Common Requirements for Maternal Health Information Systems

Produced with the Collaborative Requirements Development Methodology

December 2012

Preface

This document presents a set of requirements that translate the needs of maternal health practitioners around the globe into the language of software and system engineering to inform software development related to health systems and maternal health in particular.

The requirements were developed in 2010–2012 by PATH in collaboration with maternal health and information systems professionals working at the global and national levels. They should not be viewed as a definitive authority but rather as a tool to guide further discussions between health professionals and information system engineers and developers.

The intention of this document is to solicit opinions and technical input from key stakeholders, such as country ministry of health leaders, donors, technical agencies and software developers, regarding building a standard user and system requirements-based maternal health information system.

For example, the requirements can be used by countries, donors, technical agencies and software developers to identify country-specific priorities, develop requests for proposals and scopes of work, and implement information and communication technology interventions to support maternal health processes. In situations where there may be several alternative solutions, the requirements will help make country decision-making more transparent and rigorous by providing an objective assessment of alternatives against the weighted and prioritized country-specific preferences. In some instances, detailing the requirements of the system will by itself highlight service delivery process inefficiencies and may prompt stakeholders to consider implementing process improvements in advance or in parallel with the establishment of health information systems.

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Abbreviations

ANC	Antenatal care
CHW	Community health worker
CRDM	Collaborative requirements development methodology
EDD	Estimated due date
FP	Family planning
GPS	Global positioning system
HC	Health care
HCW	Health care worker
ICT	Information and communication technology
ID	Identification
LMP	Last menstrual period
MDG	Millennium development goals
MRN	Medical record number
MSH	Maternal health information system
PATH	Program for Appropriate Technology in Health
SBA	Skilled birth attendant
SMS	Short message service
TB	Tuberculosis
TBA	Traditional birth attendant

Background

Maternal mortality rates in low income countries are slow to improve, and information and communication technology interventions are often failing to live up to expectation leaving countries struggling to achieve the fifth Millennium Development Goal (MDG) to improve maternal health. Despite a plethora of remarkable small-scale pilots of mobile phones applications by health workers, the current landscape of ICT interventions is fragmented and lacks thoughtful attention to documentation of requirements necessary for solutions to achieve scale and become sustainable. This problem is not limited to maternal health services, in fact it is a shared problem across all health services and programs in most countries where a large percentage of health funding is from external sources.

In collaboration with global and national partners, PATH is working to specifically address the lack of an insightful, integrated, and coordinated approach for developing information system solutions for maternal health in various countries that can be 1) sustainable; 2) suitable for use nationwide and, ultimately, at the global level; and 3) interoperable with other parts of a health information system in order to improve maternal care in developing countries. In addition, PATH seeks to empower countries to be smarter consumers of ICT solutions.

Collaborative Requirements Development Methodology

The collaborative requirements development methodology (CRDM) was developed initially by the Public Health Informatics Institute in conjunction with PATH in 2009. The first broad application of this methodology was in the domain of logistic management and supply chain, completed in 2010. While the methodology was successful and appropriate for the supply chain, it was not clear if it could be applied equally effectively to the clinical domains and make sense to clinical stakeholders. Several smaller projects (tuberculosis [TB] process flows in Tanzania and work on primary health service delivery in Rwanda) found that loosely applying the methodology to clinical domains was indeed possible and in fact successful. For a complete description of CRDM, please find the final report “Common Requirements for Logistics Management Information Systems, September 30, 2010” available online at: http://www.path.org/publications/detail.php?i=1865.

Application of the Process to Clinical Work

One of the most significant initial barriers to using CRDM and business process mapping for clinical care was language. Clinicians in particular often do not think of their activities as “business” activities. Careful explanations and flexibility in using such terms allowed participants to quickly become more involved in the process, as they could see how these business processes were accurately reflecting their work. Another challenge was in recording activities and decisions consistently at the same level for each process map. Depending on the expertise and specialization of the participants, there was a tendency to want to go

"deep" in some areas and record smaller steps and sub-processes that may be of relevance clinically but contributed little to the actual intent of the activity being described. This is likely to be a challenge for business process mapping across all clinical domains when experts in the work describe the steps and create these maps from scratch with no previous business process experience. As long as participants can see where their concern, input, or idea is represented, its proper placement on the process map or requirements list can usually be mediated by a skillful facilitator. It is not feasible to expect the participants to be competent analysts without any background or training; they need to contribute the content, and have it represented by a skilled analyst.

Despite the issues with having clinicians create the business process flows and requirements, once created clinicians had no issue in reading and understanding these materials. In fact when validating the documented requirements and process flows with clinicians in the field, who were not part of the process at all, these maps were universally understood with minimal explanation. After a single exposure, clinicians were able to explain to their colleagues and further validate some steps. This ease of understanding and interpreting was universal among all clinicians and other participants we interacted with. Nonclinical developers were also able to understand the clinical flow and requirements easily with little instruction or explanation. We found the outputs (business process maps and associated requirements) to be excellent communication tools to allow for a common understanding between those who do the work and those needing to understand it from a technical perspective.

Outputs of the CRDM process

As a result of several global and country-level technical consultations to date, the experts:

1. Identified the major functional areas an information system must possess to support maternal health programs and produced a process framework for maternal health services (see Table 1 below).
2. Identified ten priority processes (highlighted in green in Table 1), taking into account issues critical to advancing information systems for national maternal health services in developing countries.
3. Developed the flow of activities for the ten priority processes (See Appendix 1) and validated it in the field.

Table 1. Process framework for maternal health services.[1]

Patient Administration	Patient Care	Patient Fees and Accounting	Planning, Management & Surveillance
Registration	Determine health action	Patient & Insurance Payments	Health education and bcc
Referral	Family planning		Surveillance of health conditions
Inpatient Transfer	Routine Antenatal Care		Determine target client population
Scheduling	Routine Delivery Community		Staffing and supervision
	Routine Delivery Facility		
	Routine Post-natal		
	Emergency Care		
	Community Health Support		
	Community Follow up		
	Diagnostics Include Laboratory		
	Medication Management		

User and Systems Requirements Supporting Maternal Health Business Processes

Each of the business processes is illustrated in a task flow model showing the logical work flow in Appendix 1. The detailed functional user and system requirements for the ten business processes highlighted above are illustrated in Appendix 2. Functional user requirements are the statements that describe what an information system needs to do to support the tasks or activities that make up the business process. These requirements are things that a user will see and use to answer the question, "What needs to happen to support the user to complete a work activity?" For the ten business processes for which requirements were developed, there are several dozen activities and more than a hundred functional requirements. These requirements, detailed in Appendix 2, are organized under each business process and associated with the activities they support. Not all listed activities within the business process have associated requirements. By showing activities that do not have associated requirements, we capture the complete logical flow of work which will be useful in the subsequent step when translating functional requirements into technical specifications. Software engineers will then use this to create the specifications.

The requirements also include general system requirements which are not associated with a specific activity or business process but rather are requirements that impact the entire system. General system requirements differ from functional user requirements in another important aspect: these requirements are

[1] Green denotes priority processes considering issues critical to advancing information systems for national maternal health services in developing countries.

usually not visible to the end-user but are essential for the system to be able to perform and support the functionality the user needs.

Lessons Learned

Overall, the highly collaborative process of translating the requirements of those who do the work into tools and documents that can be easily understood by others has proven very effective. Despite some minor challenges in the initial creation of the tools, all participants felt they were able to contribute and that their contribution was represented. This will have implications far beyond improving the development process. Including domain experts, actual clinicians and others who do the work, as well as developers and those who will help architect the solutions addresses some of the most significant issues faced in eHealth—the "disconnect" between those who will use the tools and those who are creating them. While there is good reason for optimism, it does remain to be seen if this process results in improved product design. Having the common understanding between the users and the developers is certainly a big step in the right direction.

A second observation became apparent throughout the process. While the focus was on the processes around maternal health, participants very quickly realized (and commented) that we were developing patterns that in fact applied to most areas of health service delivery. The process for routine antenatal care, for example, was similar to the process for immunization of children, or management of chronic disease (such as TB or HIV). At a basic level, the process is one of finding the subjects of interest (pregnant women; those with TB, HIV, or hypertension, etc.); enrolling them in a care protocol that includes having them return at routine intervals for care, assessment, and/or screening; and referring them on if complications are discovered. While the "content" varies (you obviously assess a pregnant woman for different issues than you do for a HIV-positive patient), the actual process is very similar. These patterns of care were identified by the users early on in the process, and we conducted specific exercises in the workshop to validate that these patterns were in fact applicable most of the time to other specific health services. While there was strong support for this finding in a workshop of experts, we were not able to validate this fully in the field. An interesting next step to this work would be to create more generically worded business process maps and validate them in the field.

The final lesson learned is regarding a shortfall in the process. The process is valuable for documenting requirements based on the current state. While there are some liberties taken to improve on each activity when describing the requirements (as they assume these are requirements for automating a manual process), this largely restricts the solution to either an incremental improvement or to one that simply automates a manual process. This seriously limits, or prohibits, thinking about solutions that transform how the work is done. This is not an insignificant problem, and there are no easy solutions to it. The skills needed to think about radically different ways of doing the work are not common. Furthermore, those who currently do the work are not usually the best ones to come up with these new concepts. They have

often performed these tasks in this way for the entirety of their careers and have difficulty engaging in the paradigm shift necessary to see different solutions.

Conclusions

While the CRDM process has proven to yield very effective tools for creating a common language to describe the "work" of maternal care, this project has uncovered several opportunities to take the process even further. First, there is an immediate opportunity to generalize the language and processes to allow them to be applied to other clinical areas and services. This is critical not only to promote reuse, but also to help recognize and design for single solutions that may be applied to improve all health services. This is critical in addressing the issue of siloed care that so often plagues the developing world.

Second, there is still opportunity to improve the process. While the process, tools, and output are effective and serve to align multiple stakeholders, the current methodology does not support the "out-of-the-box" thinking that could allow for the transformation of service delivery. Technology allows for solutions that are simply not possible in a manual, paper-based process and that full potential is not adequately addressed in the current methodology.

Lastly, it still remains to be seen what impact this process will have on the development of new systems. Will this assist countries in determining their system needs and informing the build/buy decision? Will it improve the end products? Will it ensure a system more closely addresses the real clinical needs? Will it reduce development time? Will it allow for more robust user-centered solutions? While both users and developers feel this may in fact be the case, these are still early days and further work needs to be done.

Despite the opportunities for further enhancements, the value of these documents should not be underestimated. Diverse groups of stakeholders have found both the process and the outcomes to be highly effective and beneficial to their work and conversations around improving health services with technology.

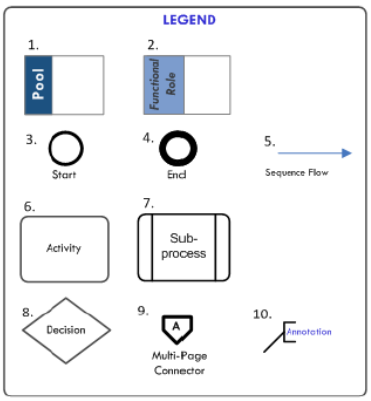
Appendix 1: Business Process Flows

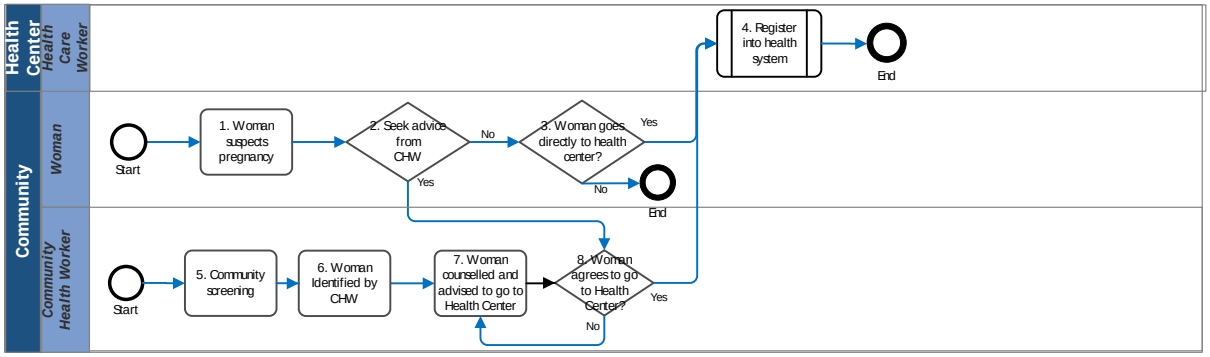
Diagram Descriptions

Task Flow Diagrams

A task flow diagram is a graphical model that illustrates the activities of a business process, as well as who performs those activities, known as functional groups. The task flow provides a "story" for the business process being diagramed. The components of the task flow diagram are defined as listed below:

1. ***Pools***—a group, department, organization or unit that contains multiple functional swim lanes (functional groups).
2. ***Swim Lanes***—a functional individual or group. These are entities that perform or are accountable for designated activities in the process.
3. ***Start Event***—a process mapping shape used to define the "start" of the process.
4. ***End Event***—a process mapping shape used to define the "end" of the process.
5. ***Sequence Flow***—shows the logical flow and direction of information and activities.
6. ***Activity***—an action performed by the functional individual or group.
7. ***Subprocess***—a shape used as a call out to another process.
8. ***Decision***—a required conclusion needed in the process. These are typically approvals or resolutions.
9. ***Multi-Page Connector***—links to the next page when a process is too large to fit on one page.
10. ***Annotation***—a text description to add clarity or context to any point of the process.





Activity Details / Narrative

General Process Notes

Objective: The identification of a pregnant woman, so she can be followed by the appropriate health provider.

There are 2 primary ways a woman may be identified: she may present herself, or she may be identified by a community health worker (CHW).

1. Woman suspects she is pregnant
The woman knows the signs of pregnancy and suspects she is pregnant.

2. Seek advice from community health worker?
The woman may seek the advice of the CHW as her initial entrance into the health system.

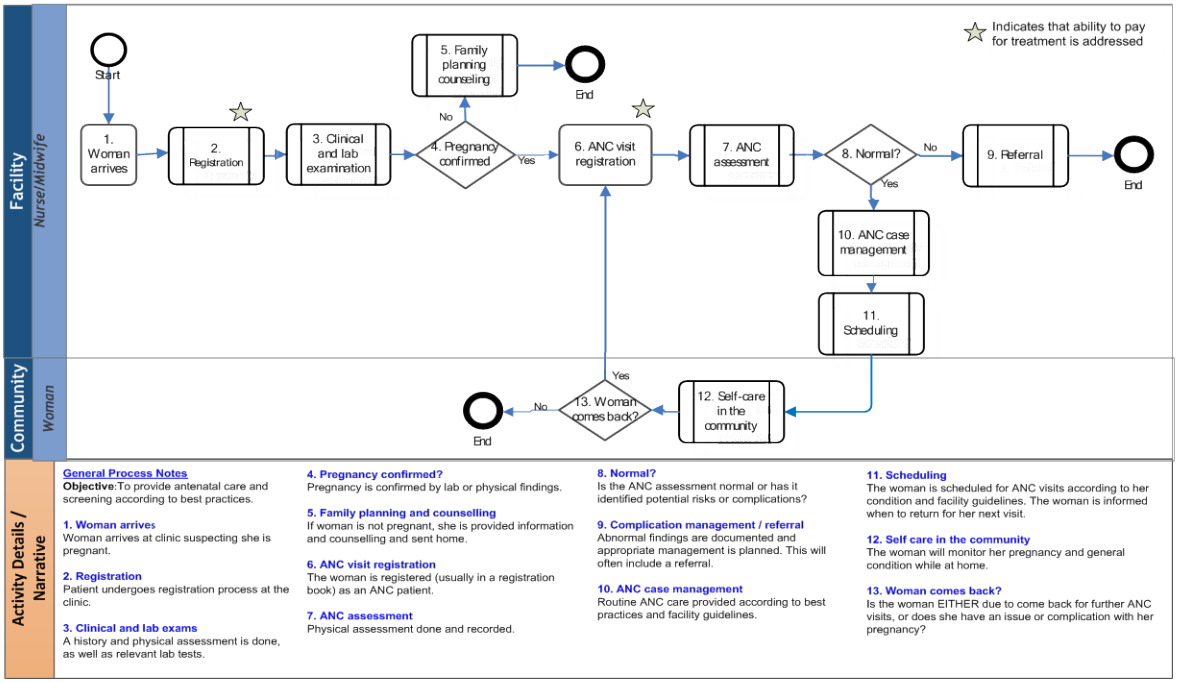
3. Woman goes directly to health center?
The woman may already know the process and decide to go directly to the health center for antenatal care (ANC).

4. Register into health system
The woman is identified in the health center as a pregnant woman to be followed. This is typically includes entry into some kind of ANC register.

5.Community screening
The CHW as part of her normal activities screens for women who are potentially pregnant

7. Woman counselled and advised to go to Health Center
The CHW counsels the woman and explains she should seek medical care to ensure the health of herself and her baby. The CHW may also provide her with details of clinic hours and directions.

8. Woman agrees to go to Health Center for ANC?
The woman will decide if she wants to seek ANC care at this time. If not the CHW will continue to follow up.



Activity Details / Narrative

General Process Notes
Objective:To provide antenatal care and screening according to best practices.

1. Woman arrives
Woman arrives at clinic suspecting she is pregnant.

2. Registration
Patient undergoes registration process at the clinic.

3. Clinical and lab exams
A history and physical assessment is done, as well as relevant lab tests.

4. Pregnancy confirmed?
Pregnancy is confirmed by lab or physical findings.

5. Family planning and counselling
If woman is not pregnant, she is provided information and counselling and sent home.

6. ANC visit registration
The woman is registered (usually in a registration book) as an ANC patient.

7. ANC assessment
Physical assessment done and recorded.

8. Normal?
Is the ANC assessment normal or has it identified potential risks or complications?

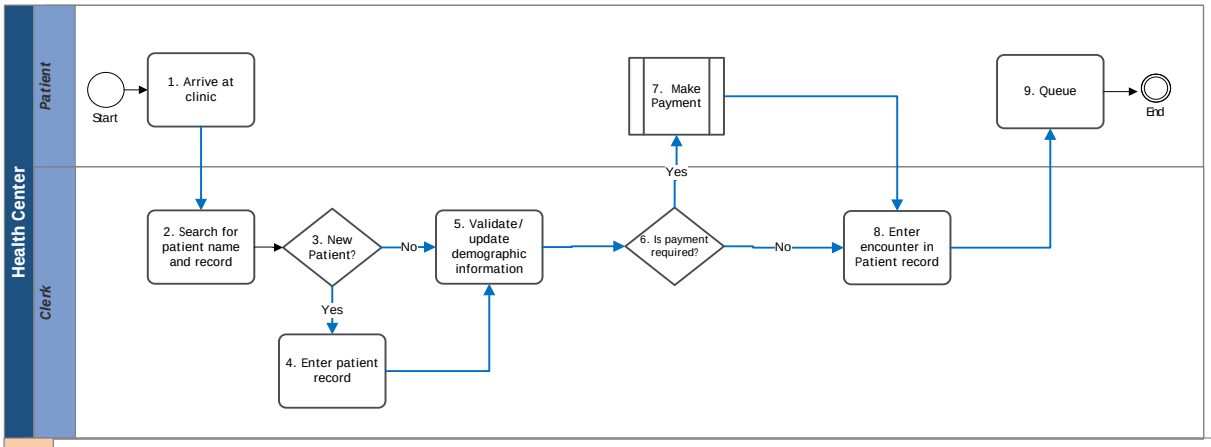
9. Complication management / referral
Abnormal findings are documented and appropriate management is planned. This will often include a referral.

10. ANC case management
Routine ANC care provided according to best practices and facility guidelines.

11. Scheduling
The woman is scheduled for ANC visits according to her condition and facility guidelines. The woman is informed when to return for her next visit.

12. Self care in the community
The woman will monitor her pregnancy and general condition while at home.

13. Woman comes back?
Is the woman EITHER due to come back for further ANC visits, or does she have an issue or complication with her pregnancy?



Activity Details / Narrative

General Process Notes
Objective: Initiate record of patient visit and validate Patient identification and insurance coverage

1.Arrive at clinic
The patient arrives at the service delivery point. Service delivery could include scheduled sessions at health centers/clinic, single visits to health center/ clinic, follow up appointments, etc.

2. Search patient name and record
Retrieve patient record through identifying information collected. A search will need to be done first on all patients in order to avoid duplicates

3. New patient?
Identify whether the patient has an existing record or is a first-time user.

4. Enter patient record
Create a patient record in the system for new Patients. Record demographic information with proof of identification.

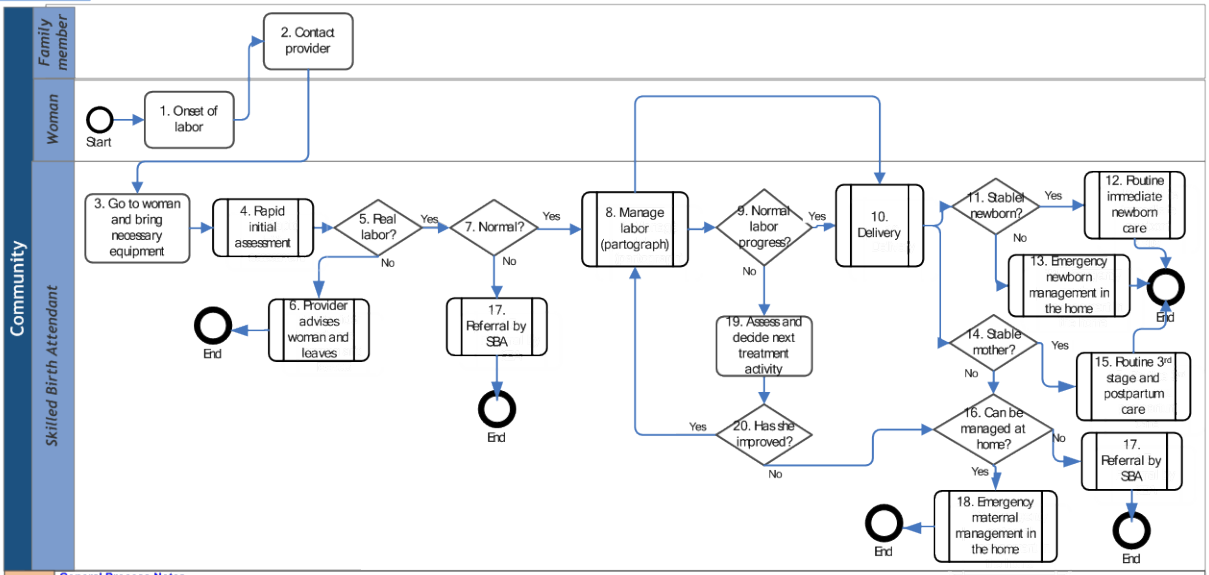
5. Validate/update demographic information
Display patient information that can be edited for updates so the clerk can verify identification of patient.

6. Is payment required?
Does the patient need to pay for services? They may have insurance, or the service may be free of charge, or they may be required to pay in advance.

7. Make payment
Pay coverage for visit. This sub- process will take place at either the cashier or insurance office depending on coverage and time.

8. Enter encounter in Patient record
Document current encounter to create record of the visit.

9. Queue
Wait for clinician to conduct consult. Clinic will assign order according to the prioritization process based on time of arrival.



Activity Details / Narrative

General Process Notes

Objective: Safe delivery in the woman's home/ community.

1. Onset of labor
The woman begins to have regular contractions.

2. Call provider
The family member (or the woman) notifies the skilled birth attendant (SBA).

3. Go to woman and bring necessary equipment
SBA goes to the woman.

4. Rapid initial assessment
The woman is assessed according to best practice.

5. Real labor
Based on physical exam, the SBA determines if the woman is in labor.

6. Provider advises woman and leaves.
If the SBA determines the woman is not in labor, she provides advice on what to watch for and when to contact her again. The SBA leaves.

7. Normal?
Is the woman in labor, with no signs of complications?

8. Manage labor
The SBA monitors the woman for progress of labor and for any signs of complications.

9. Normal labor progress?
Is the labor progressing according to the normal limits of the partogram?

10. Delivery
The woman delivers the baby, assisted by the SBA.

.11.Stable newborn?
Is the newborn crying, moving, and without significant anomalies?

12. Routine immediate newborn care
Newborn cared for according to best practices.

13. Emergency newborn management in the home
Emergency interventions performed according to best practices for the complications.

14. Stable mother?
Are there any complications with the mother?

15. Routine 3rd stage and post partum care
Routine care for the mother without complications.

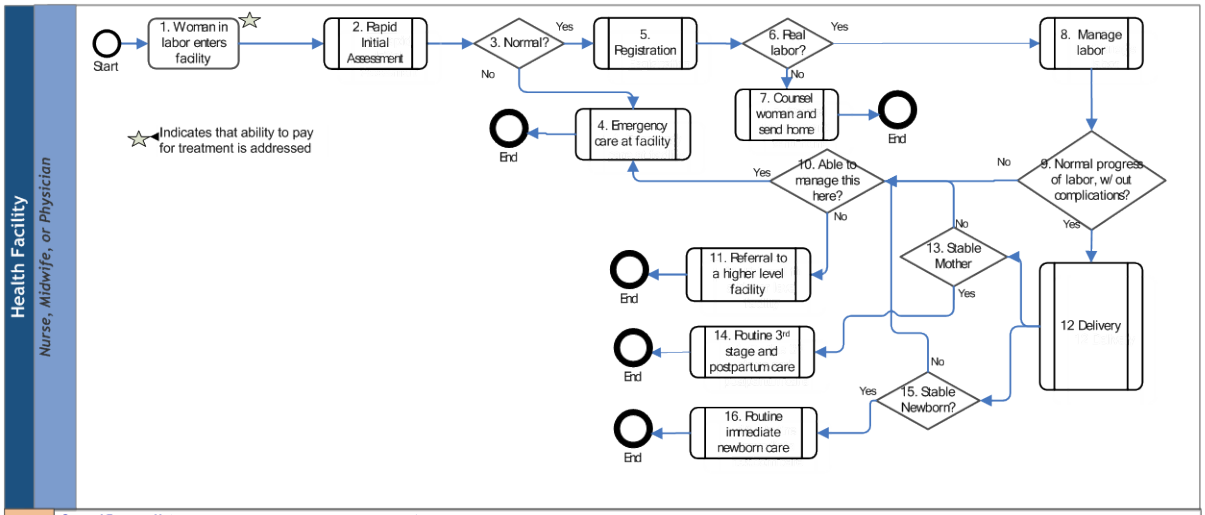
16. Can be managed at home?
SBA determines if the woman (and any complication) can be managed in home, or if transfer is needed.

17. Referral by SBA
The SBA refers mother to higher level of care (usually will require a transfer).

18. Emergency maternal management in the home
Emergency interventions are performed according to best practice. The intention is to resolve the complication at home.

19. Assess and decide next treatment activity
The SBA determines how best to manage labor that is not progressing according to best practices.

20. Has she improved?
Has the woman responded well to the treatment/ intervention?



Activity Details / Narrative

General Process Notes
Objective: Safe delivery in a facility according to best practice.

1. Woman in labor enters facility
A woman arrives at the facility in labor.

2. Rapid initial assessment
The woman is assessed according to best practice.

3. Normal?
Is the assessment within the range of normal for routine management? Typically according to posted guidelines and best practices.

4. Emergency care at facility
Interventions and care provided for complications as per protocol and best practice.

5. Registration
The woman is registered at the primary facility and routine care protocol is followed.

6. Real labor?
Based on physical exam, the HCW determines if the woman is in labor.

7. Council woman and send home
If not in labor, advise woman signs to look for and when to return. Woman is sent home.

8. Manage labor
The HCW monitors the woman for progress of labor and for any signs of complications.

9. Normal progress of labor without complications?
Is the labor progressing normally? Are there any complications?

10. Able to manage this here?
Can complications be managed in this facility?

11. Referral to higher level facility
If the complication can not be managed appropriately, the woman will need to be referred and transferred to a facility capable of providing the care she needs.

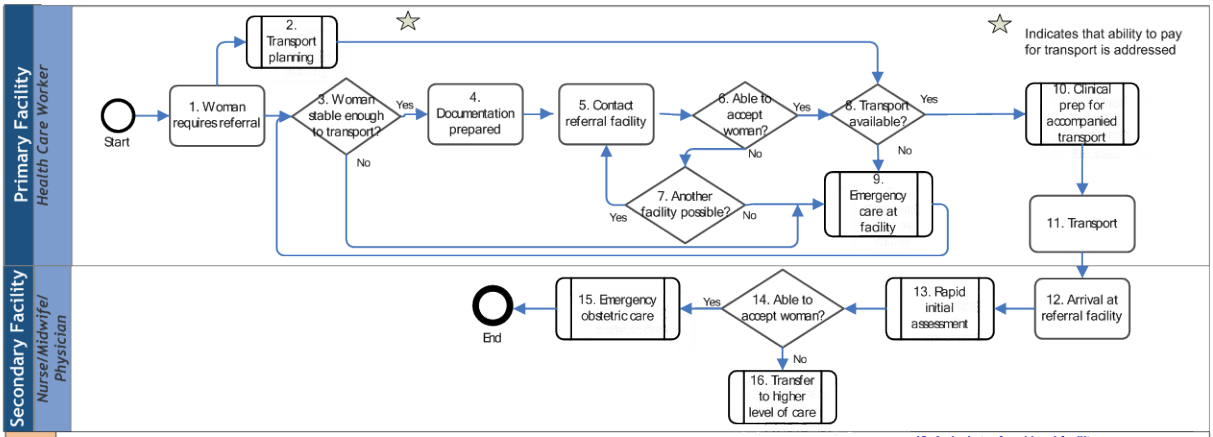
12. Delivery
The woman delivers the baby assisted by the HCW.

13. Stable mother?
Are there any complications with the mother?

14. Routine 3rd stage and post partum care
Routine care for the mother without complications.

15. Stable newborn?
Is the newborn crying, moving and without significant anomalies?

16. Routine immediate newborn care
Newborn cared for according to best practices.



Activity Details / Narrative

General Process Notes

Objective: The appropriate and timely referral of a woman with complications to a higher level of care.

1. Woman requires a referral
The HCW has determined the woman has a risk factor or complication that cannot be treated at the current location and will require referral.

2. Transport planning
Arrangements are made for transport based on availability and the woman's condition.

3. Woman stable enough to transport?
Is her condition stable or will transportation pose a greater risk?

4. Documentation Prepared
Prepare appropriate documentation to hand off care and inform receiving provider of the situation. If the patient is to go unaccompanied by a health provider, the appropriate referral paperwork is given to family.

5. Contact referral facility
The referring provider contacts the receiving facility to inquire/inform about potential transfer.

6. Able to accept woman?
Is the receiving facility able to accept the transfer?

7. Another facility possible?
If the intended facility can not accept the referral, are there other options?.

8. Transport available?
Is there appropriate transport available (ambulance, private car etc)?

9. Emergency care at facility
If transfer is not possible, the patient will need to be managed as well as possible locally. This is not ideal and efforts should continue to transfer.

10. Clinical prep for accompanied transport
Patient prepared for transport.

11. Transport
Patient is transported to referral center.

12. Arrival at referral level facility.
Patient arrives at receiving facility.

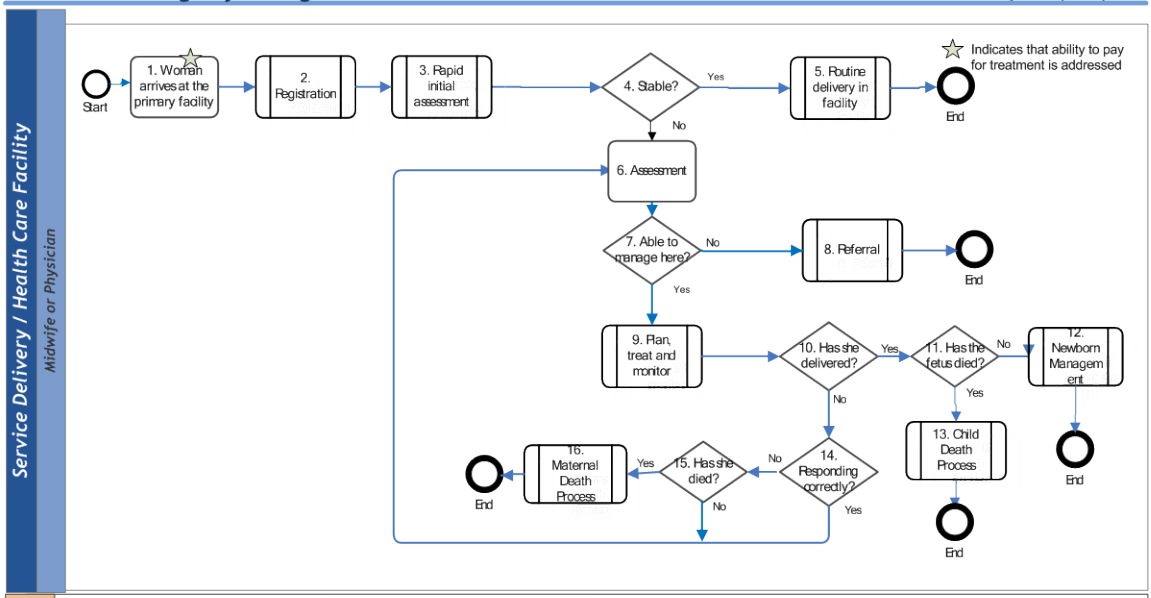
13. Rapid initial assessment
The woman is assessed according to best practice.

14. Able to accept woman?
Can the receiving facility manage the care needed? If not she will need to be transferred to a higher level of care.

15. Emergency Obstetrical Care
The process for emergency care is done.

16. Transfer to higher level of care
This is essentially this same process, although now this new facility becomes the sending facility.

7. Obstetric Emergency Management Process



Activity Details / Narrative

General Process Notes

Objective: The care and delivery of a woman at risk for complications.

1. Woman arrives at the primary facility
The woman arrives either in labor or experiencing some complication or symptoms.

2. Registration
The woman is registered as a patient at the facility. This may be done in an abbreviated manner if she appears in distress.

3. Rapid initial assessment
The woman is assessed by the health worker.

4. Stable?
Is the assessment within the range of normal for routine management? Typically according to posted guidelines and best practices.

5. Routine delivery in facility
The woman is registered at the primary facility and routine care protocol is followed (see sub process for details).

6. Assessment
Detailed clinical assessment is done and recorded.

7. Able to manage here?
Health worker determines if the woman's condition meets the requirements for transfer to a higher level of care.

8. Referral
A referral and transfer is arranged.

9. Plan, treat and monitor
A treatment plan will often be a standard, or somewhat modified plan according to best practice. Treatment will also be followed and adjusted according to the monitoring of the woman's condition. Treatment may include deliverY.

10. Has she delivered?
The treatment plan will be followed (adjusting as necessary) for each stage of labor.

11. Has the fetus died?
Determine if the fetus has died. (no fetal heart heard, no movement).

12. Newborn management
Care and assessment of the newborn.

13. Child death process
Follow the process outlined by the facility for a child death (still birth).

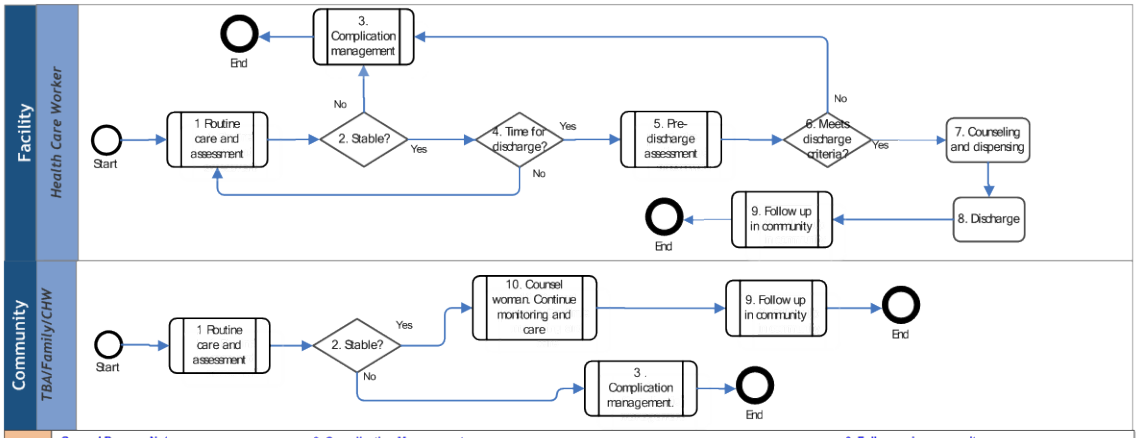
14. Responding correctly?
The health care worker determines if the treatment plan is effective. Tools used to determine this may include a partogram.

15. Has she died?
Did the woman die?

16. Maternal death process
Follow the process outlined by the facility when encountering a maternal death in facility (proper notifications and documentations).

8. Routine Postnatal Care Process

Maternal Health Information System (MHIS)



Activity Details / Narrative

General Process Notes

Objective: The appropriate care of women during the immediate postpartum period. This starts after the baby and the placenta are delivered

1.Routine care and assessment
Immediate post delivery care of mom and babe according to assessment and best practices.

2. Stable?
Is the woman's condition normal or are there complications

3. Complication Management
If there are complications identified, they are managed by the provider according to best practices. This process has several components which may include transfer or referral. If the complication is in the community- referral should be strongly encouraged.

4.Time for discharge??
According to best practice and policy, is this the timeframe for discharge?

5. Pre discharge assessment
Assess woman prior to discharge to ensure there are no complications.

6. Meet discharge criteria?
Is the woman's condition normal and fit for discharge or are there complications.

7. Counselling and dispensing
The woman is informed of follow up appointment, when to report complications with her or baby, family planning discussed and any medication necessary is dispensed.

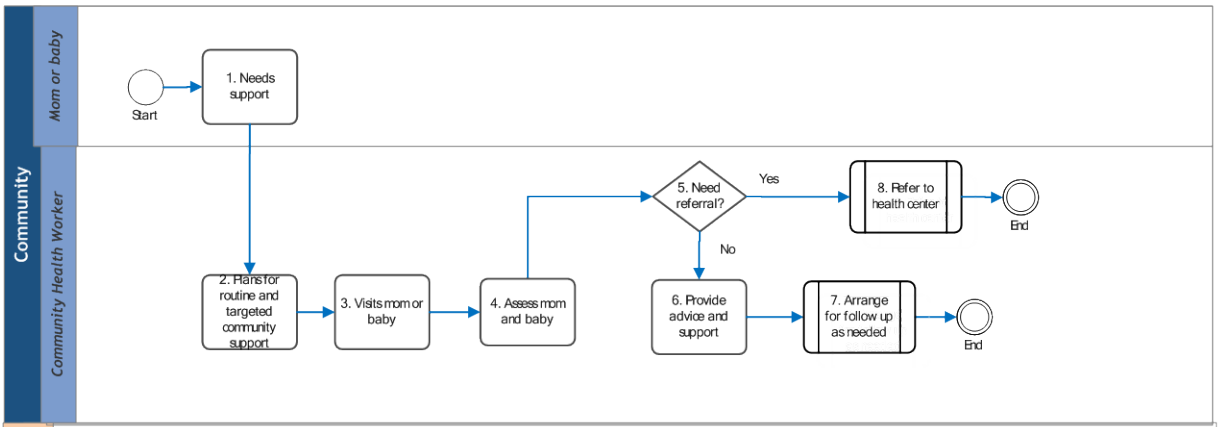
8. Discharged
Is the mom and baby are discharged.

9. Follow up in community
The woman is followed up according to instructions and best practices (usually a return visit to health center at 6 weeks and visits by the CHW).

10. Counsel woman , continue monitoring and care
Education, counselling and monitoring of condition until the woman is stable and the assistant is able to leave.

9. Community Health Support

Maternal Health Information System (MHIS)



Activity Details / Narrative

General Process Notes

Objective: Provide routine support for the woman and child in the community. In addition to individual support, the CHW also provides ongoing health promotion and education beyond individual support.

1. Needs support
The Mother (or the babe) is in need of support. There could be many reasons for this, including a new mother unsure of how best to care for her baby, a woman having difficulty breastfeeding, etc.

2. Plans for routine and targeted community support
The CHW will plan the best support options based on the needs of her community. This may include group infant care classes if there are several new parents, or individual care and follow up, depending on need.

3.Visits mom and baby
The CHW will visit Both the mother and baby routinely, just to "check in" and offer ad hoc advice based on needs, or when there are potential issues (such as the moother having difficulty breast-feeding).

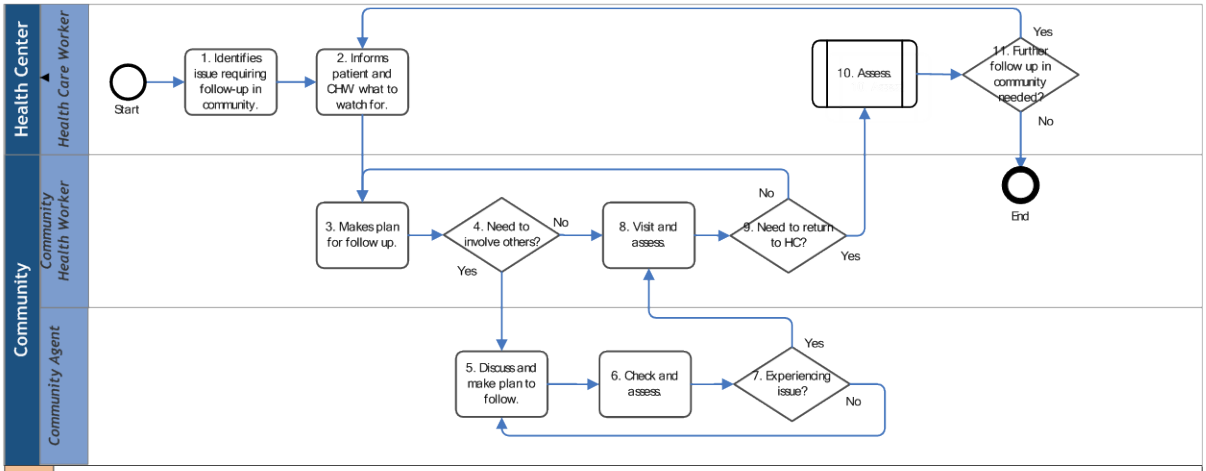
4. Assess mom and baby
The CHW will assess the mother and baby to identify any areas of concern – such as the baby not gaining weight, of the mother having temperature or abnormal discharge.

5. Need referral?
Does the Mom or Babe have a risk factor or condition that requires referral to a health center? Examples may include mastitis, failure to thrive or failure of the infant to put on weight, requests for family planning, etc.

6. Provide advice and support
The CHW can provide advice and support to the mom.

7. Arrange follow- up as needed
The CHW will make a plan with the mother for appropriate follow up. this may be routine or targeted.

8. Refer to health center
If the CHW determines the mother or baby will require medical care beyond what she can provide- she will refer them to the health center. This often includes an accompanying note or communication to the health care workers providing a brief history of the issue or concern.



Activity Details / Narrative

General Process Notes

Objective: The follow up for a woman or baby in the community. This is when there is a known issue or for routine follow up (such as post partum).

1. Identifies issue requiring community follow up
The HCW identifies a woman or baby That require follow up and monitoring in the community.

2. Informs patient and CHW what to watch for
The HCW will provide some education and information for symptoms to monitor and what to do if they are present.

3. Makes plan for follow up
The CHW makes a plan for follow up, which includes frequency of visits and things, like will she visit the woman or have the woman visit her.

4. Need to involve others?
Depending on the circumstances, it may be necessary to involve the woman's family or other community support.

5. Discuss and make plan to follow
The community agent/family member will discuss the circumstances with the CHW and determine how best to follow the woman.

6. Check and Assess
The community agent/family member will monitor the woman as instructed.

7. Experiencing Issue?
Is the woman or baby are experiencing complication or warning signs?

8. Visit and assess
The CHW as part of her planned activities, or as the result of a request from the community agent/family member, will assess the woman and baby.

9. Need to return to the HC?
The woman may need to return to the HC either as the result of a complication or danger sign, or because of a scheduled follow-up appointment with the health worker.

10. Assess
The woman or baby are assessed at the health center, by a HCW.

11. Further follow up in community needed?
Based on the situation the HCW will decide if continued follow up and monitoring in the community is needed.

Appendix 2: Requirements

General Content Notes- there are a few broad themes which have been repeated throughout the requirements. They are outlined here, rather than being expanded on each Business Process Requirement	
Theme/area	System Requirement (the system must or should)
Decision Support	provide context specific information in response to the entry of clinical data
	provide a way to define rules for alerts
	provide more than one way to present an alert- for example- a pop up screen that requires acknowledgement at the time of entry, a highlighted value with message (value turns read and note displayed lab result above normal) that does not require acknowledgement
	provide a way to combine data from multiple sources (forms, lab) to generate alert
	offer context sensitive reference material on denamand
	provide a way to add and link reference material based on rules, categories, key words
Record clinical data	provide a data entry screen that supports the entry of discrete data
	allows a data entry screen to be set up to support a protocol - allowing multiple data types and configurations
	support multiple languages
	provide a way to attach codes to discrete data without requiring the user to these codes
	must be able to identify some fields as mandatory
	must be able to request additional data based on data given (for example- does the baby have any anomalies? If yes describe)
Review clinical data	allow for multiple configurations to display data
	provide graphing
	highlight abnormal values
Mobile adaptations	allow for simplified methods for data entry- such as voice recording for later transcription
	adjust display to fit small sceens (such as mobile phones)
	provide audio cues for alerts

Business process 1—Case Detection Objective: The identification of a pregnant woman so she can be followed by the appropriate health provider.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
1.1.1	Woman suspects she is pregnant	Patient	Provide general community education
1.2.1	Decides to seek advice from CHW	Patient	Provide a means for a patient to request specific information
1.2.2	Decides to seek advice from CHW	Patient	In response to a query : provide specific information on how to access the CHW in her area
1.2.3	Decides to seek advice from CHW	Patient	Allow a community user to self register for service (CHW service)
1.3.1	Woman goes directly to health center	Patient	Provide a means for a patient to request specific information
1.3.2	Woman goes directly to health center	Patient	In response to a query : provide specific information on how to access the Health Center in her area
1.4.1	Register into health system	HCW	See sub process for registration
1.4.2	Register into health system	HCW	Allow for specific registration into ANC
1.5.1	Community screening	CHW	Provide remote access to input, modify and view lists of women of childbearing age and their status
1.5.2	Community screening	CHW	Assist in the tracking and monitoring of potential pregnancies by sorting and reporting on specific attributes (such as last seen, noting pregnancy suspicions etc)
1.6.1	Woman counseled and advised to go to HC	CHW	provide a way to alert HC of potential patient
1.7.1	Woman agrees to go to HC	CHW	provide a way for the CHW to set a reminder to follow up with woman
1.8.1	Woman agrees to go to HC	CHW	provide a way for the woman to opt in to scheduled reminders or targeted pregnancy information

Business process 2—Routine antenatal care Objective: To provide antenatal care and screening according to best practices.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
2.1.1	Woman arrives	Nurse/Midwife	None
2.2.1	Registration	Nurse/Midwife	See subprocess for details
2.3.1	Clinical and lab exam	Nurse/Midwife	Provide identification information for patient
2.3.2	Clinical and lab exam	Nurse/Midwife	Provide a review of any past medical history previously entered
2.3.3	Clinical and lab exam	Nurse/Midwife	Provide a standardized form for the entry of clinical data
2.3.4	Clinical and lab exam	Nurse/Midwife	Provide a list of tests that the HCW can order
2.3.5	Clinical and lab exam	Nurse/Midwife	Print a requisition for the lab test, which includes required information for performing the test[2]
2.4.1	Pregnancy confirmed	Nurse/Midwife	Provide a place to document pregnancy (this should be accompanied by specific information such as last menstrual period [LMP] and estimated due date
2.4.2	Pregnancy confirmed	Nurse/Midwife	Calculate gestational age (based on LMP)
2.5.1	Family Planning (FP) and counseling	Nurse/Midwife	Provide a standardized form for the entry of FP information
2.5.2	Family Planning and counseling	Nurse/Midwife	Provide information about resources and alternatives to allow for informed decisions
2.6.1	Antenatal care (ANC) visit registration	Nurse/Midwife	Provide a standardized form for the entry of ANC information
2.6.2	ANC visit registration	Nurse/Midwife	Provide a list or roster of all antenatal women
2.6.3	ANC visit registration	Nurse/Midwife	Provide tools to search, sort, and filter the antenatal database
2.6.4	ANC visit registration	Nurse/Midwife	Print a copy of the ANC information that replicates the paper antenatal register
2.7.1	ANC assessment	Nurse/Midwife	Provide a standardized form for the entry of ANC information
2.7.2	ANC assessment	Nurse/Midwife	Provide real-time range checks and data integrity checks on data
2.8.1	Normal	Nurse/Midwife	Provide decision support as appropriate for users based on data entered
2.8.2	Normal	Nurse/Midwife	Suggest appropriate treatments/investigations based on findings
2.8.3	Normal	Nurse/Midwife	Provide access to context appropriate information to inform decisions
2.9.1	Referral	Nurse/Midwife	See subprocess for details
2.10.1	ANC case management	Nurse/Midwife	Provide decision support as appropriate for users based on data entered[3]
2.10.2	ANC case management	Nurse/Midwife	Provide tools to promote care protocols
2.11.1	Scheduling	Nurse/Midwife	Display a schedule of available days
2.11.2	Scheduling	Nurse/Midwife	Allow for the input of custom schedules to allow for visits on specific days/times, account for holidays and vacations, etc.
2.11.3	Scheduling	Nurse/Midwife	Display number of existing visits per day (to allow for balancing)
2.11.4	Scheduling	Nurse/Midwife	Indicate (based on protocol) the preferred days for follow-up visit
2.11.5	Scheduling	Nurse/Midwife	Record identification and tracking information (such as cell phone number) for patient in schedule
2.12.1	Self care in the community	Woman	Provide a source of accurate health information accessible and appropriate for lay persons (this may include both pull and push options)

[2] This minimum data may vary by location and by test.

[3] The rules and specifics of this decision support will vary by area and by finding, and may take the form of alerts or information messages, flags on data, etc.

ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
2.12.2	Self care in the community	Woman	Provide information messages in a way that ensures patient confidentiality
2.13.1	Woman comes back?	Woman	provide a list of scheduled visits to allow for defaulters to be traced
2.13.2	Woman comes back?	Woman	provide the ability to "check in" for a scheduled visit
2.13.3	Woman comes back?	Woman	identify the date of the last attended visit

Business process 3—Registration Objective: Initiate record of patient visit and validate patient identification and insurance coverage.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
3.1.1	Patient Arrives	Patient	None
3.2.1	Search for patient name and record	Registration clerk	Search if patient is already in system (using at least 2 identifiers)
3.2.2	Search for patient name and record	Registration clerk	Display sufficient data[4] to confirm patient
3.2.3	Search for patient name and record	Registration clerk	Require a user to search if a patient is already in the system prior to starting a new medical record entry[5]
3.2.4	Search for patient name and record	Registration clerk	Read patient information from a bar code on a patient identification and pull up patient information[6]
3.3.1	New Patient?	Registration clerk	Provide sufficient data to rule out this patient is already in the system
3.4.1	Enter patient record	Registration clerk	If this is a returning visit, the visit should be added to the previous visit (to show they are related)[7]
3.4.2	Enter patient record	Registration clerk	Must be able to enter identification information (demographics)[8]
3.4.3	Enter patient record	Registration clerk	Indicate mandatory fields that must be filled out for registration to be valid
3.4.4	Enter patient record	Registration clerk	Generate encounter number for visit[9]
3.4.5	Enter patient record	Registration clerk	Generate or associate to existing hospital or clinic medical record number (MRN)[10]
3.4.6	Enter patient record	Registration clerk	Allow edits to fields on screen before information is committed[11]
3.4.7	Enter patient record	Registration clerk	Allow for a temporary identification in emergency situations when full identity unknown[12]
3.5.1	Validate/Update demographic information	Registration clerk	Display patient information for validation (and allow edits)[13]
3.5.2	Validate/Update demographic information	Registration clerk	Allow for updates to demographic information[14]
3.5.3	Validate/Update demographic information	Registration clerk	Retains previous history of updated information[15]
3.5.4	Validate/Update demographic	Registration clerk	Allow attachment of a digital photograph to the patients record[16]

[4] Date of birth, gender, parents name, village, last visit/encounter.

[5] This should be a "smart search" that presents options as characters are typed.

[6] Could this also be a magnetic strip?

[7] This would be for follow up to receive lab results or something similar.

[8] What information should be captured, mandatory and desired, needs to be defined. The patient record should include community health worker's name.

[9] System generated for encounter.

[10] System generated hospital or clinic MRN.

[11] The person entering data should be able to go backwards on screen to change information during the entry process.

[12] This could also be used for registration of babies after delivery.

[13] The system must allow for edits, although this can be in a separate action (such as by clicking the edit button).

[14] This should include community health worker as part of information.

[15] This is important for both audit and potential reconstruction of information (such as tracking disease outbreaks, recalls retrospectively).

[16] This may be entered or confirmed when the patient pays their annual dues (could be updated for children annually).

	information		
3.5.5	Validate/Update demographic information	Registration clerk	Allow photo to be viewable to confirm patient identity
3.6.1	Is payment required?	Registration clerk	Provide information regarding payment based on reason for visit or insurance information[17]
3.7.1	Make payment	Patient	Provide sufficient information to calculate the amount of the payment[18]
3.8.1	Enter encounter in patient record	Registration clerk	Indicate patient has arrived for scheduled visit[19]
3.8.2	Enter encounter in patient record	Registration clerk	Certain activities, such as checking in a visit or entering a new patient should make the status of a patient something like "arrived" or waiting to be seen[20]
3.8.3	Enter encounter in patient record	Registration clerk	Record a time/date-stamped new visit (encounter)
3.8.4	Enter encounter in patient record	Registration clerk	Able to enter service patient is there to see/visit[21]
3.9.1	Queue	Registration clerk	Create a patient queue by service or provider/area according to time stamp
3.9.2	Queue	Registration clerk	Queue will need to be time stamped with arrival time
3.9.3	Queue	Registration clerk	Queue should also indicate and sort according to arrival time or special needs[22]

[17] This should be based on specific rules for procedure costs /payment or co-pay.

[18] This sub process may vary by site and policy.

[19] This should be connected to the schedule system, and the registration clerk should be able to change the status of the visit to “arrived” or “waiting.”

[20] These statuses could be used to create the patient queues (a list of patients waiting to be seen that are physically present).

[21] This should be a drop-down list.

[22] The exact nature of this sequencing still needs to be further defined.

Business process 4—Routine delivery in the community Objective: Safe delivery in the woman's home/community.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
4.1.1	Onset of labor	family member	NA
4.2.1	Contact provider	woman	NA
4.3.1	Go to woman and bring necessary equipment	Skilled Birth Attendant	NA
4.4.1	Rapid initial assessment	Skilled Birth Attendant	see note - data entry, decision support + mobile
4.5.1	Real labor?	Skilled Birth Attendant	see note- decision support + mobile
4.6.1	Provide advice	Skilled Birth Attendant	provide follow up access to information for the patient
4.7.1	Normal	Skilled Birth Attendant	see note- decision support + mobile
4.8.1	Manage labor	Skilled Birth Attendant	provide a graphic review of the data- in partograph form
4.9.1	Normal labor progress?	Skilled Birth Attendant	see note- decision support + mobile
4.10.1	Delivery	Skilled Birth Attendant	create a separate but linked chart for each baby
4.10.2	Delivery	Skilled Birth Attendant	allow initial data entry to be on a single screen- but can separate baby information if needed
4.11.1	Stable newborn?	Skilled Birth Attendant	see note- decision support + mobile
4.12.1	Routine immediate newborn care	Skilled Birth Attendant	see note- data entry + mobile
4.13.1	Emergency newborn management in the home	Skilled Birth Attendant	see note - data entry, data review, decision support + mobile
4.14.1	Stable mother	Skilled Birth Attendant	see note- decision support + mobile
4.15.1	Routine 3rd stage and PP care	Skilled Birth Attendant	see note- data entry + mobile
4.16.1	Can be managed at home?	Skilled Birth Attendant	see note- decision support + mobile
4.17.1	Referral by SBA	Skilled Birth Attendant	see referral process for further details
4.18.1	Emergency maternal management at home	Skilled Birth Attendant	see note - data entry, data review, decision support + mobile

4.19.1	Assess and decide next treatment	Skilled Birth Attendant	see note - data entry, data review, decision support + mobile
4.20.1	Has she improved?	Skilled Birth Attendant	see note- decision support + mobile

Business process 5—Routine delivery in a health facility Objective: Safe delivery in a facility according to best practices.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
5.1.1	Woman in labor enters	Nurse, midwife or physician	NA
5.2.1	Rapid Initial Assessment	Nurse, midwife or physician	see note- data entry
5.3.1	Normal?	Nurse, midwife or physician	see note- decision support
5.4.1	Emergency care at facility	Nurse, midwife or physician	see note - data entry, decision support and data review
5.5.1	Registration	Nurse, midwife or physician	see registration subprocess
5.6.1	Real labor?	Nurse, midwife or physician	see note- decision support
5.7.1	Counsel and send home	Nurse, midwife or physician	ability to print follow up instructions
5.7.2		Nurse, midwife or physician	provide reminder to follow up with woman in set period of time
5.8.1	mange labor	Nurse, midwife or physician	see note - data entry, decision support and data review
5.9.1	normal labor progress?	Nurse, midwife or physician	see note- decision support
5.10.1	able to manage this here?	Nurse, midwife or physician	see note- decision support
5.11.1	referral	Nurse, midwife or physician	see referral subprocess
5.12.1	delivery	Nurse, midwife or physician	create a separate but linked chart for each baby
5.12.2		Nurse, midwife or physician	allow initial data entry to be on a single screen- but can separate baby information if needed
5.13.1	stable mother?	Nurse, midwife or physician	see note- decision support
5.14.1	routine 3rd stage care	Nurse, midwife or physician	see note - data entry, decision support and data review
5.15.1	stable newborn?	Nurse, midwife or physician	see note- decision support
5.16.1	routine immediate newborn care	Nurse, midwife or physician	see note - data entry, decision support and data review

Business process 6—Referral from primary to secondary facility Objective: The appropriate and timely referral of a woman with complications to a higher level of care.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
6.1.1	Woman requires referral	HCW	Provide context-sensitive, real-time decision support (alerts, advice, resources)
6.1.2	Woman requires referral	HCW	Display referral criteria
6.2.1	Transport planning	HCW	Display a checklist of activities to prepare for transport
6.2.2	Transport planning	HCW	Provide communication support to manage transport (such as short message service [SMS] to ambulance to check availability)
6.2.3	Transport planning	HCW	Support payment for transport if needed (such as a voucher to be paid at receiving facility)
6.2.4	Transport planning	HCW	Provide up-to-date list of transport providers with contact information
6.3.1	Woman stable enough to transport?	HCW	Provide context-sensitive, real-time decision support (alerts, advice, resources)
6.4.1	Documentation prepared	HCW	Provide a transfer report based on a predefined format
6.4.2	Documentation prepared	HCW	Populate the transport report from fields previously entered (providing a relevant history)
6.4.3	Documentation prepared	HCW	Print the transport report
6.4.4	Documentation prepared	HCW	Send the transport report via secure email to the receiving facility
6.5.1	Contact referral facility	HCW	Provide a list of referral facilities and their contact numbers
6.5.2	Contact referral facility	HCW	Maintain an up-to-date and accurate referral list that can be updated and viewed by multiple parties (web based)
6.6.1	Able to accept woman?	HCW	Provide sufficient information in referral request for referral site to determine if they can treat the woman
6.6.2	Able to accept woman?	HCW	Support an up-to-date call list
6.6.3	Able to accept woman?	HCW	Support a simple bed or referral management (identify available beds and pending transfers)
6.7.1	Another facility possible?	HCW	Support referral management across multiple facilities—shared bed or resource management
6.7.2	Another facility possible?	HCW	Identify the next referral option based on condition and capacity
6.8.1	Transport available?	HCW	See transport planning activity
6.9.1	Emergency Care at facility	HCW	Allow for data sharing to obtain remote advice (telemedicine)
6.9.2	Emergency Care at facility	HCW	Provide context-sensitive, real-time decision support (alerts, advice, resources)

6.10.1	Clinical prep for accompanied transport	HCW	Provide checklist to assist clinician
6.10.2	Clinical prep for accompanied transport	HCW	Provide printable instructions to give to family or transport attendants
6.11.1	Transport	HCW	None
6.12.1	Arrival at referral facility	Nurse/Midwife/Physician	Notify sending facility that patient has arrived
6.12.2	Arrival at referral facility	Nurse/Midwife/Physician	Provide access to medical and obstetrical information on patient (this may include a printed report or online access to history)
6.13.1	Rapid initial assessment	Nurse/Midwife/Physician	Provide context-sensitive, real-time decision support (alerts, advice, resources)
6.13.2	Rapid initial assessment	Nurse/Midwife/Physician	Provide standardized data entry for assessment data
6.13.3	Rapid initial assessment	Nurse/Midwife/Physician	Allow the user to review past medical history and obstetrical history
6.14.1	Able to accept woman?	Nurse/Midwife/Physician	Provide facility bed/resource information for decision-making
6.14.2	Able to accept woman?	Nurse/Midwife/Physician	Support referral management across multiple facilities—shared bed or resource management
6.14.3	Able to accept woman?	Nurse/Midwife/Physician	Provide context-sensitive, real-time decision support (alerts, advice, resources)
6.15.1	Emergency obstetric care	Nurse/Midwife/Physician	See sub process for details
6.16.1	Transfer to higher level of care	Nurse/Midwife/Physician	Repeat of this sub process

Business process 7—Obstetric emergency management Objective: The care and delivery of a woman at risk for complications.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
7.1.1	Woman arrives	Midwife or Physician	NA
7.2.1	Registration	Midwife or Physician	See registration sub process
7.3.1	Rapid initial assessment	Midwife or Physician	see note- data entry
7.4.1	Stable?	Midwife or Physician	see note- decision support
7.5.1	routine facility delivery	Midwife or Physician	See routine facility delivery process
7.6.1	assessment	Midwife or Physician	see note - data entry, decision support and data review
7.7.1	able to manage here?	Midwife or Physician	see note- decision support
7.8.1	referral	Midwife or Physician	see referral process
7.9.1	plan, treat and monitor	Midwife or Physician	see note - data entry, decision support and data review
7.9.2		Midwife or Physician	support the development of a treatment plan
7.9.3		Midwife or Physician	support the update of a treatment plan
7.9.4		Midwife or Physician	support the modification of treatment plan
7.9.5		Midwife or Physician	access external resources for support (link to other systems or experts)
7.10.1	has she delivered	Midwife or Physician	NA
7.11.1	has fetus died?	Midwife or Physician	NA
7.12.1	Newborn management	Midwife or Physician	see note - data entry, decision support and data review
7.13.1	child death process	Midwife or Physician	link to external reporting system
7.14.1	responding correctly?	Midwife or Physician	see note- decision support
7.15.1	has she died?	Midwife or Physician	NA
7.16.1	Maternal death process	Midwife or Physician	link to external reporting system
7.16.2		system	generate alert to trigger autopsy

Business process 8—Routine postnatal care Objective: The appropriate care of women during the immediate postpartum period.			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
8.1.1	Routine care and assessment	HCW/CHW	see note - data entry, decision support and data review
8.2.1	Stable	HCW/CHW	see note- decision support
8.3.1	Complication maanagement	HCW/CHW	see note - data entry, decision support and data review
8.4.1	Time for discharge	HCW/CHW	see note- decision support
8.5.1	Pre-discharge assessment	HCW/CHW	see note - data entry
8.6.1	Meets discharge criteria?	HCW/CHW	see note- decision support
8.7.1	Counseling and dispensing	HCW/CHW	create a discharge summary
8.7.2	Counseling and dispensing	HCW/CHW	print any needed discharge instructions
8.7.3	Counseling and dispensing	HCW/CHW	order any necessary medication
8.7.4	Counseling and dispensing	HCW/CHW	provide a pick list of relevent medications for discharge
8.7.5	Counseling and dispensing	HCW/CHW	print script for medication so it may be filled in dispensary
8.8.1	Discharge	HCW/CHW	indicate a patient's status of discharged in the system
8.8.2	Discharge	HCW/CHW	indicate the date and time of discharge
8.9.1	Follow up in community	HCW/CHW	see process for community follow up
8.10.1	Counsel woman continue monitoring and care	HCW/CHW	see note - data entry, decision support and data review (mobile)

Business process 9—Community health support Objective: Provide routine support for the woman and child in the community (in addition to individual support, the CHW also provides ongoing health promotion and education).			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
9.1.1	Needs support	Mother or baby	Provide a source of accurate health information accessible and appropriate for the community
9.1.2	Needs support	Mother or baby	Provide a means to connect directly to a CHW if needed (through an SMS?)
9.2.1	Plans for routine and targeted community support	CHW	Provide tools for case load management
9.2.2	Plans for routine and targeted community support	CHW	Allow for the maintenance of rosters of community members meeting specific criteria (such as women of childbearing age)
9.2.3	Plans for routine and targeted support	CHW	Provide planning tools to manage transport, commodities, etc.
9.3.1	Visits mother or baby	CHW	Reminders for visit schedule
9.4.1	Assess mother and baby	CHW	Allow the recording of key observations
9.4.2	Assess mother and baby	CHW	Provide information for common conditions and what to do (protocols)
9.5.1	Needs referral?	CHW	Provide guidelines and alerts to help identify complications
9.6.1	Provide advice and support	CHW	Provide sources for educational materials
9.6.2	Provide advice and support	CHW	Support remote advice and consultation
9.7.1	Arrange for follow-up as needed	CHW	Set reminder for follow-up
9.8.1	Refer to health center	CHW	Send a referral request to health center
9.8.2	Refer to health center	CHW	Means to monitor for the mother or baby to attend at the health center (complete the referral)
9.8.3	Refer to health center	CHW	Produce a list of all pending referrals
9.8.4	Refer to health center	CHW	Allow the health center to complete referrals; this triggers a message back to the CHW
9.8.5	Refer to health center	CHW	Set a reminder for follow-up if referral not completed in set amount of time

Business process 10—Community follow-up Objective: The follow-up for a woman or baby in the community (routine postpartum or when there is a known issue).			
ID	Activity	Entity/ Functional Role	System Requirement (the system must or should)
10.1.1	Identifies issue requiring follow-up in community	HCW	Provide standard protocols for use in routine follow-up
10.2.1	Informs patient and CHW what to watch for	CHW	Provide printed follow-up instructions based on standard issues (discharge instructions)
10.2.2	Informs patient and CHW what to watch for	CHW	Provide online/SMS/voice access to instructions
10.3.1	Makes plan for follow-up	CHW	Provide alerts and reminders for visits or activities
10.3.2	Makes plan for follow-up	CHW	Provide tools to manage schedule and resources
10.4.1	Need to involve others?	CHW	None
10.5.1	Discuss and make plan to follow	Community Agent/Family	Allow for alerts and reminders to be sent to other community agents as appropriate
10.5.2	Discuss and make plan to follow	Community Agent/Family	Provide accessible community-appropriate information which is context sensitive
10.6.1	Check and assess	Community Agent/Family	Remote reporting by family members
10.7.1	Experiencing issue?	Community Agent/Family	Provide a simple way to contact the appropriate help
10.8.1	Visit and assess	CHW	Allow the CHW to record their findings and visits
10.9.1	Need to return to HC?	CHW	Visit reminders to patient, family, and HCW
10.9.2	Need to return to HC?	CHW	Decision support for abnormal symptoms
10.10.1	Assess	HCW	Ability to review past medical information
10.10.2	Assess	HCW	Ability to review updates from CHW or family
10.11.1	Further follow-up in community needed?	HCW	Ability to update treatment plan or protocol
10.11.2	Further follow-up in community needed?	HCW	Provide context-sensitive, real-time decision support (alerts, advice, resources)

General and nonfunctional requirements
System Requirement (the system must or should)
Provide a means to audit usage
Have role-based security options
Be reliable and robust
Provide a means to ensure confidentiality and privacy of personal health information
Have ability to easily back up information
Warn user if no valid backup for more than x days
Data entry screens must be configurable and must support the following data entry methods (pick list, radio buttons, smart search, free text, restricted data types)
Must have the ability to store images or other "blob" type data
Should have additional language support
User should be able to navigate screens with both a mouse and keyboard
Accept data from multiple input methods including paper, online web forms, PC asynchronously, PC synchronously, interactive voice response, bar code, RFID (Radio Frequency Identification)
Support real-time quality control auditing of data entry
Support real-time data entry feedback, preventing data entry errors from being recorded
Have an ability to exchange data with other approved systems
Provide flexible password control to align to national policy and standard operating procedure
Store data centrally in a physically secure location
Allow administrator(s) to maintain and update master tables
Allow system administration by local staff
Incorporate geocoding [GPS (global positioning system)]
Have a report-generation tool that can allow administrators to produce routine and ad hoc reports