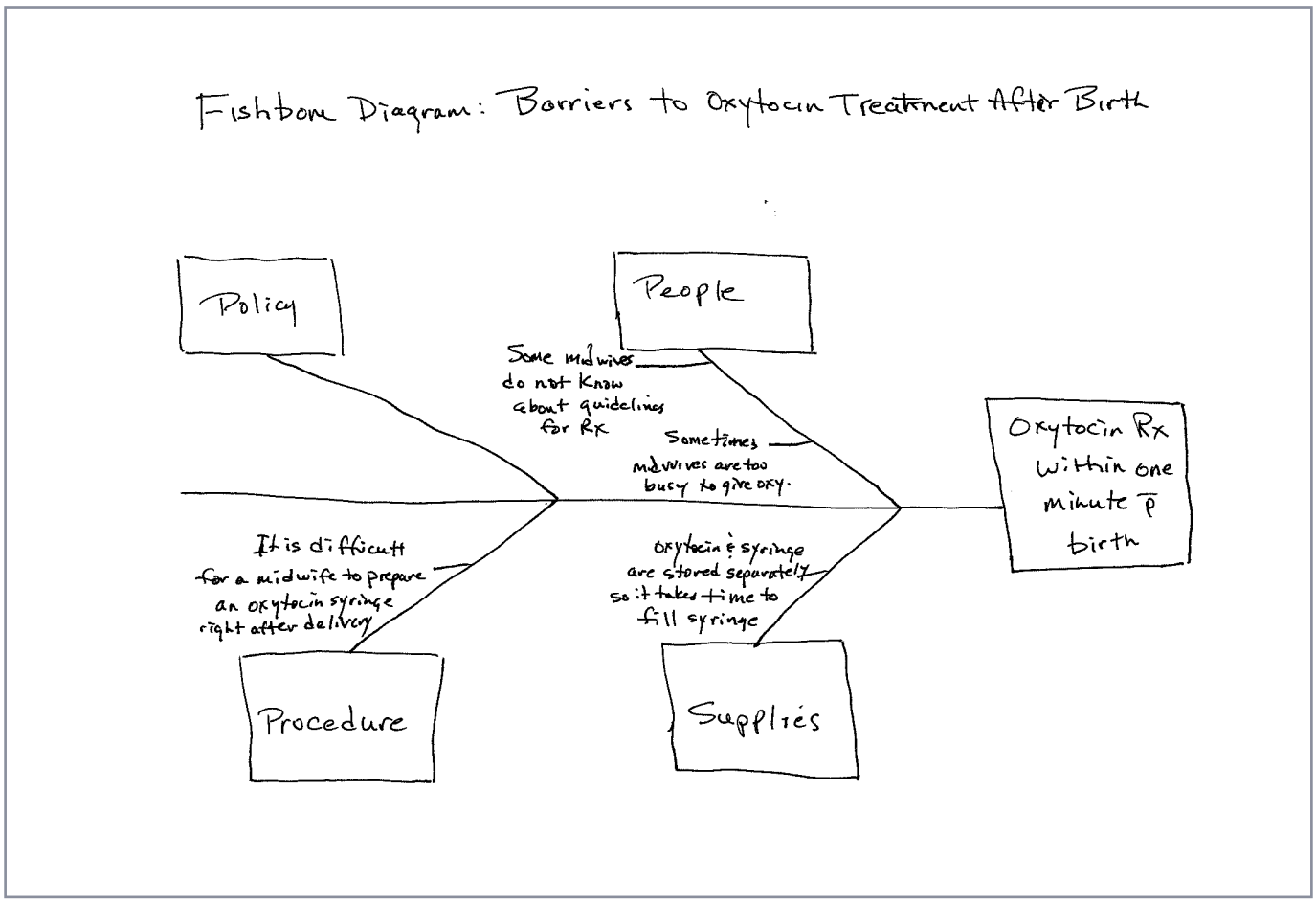
The fishbone diagram is used to identify the causes of a gap in the quality of care. It is most helpful when a gap has multiple contributing causes or barriers. This tool sorts potential causes by typical domains or general areas of care (for example, policies, people, procedures and supplies). Teams use the tool by listing potential causes or barriers that contribute to the gap in quality within each domain. These form the small bones of the fish. After all potential causes have been listed, those that may have the greatest impact or are most easily corrected can be identified.

How to develop a fishbone diagram:

1. Draw a horizontal line. At one end (corresponding to the "head" of the fish), write the gap in quality that you want to improve.
2. Then draw diagonal lines ("bones") from the horizontal line to boxes. Within each, write the name of a domain or major area of care (see figure).
3. Within each domain, identify one or more potential problems or barriers that might cause the gap that you are going to improve.



EXAMPLE:
The midwives at a district hospital recently reviewed the care provided to mothers around the time of birth. They discover that only about ½ of mothers are treated with a uterotonic (oxytocin) within one minute of birth. They draw a fishbone diagram to help them identify barriers to this treatment (see next page).



They identify several barriers to providing oxytocin within minute after birth:

- Lack of knowledge about this treatment
- Insufficient staffing to allow midwives to deliver care to mothers and babies and always give oxytocin
- A poorly organized process of treatment: oxytocin and syringe not stored together; syringe not filled with oxytocin until after delivery

The identification of these barriers will help them develop a plan for change to improve treatment with oxytocin.

Appendix B.2. Five whys root cause analysis

The "five whys" technique is used to identify the root cause of a gap in the quality of care. It is sometimes used with other tools, for example the flow chart, to help discover the single most likely cause of the gap.

How to use the five whys:

1. Start by asking why you have a problem.
2. Then ask why to the answer given and continue to repeat these questions until you discover the root cause of the problem.
3. Develop a plan to improve this root cause.

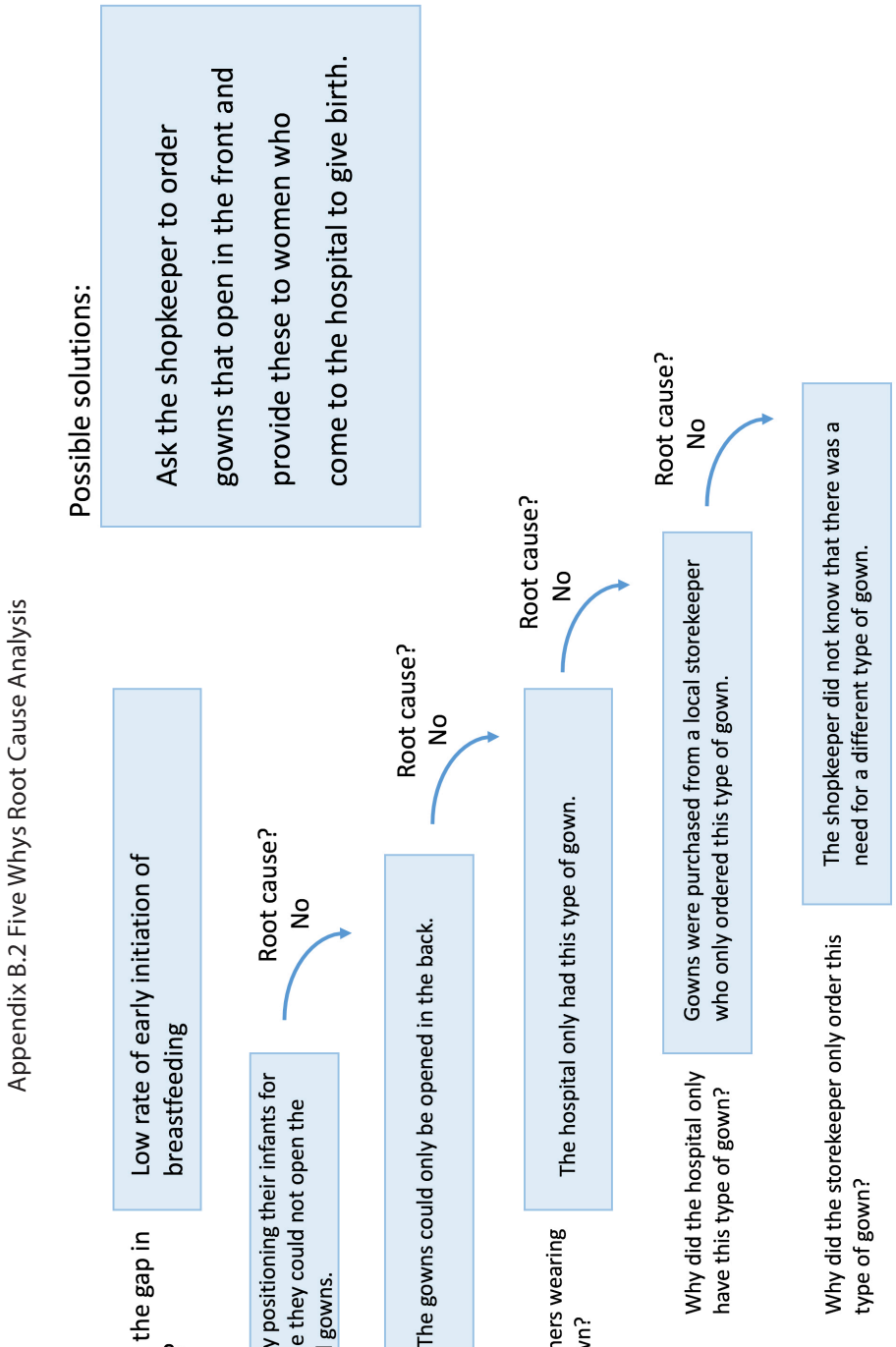
Notes:

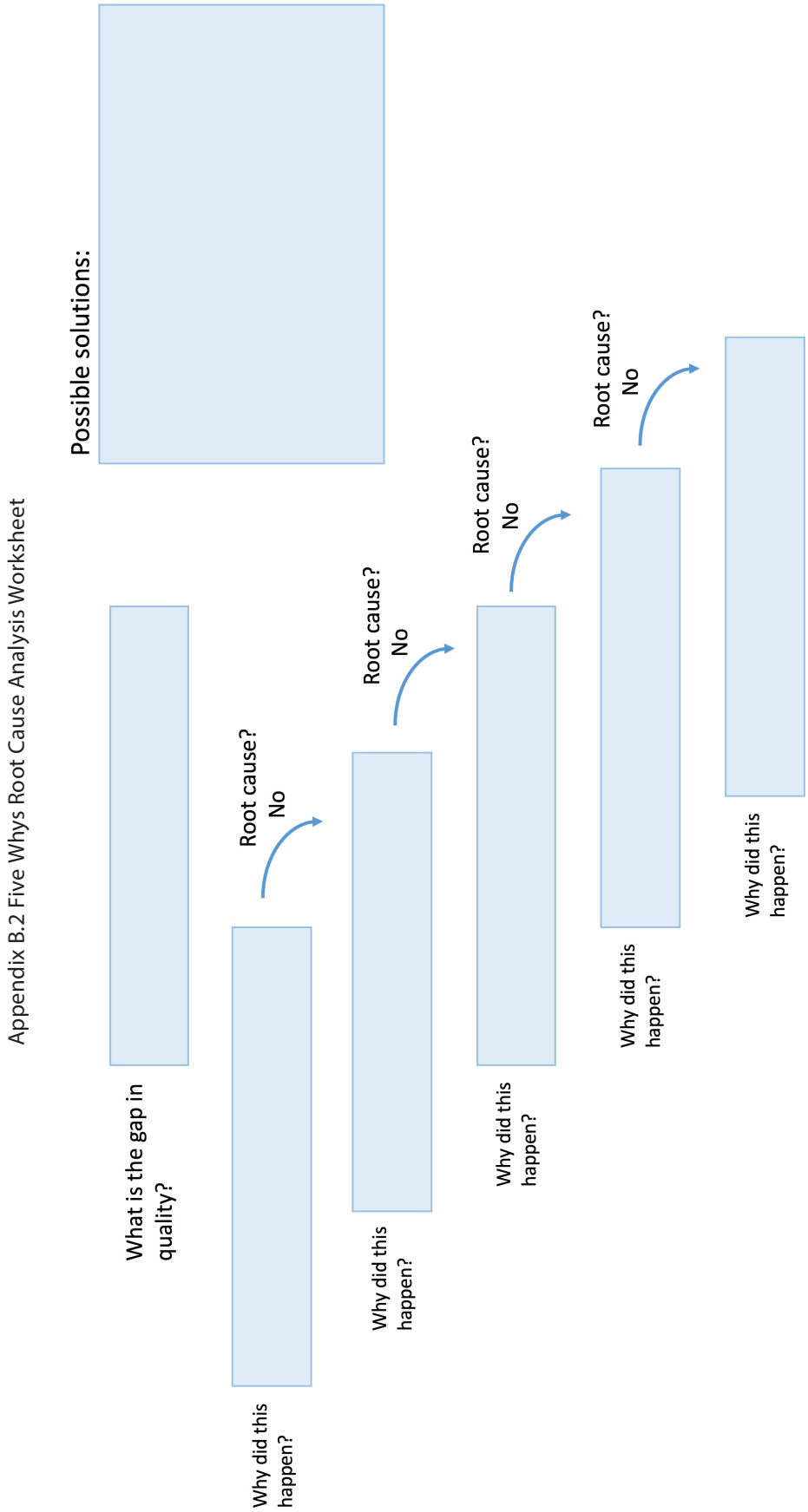
- There is nothing special about asking why five times. Keep asking until you are sure you have discovered the root cause of the problem. This may require fewer than five times, or sometimes more.
- A potential challenge you might face while using this tool is that it does not always lead you to a helpful answer or could lead you to identifying problems that are beyond your control and cannot be fixed.

Example (adapted from the "Improving Quality in Healthcare; Implementation Guide by ASSIST India[1]):

Mothers who give birth in a small district hospital have a low rate of early initiation of breast feeding despite being told about the importance of early breastfeeding. To identify the cause of this low rate, the improvement team used the Five Whys analysis. They first asked women why they were not initiating breast feeding soon after birth. They learned that mothers were unable to easily place their infants to the breast because they could not open the front of their hospital gowns. When they learned this answer, they asked four additional question and discovered the root cause of this gap in quality (see chart on the following page). The root cause suggested a simple solution to the problem.

[1]*Singh R, Singh M, Jha R, Sharma P, Livesley N. 2016. Improving Quality in Healthcare: A practical guide for health care providers. Technical Report. Published by the USAID ASSIST Project. Bethesda, MD: University Research Co., LLC (URC).*


Appendix B.2 Five Whys Root Cause Analysis
What is the gap in quality?
Low rate of early initiation of breastfeeding
Why did this happen?
Mothers had difficulty positioning their infants for breastfeeding because they could not open the front of their hospital gowns.
Root cause? No
Why couldn't they open the front?
The gowns could only be opened in the back.
Root cause? No
Why were mothers wearing this type of gown?
The hospital only had this type of gown.
Root cause? No
Why did the hospital only have this type of gown?
Gowns were purchased from a local storekeeper who only ordered this type of gown.
Root cause? No
Why did the storekeeper only order this type of gown?
The shopkeeper did not know that there was a need for a different type of gown.
Possible solutions:
Ask the shopkeeper to order gowns that open in the front and provide these to women who come to the hospital to give birth.


Appendix B.2 Five Whys Root Cause Analysis Worksheet
Possible solutions:
What is the gap in quality?
Why did this happen?
Root cause? No
Why did this happen?
Root cause? No
Why did this happen?
Root cause? No
Why did this happen?
Root cause? No
Why did this happen?

APPENDIX C.

Examples of Process and Outcome Indicators

Type of indicator	Indicators	Numerator	Denominator	Relevance with global monitoring frameworks
Routine assessment and treatment of women				
Process indicator	% of all women giving birth in the health facility whose progress in labour was correctly monitored and documented using a partograph with a 4-h action line[1]	# of women giving birth in the health facility whose progress in labour was correctly monitored and documented using a partograph with a 4-h action line	Total # of all women giving birth in the health facility	WHO QoC (quality statement 1.1a) output indicator #7
Process indicator	% of all women giving birth in the health facility who received oxytocin within 1 min of birth of their infant	# of women giving birth in the health facility who received oxytocin within 1 min of birth of their infant.	Total # of all women giving birth in the health facility within reporting period	WHO QoC (quality statement 1.1a) output indicator #9
Outcome indicator	Stillbirth rate	# of babies with no signs of life born weighting at least 1000 grams or after 28 weeks of gestation	Per 1,000 total (live and stillborn) births in the health facility	ENAP, Impact
Outcome indicator	Neonatal mortality rate	# of live born infants per year dying before 28 completed days of age	Per 1,000 live births in the health facility	ENAP, Impact
Outcome indicator	Very early neonatal death rate	Live born infants who died before discharge (or within the first 24 hours after birth)	Per 1,000 live births in the health facility	USAID-led initiative *"Helping 100,000 Babies Survive and Thrive"*
Outcome indicator	Institutional maternal mortality ratio	# of maternal deaths in the facility during reporting period	Per 100,000 women giving birth in the health facility	WHO 100 Core Health Indicators
Routine care of newborn immediately after birth				
Process indicator	% of all newborns who were kept in skin-to- skin contact (with body and head covered) with their mothers for at least 1 h after birth	# of newborns with immediate skin-to-skin contact for at least 1h after birth	Total # of live births in the health facility	WHO QoC (quality statement 1.1b) output indicator #8
Process indicator	% of all newborns who were breastfed within 1 hour after birth	# of newborns breast fed within 1 hour after birth	Total # of live births in the health facility	WHO QoC (quality statement 1.1b) output indicator #10

[1]*Correct monitoring defined as reporting as: start plotting when cervix ≥ 4 cm, then cervix should delate ≥1 cm/r, every 30 min plot HR, contractions, fetal HR, every 2 hrs _ temperature and every 4 hours BP.*

Type of indicator	Indicators	Numerator	Denominator	Relevance with Global Monitoring frameworks
Process indicator	% of newborn with Chlorhexidine (CHX) cord cleansing	# of newborns that received at least one dose of CHX (71.%) to the cord on the first day after birth (within 24 hours of birth)	Total # of live births in the health facility	ENAP, (modified for facility level)
Outcome indicator	% of all newborns who had normal body temperature (36.5–37.5 °C) at the time of the first complete examination (between 60 min and 120 min after birth)	# of all newborns who had normal body temperature (36.5–37.5 °C) at the time of the first complete examination (between 60 min and 120 min after birth)	Total # of live births in the health facility	WHO QoC (quality statement 1.1b) output indicator #12
Routine postnatal care of mothers and newborns				
Process indicator	% of all postnatal assessments in the health facility that documented maternal blood pressure, pulse rate, vaginal bleeding/lochia and breastfeeding problems	# of all postnatal assessments in the health facility that documented maternal blood pressure, pulse rate, vaginal bleeding/ lochia and breastfeeding problems	Total # of all women giving birth in the health facility	WHO QoC (quality statement 1.1c) output indicator #11
Treatment of preeclampsia				
Process indicator	% of all women in the health facility with severe pre-eclampsia or eclampsia who received the full dose of magnesium sulfate or loading dose of magnesium sulfate and referral	# of all women in the health facility with severe pre-eclampsia or eclampsia who received the full dose of magnesium sulfate or loading dose of magnesium sulfate and referral	Total # of all women with severe pre- eclampsia or eclampsia in the health facility	WHO QoC (quality statement 1.2) output indicator #4
Outcome indicator	% of all women with pre-eclampsia or eclampsia in the health facility who died as a result of pre-eclampsia and eclampsia	# of all women with pre-eclampsia or eclampsia in the health facility who died as a result of pre-eclampsia and eclampsia	Total # of all women with severe pre- eclampsia or eclampsia in the health facility	WHO QoC (quality statement 1.2) output indicator #7

Treatment of delayed/obstructed labor				
Type of indicator	**Indicators**	**Numerator**	**Denominator**	**Relevance with Global Monitoring frameworks**
Process indicator	% of all women in the health facility with confirmed delay in labour progress who received oxytocin for augmentation of labour[2]	# of all women in the health facility with confirmed delay in labour progress who received oxytocin for augmentation of labour	Total # of all women in the health facility with confirmed delay in labour progress	WHO QoC (quality statement 1.4) output indicator #6
Process indicator	% of all women in the health facility with prolonged and/ or obstructed labour who gave birth by caesarean section	# of all women in the health facility with prolonged and/or obstructed labour who gave birth by caesarean section	Total # of all women in the health facility with prolonged and/or obstructed labour	WHO QoC (quality statement 1.4) output indicator #10
Outcome indicator	% of all women giving birth in the health facility whose active phase of first stage of labour exceeded 12 h	# of all women giving birth in the health facility whose active phase of first stage of labour exceeded 12 h	Total # of all women giving birth in the health facility	WHO QoC (quality statement 1.4) output indicator #11
Newborn resuscitation				
Process indicator	% of newborns who were not breathing spontaneously/crying at birth for whom resuscitation actions (stimulation and/or bag and mask) were initiated	# of newborns who were not breathing spontaneously/crying at birth for whom resuscitation actions (stimulation and/or bag and mask) were initiated	Total # of births in the health facility not breathing spontaneously/ crying at birth, excluding macerated stillbirths and including fresh stillbirths (as surrogate of intrapartum stillbirths)	ENAP, Coverage
Outcome indicator	% of babies not breathing at birth that were resuscitated successfully by stimulation and/or bag and mask	% of babies not breathing at birth that were resuscitated successfully by stimulation and/or bag and mask	Total # of births in the health facility not breathing spontaneously/ crying at birth (excluding macerated stillbirths and including fresh stillbirths) for whom resuscitation actions (stimulation and/ or ventilation with bag and mask) were initiated	USAID Newborn Resuscitation Quality Framework

[2]*Defined for nulliparous women as those not giving birth within 3 h of the start of the second stage and, for multiparous women as those not giving birth within 2 h of the start of the second stage.*

Type of Indicator	Indicators	Numerator	Denominator	Relevance with Global Monitoring frameworks
Care of preterm labor/preterm birth/LBW				
Process indicator	Antenatal corticosteroids (ACS) use	All women giving birth in facility who are <34 completed weeks and received one dose of ACS for being at risk of preterm birth	Total # of live births in health facility who are born at <34 completed weeks of gestation	ENAP, Coverage
Process indicator	% of neonates weighing ≤2000 g at birth initiated with facility based Kangaroo Mother Care[3]	# of neonates weighing ≤2000 g at birth initiated with facility based Kangaroo Mother Care	Total # of neonates weighing ≤2000 g at birth in the health facility	ENAP, Coverage
Outcome indicator	Neonatal mortality rate among all low birth-weight babies born in the health facility	# of liveborn infants weighing <2,500 g who died in the health facility before discharge	Total # of low birth-weight newborns in the health facility per 1,000 liveborn infants with <2,500 g in the health facility	WHO QoC (quality statement 1.6b) output indicator #11
Process indicator	% of all birthing or postpartum women in the health facility with signs of infection who received injectable antibiotics	# of all birthing or postpartum women in the health facility with signs of infection who received injectable antibiotics	Total # of all birthing or postpartum women in the health facility with signs of infection	WHO QoC (quality statement 1.7a) output indicator #7
Outcome indicator	% of maternal death due to maternal sepsis in all causes of maternal death	# of maternal death due to maternal sepsis in all causes of maternal death	Total # of maternal deaths in the facility	
Prevention and treatment of newborns with suspected infection or risk factors for infection				
Process indicator	# of all newborns in the health facility with signs of Possible Severe Bacterial Infection (PSBI)[4] who received injectable Ampicillin and Gentamicin	# of all newborns with signs of PSBI who received at least one dose of injectiable Ampicillin and Gentamicin in the health facility	Total # of newborns with PSBI in the health facility	ENAP, Coverage WHO QoC (quality statement 1.7b) output indicator #5
Outcome indicator	% of all early neonatal deaths in the health facility facility that were due to sepsis	# of all neonatal deaths in the health facility facility that were due to sepsis	Total # of all neonatal deaths in the health facility	WHO QoC (quality statement 1.7b) output indicator #8

[3] *Care of a preterm infant with early, continuous skin-to-skin contact, and exclusive breastfeeding or feeding with breast milk.*

[4] *Signs of PSBI include any of the following: not able to feed since birth or stopped feeding well, convulsions, fast breathing (60 breaths per minute or more) among infants less than 7 days old, severe chest in-drawing, fever (38 °C), movement only when stimulated or no movement at all.*

Acknowledgements

Improving Care of Mothers and Babies was conceived and designed by an inter-disciplinary team of physicians, nurse midwives and educators from the Survive & Thrive Global Development Alliance.

Editor
Carl Bose, MD
University of North Carolina
Chapel Hill, NC

Associate Editor
Jorge Hermida, MD
University Research Co, LLC
Quito, Ecuador

Editorial Board
Jennifer Breads, MSN, MPH
Jhpiego
Baltimore, MD

Tamar Chitashvili, MD, MPH&M
University Research Co, LLC
Bethesda, MD

Cherrie Evans, DrPH, CNM
Jhpiego
Baltimore, MD

Tyler Hartman, MD
Dartmouth-Hitchcock Medical Center
Lebanon, NH

Beena Kamath-Rayne, MD, MPH
Cincinnati Children's Hospital
Medical Center
Cincinnati, OH

Nigel Livesley, MD, MPH
University Research Co, LLC
New Delhi, India

Susan Niermeyer, MD, MPH
University of Colorado
Denver Aurora, CO

Jackie Patterson, MD
University of North Carolina
Chapel Hill, NC

Suzanne Stalls, CNM, MA
American College of Nurse-Midwives
Silver Spring, MD

Illustrator/Art Director
Anne Jorunn Svalastog Johnsen
Laerdal Global Health
Stavanger, Norway

Illustrator
Bjørn Mike Boge
Laerdal Global Health
Stavanger, Norway

Managing Editor
Casey Lowman, MPH
American Academy of Pediatrics
Elk Grove Village, IL

Special Reviewer
Neena Khadka, MBBS, DCH, MA, MPH
Maternal and Child Survival Program/
Save the Children
Washington, DC

Survive & Thrive and the Improving Care of Mothers and Babies Editorial Board acknowledge with appreciation the following individuals for valuable time spent reviewing program materials.

Sheena Currie, RM, MEd
Jhpiego
Baltimore, Maryland

Santorino Data, MD
Mbarara University of Science and
Technology
Mbarara, Uganda

Ashok Deorari, MD, FAMS
All India Institute of Medical Sciences
New Delhi, India

Bernhard Fassl, MD
University of Utah
Salt Lake City, Utah

Brynjar Foss, PhD
Laerdal Global Health
Stavanger, Norway

Kathleen Hill, MD, MPH
Maternal and Child Survival Program/
Jhpiego
Washington, DC

Lily Kak, PhD
Mary Ellen Stanton, CNM, MSN, FACNM
US Agency for International Development
Washington, DC

Douglas W. Laube, MD, MEd
University of Wisconsin
Madison, WI

Jerker Liljestrand, MD, PhD
Bill and Melinda Gates Foundation
Seattle, WA

Arti Maria, MD
Dr. Ram Manohar Lohia Hospital
New Delhi, India

Rajesh Mehta, MD
World Health Organization,
Regional Office for South-East Asia
New Delhi, India

Edward Moses, MScPM
Maikhanda Trust
Lilongwe, Malawi

Magdalena Serpa, MD, MPH
PATH
Washington, DC

Kim Ethier Stover, MA
University Research Co, LLC
Bethesda, MD

Michael Visick, MD
LDS Charities
Logan, UT

Steve Wall, MD, MS, MSW
Saving Newborn Lives/
Save the Children
Washington, DC

Nabila Zaka, MBBS, PhD
UNICEF
New York, NY

This work was made possible through the collaborative efforts of the Survive & Thrive Global Development Alliance.
Special thanks is extended to those partners who provided lead guidance in the development of these materials: the American Academy of Pediatrics (AAP), the American College of Nurse Midwives (ACNM), Jhpiego, Laerdal Global Health, Save the Children, University Research Co., LLC (URC), and the US Agency for International Development (USAID).

Survive & Thrive *is an alliance of government, professional health association, private sector and non-profit partners working alongside country governments and health professionals to improve health outcomes for mothers, newborns and children through clinical training, systems strengthening and policy advocacy. By leveraging the combined resources and expertise of some of the most respected United States and global organizations in maternal and child health, Survive & Thrive is able to energize critical health care interventions during the time when mothers and their children are most vulnerable—from pregnancy through childbirth, and childhood through age five—thereby making a real impact in ending preventable maternal and child deaths worldwide.*

The Alliance consists of the following partner organizations: *USAID, AAP, ACNM, American College of Obstetricians and Gynecologists (ACOG), American Heart Association (AHA), Save the Children, International Pediatric Association (IPA), LDS Charities, Laerdal Global Health, Johnson & Johnson, Jhpiego, Project C.U.R.E., Millennium Villages, Global Health Media, Sigma Theta Tau International Honor Society of Nursing, and USAID's Applying Science to Strengthen and Improve Systems (ASSIST) Project and Maternal and Child Survival Program (MCSP).*

survive & thrive

professional associations, private sector and global health scholars
saving mothers, newborns and children