



Improving Emergency Obstetric Referrals: A Mixed Methods Study of Barriers and Solutions in Assin North, Ghana

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Abstract

Background: Women in developing countries often face serious health risks during pregnancy and delivery due to poor access to early and appropriate referrals. Despite studies that show clear linkages between timely referrals and improved maternal outcomes, challenges still remain in the referral process, particularly in rural communities.

Objectives: To investigate baseline referral systems in obstetrics in rural Ghana with a focus on describing barriers, solutions and the value of healthcare workers (HCW) in identifying system-based bottlenecks.

Design: A mixed methods approach: for the quantitative component, we reviewed health facility registers; for the qualitative section, we used semi-structured interviews to obtain provider narratives.

Setting: Referral systems in obstetrics in Assin North Municipal Assembly, a rural district in Ghana. This included 1 district hospital, 6 health centers, and 4 local health posts. This work was embedded in an ongoing quality improvement project in the district addressing barriers to existing referral protocols to lessen delays. Eighteen HCWs (8 midwives, 4 community health officers, 3 medical assistants, 2 ER nurses, 1 doctor) at different facility levels within the district were interviewed for the qualitative section.

Results: Between January – June 2012, the leading causes for obstetric referrals to the district hospital were prolonged labor, retained placenta, postpartum hemorrhage, malpresentation of baby, and premature rupture of membranes. From the district hospital to tertiary care hospitals, the leading cause of referrals was severe eclampsia. Delay indicators were not able to be obtained due to poor documentation. From the qualitative study, we identified important gaps in referral processes in Assin North, with the most commonly noted including recognizing danger signs, alerting receiving units, accompanying critically-ill patients, documenting referral cases, and giving and obtaining feedback on referred cases. Main root causes identified by providers were in five domains: 1) individual and socio-cultural factors 2) transportation, 3) communication, 4) clinical skills and management, and 5) standards of care and monitoring, and

suggested interventions that target these barriers. Mapping these challenges allowed for better understanding of next steps for developing comprehensive, evidence-based solutions to identified referral gaps within the district.

Conclusions: Addressing referral processes may hold better promise for reducing maternal mortality if frameworks for designing solutions target multiple referral challenges concurrently. Providers are an important source of information on local referral delays and should be better engaged in identifying the challenges and in the development of approaches to improvement responsive to these gaps. Similar work is needed to integrate their perspectives with those of patients and their communities.

Glossary

bEmOC	- Basic Emergency obstetric care
cEmOC	- Comprehensive Emergency obstetric care
CHO	- Community Health Officer
CHPS	- Community Based Health Planning and Services
CHRP	- Comprehensive Rural Health Project
CPD	- Cephalopelvic disproportion
EmOC	- Emergency obstetric care
GHS	- Ghana Health Service
HCW	- Health care workers
IMMPACT	- Initiative for Maternal Mortality Programme Assessment
MA	- Medical Assistant
MMR	- Maternal Mortality Ratio
MWH	- Maternity Waiting Homes
OL	- Obstructed labor
PFA!	- Project Fives Alive!
PPH	- Postpartum hemorrhage
QI	- Quality Improvement
UNFPA	- United Nations Population Fund
UNICEF	- United Nations Children's Fund
VHW	- Village Health Workers
WHO	- World Health Organization

BACKGROUND

Maternal mortality remains a major challenge to health systems worldwide. It is estimated that every year, about 358,000 women die globally from causes related to pregnancy complications and childbirth. Ninety-nine percent of these deaths occur in developing countries, with 313,000 occurring in South Asia and Sub-Saharan Africa alone ¹. Moreover for every maternal death, 10 to 15 women suffer from disability ². One objective of the Millennium Development Goals is to reduce maternal mortality by 75% between 1990 and 2015, however unlike other regions, sub-Saharan Africa has not seen improvements in indicators linked to maternal mortality, leading to concerns that the Millennium Development targets will not be met.

Maternal Healthcare in Ghana

In Ghana, a population of about 25 million, maternal mortality stands at about 350 deaths per 100,000 live births, reaching higher rates in rural areas³. The 1993 Ghana demographic and health survey found large inequalities in access to prenatal care and institutional delivery, and these have been identified across geographical regions, educational backgrounds, religions, and socioeconomic status ⁴. Other studies have shown similar results, with residents of southern Ghana using more maternal services than those in northern Ghana, and Christians more likely to utilize maternal health services than Muslims or traditional believers ⁵. Even though health surveys over 1993-2003 showed a steady improvement in the proportion of deliveries with skilled attendants, another independent review showed skilled attendant deliveries actually fell from 54% to 35% nationally between 2005 and 2007 ⁶.

Skilled birth attendance, defined as the presence of someone with midwifery skills able to manage a normal delivery, recognize complications, and refer appropriately, is critical to reduce maternal mortality; however ensuring that women deliver at facilities with qualified attendants has been a challenge in the country. Between 1993 and 2003, while institutional deliveries increased from 85% to 90% for the richest quintile, rates for the poorest quintile dropped from 25% to 19%. Only 45% of births were attended by a medical practitioner (79% in urban areas, 33% in rural) in 1998 ^{7,8}, and most unattended deliveries happened at home.

Over the past decade, the Ministry of Health has made efforts to improve rates of skilled delivery, introducing exemptions from institutional delivery fees in April 2005⁸, and national insurance covering antenatal care in July 2008^{9,10}. This was part of a growing movement to improve access to obstetric care, succeeding similar efforts in Burundi (2006), Zambia (2006), Burkina Faso (2006), Kenya (2007), Niger (2008) and Sudan (2008) to name a few⁶. Though impact studies are few and far between, the IMMPACT group in Ghana showed that user fee exemptions increased the proportion of deliveries in health facilities, and the greatest increases occurred among the poorest and least educated women. However the studies also showed that the quality of service did not show any appreciable improvement¹¹. Despite an increase in utilization rates increased in some regions¹², maternal mortality rates did not improve¹³. This suggests that major challenges remain not only in providing women ready access to skilled obstetric services, but also in improving the quality of care in health facilities.

The evidence for emergency obstetric care (EmOC)

One of the biggest barriers confronting efforts to reduce maternal mortality through increased skilled delivery is access to emergency obstetric care. In 1997, the WHO, UNICEF and UNFPA identified and proposed a package of medical interventions called EmOC required to treat the major direct obstetric complications¹⁴. The individual components of this package include administration of parenteral antibiotic treatment, treatment of eclampsia, oxytocic drugs and anticonvulsants, manual removal of placenta and retained products, and assisted vaginal delivery, all known as 'signal functions'. These signal functions constitute required services to be offered by Basic EmOC facilities (bEmOC). Comprehensive EmOC (cEmOC) facilities perform all signal functions plus cesarean surgery and blood transfusions. Not surprisingly, the case for emergency obstetric care is compelling. Enhanced training programs for physicians and midwives on emergency obstetric care by visiting obstetricians at a state referral hospital in Kebbi state, Nigeria reduced the case fatality rate of obstetric complications from 22% to 5% over 5 years¹⁵. Furthermore, a systematic review by Paxton and colleagues that showed that EmOC interventions, often co-existing with skilled birth attendance, led to robust declines in maternal mortality¹⁶. In one prospective cohort study in rural India, EmOC was effective in preventing maternal deaths by encouraging self-referral to a district hospital of 79% of women in

a community previously with 85% home deliveries¹⁷. Another quasi-experimental study showed that maternal mortality was reduced to the same degree when EmOC services were close (less than 2 hrs travel time) compared to areas with midwives present in health facilities with transport to EmOC care¹⁸, suggesting that referral systems may be as effective as having services in close proximity to residents. Predictably, a recent ranking of evidence for interventions improving maternal mortality by the World Bank affirmed the importance of EmOC¹⁹.

Consistent with other studies in sub-Saharan Africa, the leading direct causes of maternal deaths in Ghana include hemorrhage, infection, eclampsia, obstructed labor and septic abortion, most of which occur around the time of labor and delivery and are addressed by EmOC²⁰⁻²². Some reports suggest that perinatal mortality accounts for as high as 75% of maternal mortality in Ghana⁴. As previously discussed, prevention and management of these complications require care by a skilled birth attendant and timely access to comprehensive emergency obstetrical care (cEMOC), making referral systems critical for the survival of such women and their babies^{23,24}. In a study of 121 maternal deaths in Maharashtra, India, multivariate analyses showed that during postpartum hemorrhage, blood transfusions (offered in cEMOCs) significantly decreased the risk of maternal deaths (odds ratio 0.05). Surprisingly, number of referrals (often from unskilled attendants) was positively associated with maternal deaths (odds ratio 12.1)²⁵, suggesting merely increasing quantity of referrals may not be sufficient to reduce maternal deaths. Together, these findings demonstrate convincing evidence in favor of promoting health systems that place value on quality of healthcare services through improving the strength of skilled birth attendance and emergency obstetric services. Intuitively, women who suffer intrapartum complications are more likely to have a perinatal death²⁶. And low maternal and neonatal deaths in developed countries today are due, in large part, to the fact that obstetric complications are identified, referred as needed, and treated promptly in the context of a well-oiled health system.

The Three Delays Model

According to Thaddeus' and Maine's "3 delays model", there are three main delays affecting the timely delivery of care to a pregnant women in a facility when complications occur: (I) delays in seeking care, (II) delays in identifying and reaching the appropriate facility, and (III) delays in receiving quality care once the woman reaches the facility²⁷. Several studies have applied this

model to local contexts ^{26,28-30}, stressing the importance of eliminating delays occurring before *and* after the woman in labor arrives at the health facility ²⁷⁻²⁹, and suggesting interventions addressing identified local gaps in various components of the referral process ^{26,31,32}. In a qualitative study applying the 3 delays model to access to emergency obstetric care in rural Gambia, underestimation of the severity of the complication, cultural beliefs, and prior negative experiences with the healthcare system were cited as important factors contributing to delay 1 (deciding to seek care). Lack of, and prolonged transportation, and seeking care at multiple facilities constituted delay 2, and delay in receiving prompt and appropriate care comprised delay 3 ³³. Protective factors related to these delays included having an educated husband or being at the woman's parent's home at the time of delivery (delay 1), residing in and not away from the village and having the presence of a resident nurse in the village (delay 2), and having a skilled attendant during the delivery (delay 3) ²⁵.

At face value, effective referral systems might seem to primarily address delay 2. To that effect, efforts to improve referral systems usually target Delay 2 factors such as bad roads, high transportation costs, and poor communication because those are most researched and well documented in literature ³². An ideal framework for design of interventions however should not overlook the complex nature of this delay paradigm and how all three phases are intricately linked. For example, if an effective ambulance service is implemented to transport pregnant women to the nearest facility (delay 2) but no interventions are put in place to reduce the long wait times at the facility (delay 3), then pregnant women may still be deterred from seeking care from the health facilities because of the opportunity costs involved in adhering to referrals. Reexamining the problem of delays through the lens of referral systems and their associated bottlenecks is a good way to take another look at Thaddeus and Maine's three delays model in a way that is more effective in planning holistic interventions. Recognizing the importance of local provider and consumer inputs to the identification of barriers and ownership of solutions to overcome those barriers ^{34,35}, we present a contextual application of Thaddeus and Maine's model in a rural setting in Ghana, highlighting the role and experiential knowledge of healthcare providers.

Referral Structure in Ghana

In 1990, more than 70% of Ghanaians lived over 5 miles from the nearest health care provider, and rural maternal and infant mortality rates were nearing double those of corresponding urban rates³⁶. Reacting to these discouraging statistics, a task force was launched to improve access to health care delivery especially to more rural parts of the country. Based on a three-village study involving focus groups and subsequent pilot services called the Navrongo Experiment, the Community-based Health Planning and Services (CHPS) compound was formed. The initial premise of the CHPS compound involved mobile nurses equipped with motorcycles to do home visits, with compounds as stations within the village. Studies showed that it reduced childhood mortality by a third³⁷ and fertility rate by one birth³⁸. Given its resounding success, the CHPS model was adopted in 1999 as a national policy by the Ghanaian Ministry of Health (MoH). Health posts were established to reduce barriers to geographical access to health care, with a focus on remote, resource-poor limited rural districts within the country. Community Health Officers (CHOs) were trained to provide primary healthcare including treating minor ailments, health education, immunizations, family planning, antenatal and postnatal care, and supervising simple deliveries. They were supported by community volunteers who assisted with community mobilization, maintenance of community registers and other essential activities³⁶.

The establishment of local CHPS (also known as health posts) introduced an additional level of care, and referral systems in Ghana became three-tiered. In maternal health, health posts are expected to refer to health centers, which refer to the district hospital. If the district hospital cannot manage any further, it refers upwards to regional and other tertiary hospitals (Fig. 1).

Private facilities are not included in this public sector network but are worth mentioning because they constitute a significant component of healthcare delivery especially in rural Ghana. Several district hospitals in Ghana are faith-based or privately-owned, especially in rural regions. This is similar to many other resource-constrained settings. In a large study of 2,905 pregnancies in rural Maharashtra, India for instance, 40% of hospital deliveries and 38% of cesarean sections within the district occurred in low-cost private hospitals¹⁷. Maternity waiting homes (MWH), residential posts within easy reach of a hospital or health center providing emergency obstetric care³⁹ are also present, and often form part of the private sector in Ghana. Although they sound

effective in theory, practical evidence of their impact has been conflicting. A study of 1573 patients in Papua New Guinea found that women who used MWHs were less likely to have obstructed labor or cesarean sections. However another study of 854 births in Zimbabwe found no significant difference in perinatal and maternal outcomes in women who stayed in a MWH compared to those who had not but went directly to the hospital to deliver, though low utilization of MWHs was a challenge in this study ⁴⁰.

In contrast to patients going to transitional facilities like MWHs, there are others who bypass all lower tier facilities and present directly to district hospitals for care. Self-referral is an important component of the referral pyramid which is also not included in the national model described above. Previous studies have shown that majority (61-82%) of users of higher tier delivery services are not referred by healthcare providers ^{41,42}. Such deviations from recommended practice are often pinned on patient non-compliance with referral ‘advice’ on one hand, especially if clinical assessment by local health officer suggests otherwise ^{43,44}. On the other hand, however, others argue that this bypassing phenomenon reflects justifiable lack of confidence in quality of care in lower levels of care ⁴⁵. A case-control study in rural Mali showed that maternal mortality rates were lower among women referred for emergency obstetric care than among those who self-presented to the district hospital without referral ⁴⁶. Self-referral can lead to under-utilization of lower-level facilities and overcrowding of higher-level facilities with inappropriate cases, but it can also stimulate further investigations leading to improvement in care provided at the lower level facilities to match patients’ preferences. The development of effective patient referral systems is one of the important public health issues in developing countries. Primary health care that addresses the issue of bypassers is indispensable in care of patients, but it will be futile if there is no effective hospital support to care for more complicated patients especially in emergency situations.

The Role of Referral Systems

According to a study of 396 pregnant women referred to Korle Bu Teaching Hospital, the largest tertiary hospital in Ghana over a 6-week period, 84.3% were referred during their 1st stage of labor (up to 20 hours), 3.8% during the 2nd stage (2 hours or more), 8.8% during the 3rd stage (up to 20 minutes) and 3% not in labor. Notably, the most common indications in the 1st stage was

failure to progress (21.5%), in the 2nd stage was delayed second stage (3.3%), in 3rd stage was retained placenta (5.6%), and in women not in labor, antepartum hemorrhage (2.3%)⁴². Only one woman died 10hrs after arrival. This low mortality rate may have been due to the fact that the patient had been referred early, or that Korle Bu, the largest tertiary hospital, is equipped with staff and equipment to respond to such emergencies and so the quality of care delivered high and limited 3rd phase delay. The outcomes may not have been similar in a district hospital, but no data were found.

The importance of effective and timely referrals in an obstetric emergency is related to the unpredictability of pregnancy complications and their potential to progress rapidly to become severe and life threatening. For example, a serious hemorrhage can lead to death of a woman and the unborn fetus within minutes or hours without timely intervention. In especially resource-poor settings, two-thirds of women deliver at home, without access to emergency obstetric services or trained professionals⁴⁷. Maternal and neonatal deaths could therefore be prevented if functional referral systems were in place to ensure pregnant women reach appropriate health services to prevent complications and are referred up the facility chain when complications occur. A cohort study of 2905 pregnant women in rural Maharashtra, India showed that 14.4% of all deliveries had identified complications. Of these complications 78.9% were at home, and 11.1% at health facilities. Maternal mortality rate was 70 per 100,000 in the Comprehensive Rural Health Project (CHRP) hospital compared to 95 per 100,000 in the local government hospital. The key difference between the two hospitals was that CHRP trains Village Health Workers (VHW), mature women who provide basic health education and clinical service particularly for women and children, are trained to conduct safer home deliveries, and identify and discuss indications for referral with pregnant women and their families. Besides the gains in maternal mortality, this project also saw a low per capita cost of delivery (Rupees 35 (US\$0.83) per woman of childbearing age per year¹⁷. Another case control study in rural Mali showed that implementing a maternity referral system including bEmOC and cEmOC reduced risk of death by half two years after the implementation compared to before, with nearly half of the reduction attributable to fewer deaths from hemorrhage⁴⁸.

A recent systematic review has shown that the most successful maternal health initiatives are those that include strengthening referral systems as a component⁴⁹. Modeling techniques have

been used to predict that maternal mortality could drop as low as 80% if more focus is placed on referral strategies alongside other interventions ⁵⁰.

Challenges in Referral Systems

Although streamlining referral systems seems like a worthwhile effort, effect on health outcomes remain conflicting. Some studies found that strong referral systems were associated with robust reductions in maternal deaths ^{15,45} while in others there was little or no benefit. ³².

Available evidence suggests that less satisfactory gains in maternal survival are often related to non-utilization due to weak and poorly responsive health systems ⁵¹. Contributory factors include prohibitive costs, other opportunity costs, condition of road and transport, knowledge and attitude of health staff, previous discouraging experiences, no follow-up post-referral ⁵¹ knowledge and attitude of health staff. Others incite weak information systems, and poor accountability measures ⁵² as major challenges facing local efforts. Fear and insecurity of patients of sudden medical complications, of loss of dignity and of being cared for by an unknown person ⁵³ have also been invoked.

In summary, past studies have found the critical role of the referral system, but much remains unknown, including work to better identify the gaps and effective interventions to address them (Table 1).

Aims of Study

Our study aimed to understand local health care worker (HCW) perspectives on causes of challenges in the referral of obstetric cases in rural Ghana, and to identify potential strategies identified by these front-line providers to help address systemic deficits. Including provider perspectives is critical in developing and sustaining change ideas for improvement, a common approach used in quality improvement initiatives ^{35,54}. We used quantitative and qualitative methodology to explore further gaps and develop integrated frameworks, with aims to:

- 1) investigate major causes for referral,
- 2) understand gaps and bottlenecks at both facility and community levels in referral of obstetric cases,
- 3) identify strategies to help address these systemic deficits,
- 4) develop a model for design of holistic change packages to improve quality of care in obstetric referrals.

We expect that the results of the study would add to the existing literature, as well as enable us better inform ongoing quality improvement (QI) efforts in the Assin North District in order to improve the obstetrical referral processes in the district and ultimately reduce maternal mortality.

METHODS

Project Fives Alive!

This study was embedded into the Project Fives Alive! (PFA!) project. *PFA!* is a collaboration between the Institute for Healthcare Improvement and the National Catholic Health Service working in close collaboration with the Ghana Health Service to improve maternal and child health outcomes using a QI approach including learning collaboratives and coaching⁵⁵. By the start of this project in July 2012, the project had reached all health facilities in all 38 districts of the three northernmost regions and all 29 Catholic hospitals in the remaining regions of the country.

Study Setting

Assin North Municipality, located in the Central region of Ghana, has a population of 171,499 spread over 1500 km² and is served by 1 district hospital, 6 health centers, and 4 local health posts (Fig. 2). Assin North is one of six districts in Ghana selected by PFA! to test strategies to improve existing referral systems to address gaps that contribute to adverse maternal and newborn outcomes. This district was selected due to its relatively high maternal mortality rate (239.2 per 100,000 live births, institutional deaths only; so likely higher total deaths) and prior

experience in QI methodology working with *PFA!*. Lessons learned from this 18-month innovation phase focused on maternal mortality will be spread to the rest of the country through the *PFA!* platform⁵⁵.

Data Collection and Analysis

Quantitative Study

The quantitative component aimed to

1. Obtain major referral indications in emergency obstetric care in Assin North district
2. Understand potential differences in recognition, and management of specific obstetric complications at the health posts and health centers, including referrals to the district hospital.

We reviewed health posts, health centers and hospital registers to obtain various indicators of interests. Table 2 and 3 shows the main indicators (Aim 2) which we planned to capture in our study. Our eventual goal was to stratify each indicator by specific complication type.

Qualitative study

The qualitative component aimed to

1. Understand the potential causes of systemic gaps leading to delayed referral of obstetrical complications in the Assin North Municipal District, Ghana
2. Explore preliminary solutions to these gaps

We conducted semi-structured interviews with HCWs in four health posts, six health centers and one district hospital in the Assin North Municipality, Ghana. A total of 18 HCWs participated: 4 community health officers (CHO), 8 midwives, 3 medical assistants (MA), 1 physician and 2 nurses (Fig. 3).

Development of the Interview Guide

Table 4 was developed as a template for the interview guide used in this study. It specifically elicited responses related to barriers to referrals within the district. Information in this list was informed by a model developed by Thaddeus and Maine to explain delays contributing to

maternal mortality in developing countries, as well as insights from other studies on this topic^{29,56,57}.

Possible solutions to gaps in referral systems were also assessed, with a special focus on responses that addressed multiple barriers concurrently. The interview guide used for this study was designed, reviewed and piloted with midwives at Maamobi General Hospital in Accra, Ghana prior to the research start date. Feedback was used to adapt the guide to better reflect local context and language.

Recruitment and Enrollment Procedures

In collaboration with *PFA!*, all study participants were recruited on a volunteer basis, and no compensation was given. A month prior to the site visit, invitations were sent to in-charge health staff at all sites, all of whom agreed to participate or delegated to next in-charge staff if they were otherwise indisposed. A week prior to the site visit, reminders were sent to health workers willing to participate. On the day of the visit to the site, interviews were conducted with these pre-identified individuals on the premises.

Eighteen face-to-face semi-structured interviews were conducted during a two-week period in June 2012 representing 51% of clinicians involved in emergency obstetric delivery in the district. The 49% who were not interviewed were either not scheduled to work, or were away on vacation at the time of the site visit. Questions were open-ended, and interviews were largely conducted in English (See Appendix). Respondents were encouraged to use Twi, the local Ghanaian dialect, if they could not find the equivalent words or expressions in English to continue. Interviews were audio-recorded and transcribed verbatim, with any responses in Twi translated to English with expert help prior to analysis. NVivo® v10.0 software was used to analyze the transcripts for common themes regarding barriers and solutions to effective referral and management of obstetric complications. Topics relating to the study aims were identified and coded without predefined categories. After coding was completed, themes were developed and classified, guided by the three-delays framework. A triangulation of data sources⁵⁸ was employed, comparing information from different categories of respondents.

Ethical Considerations

All participants gave informed consent prior to participation in the survey and interviews were conducted in settings where confidentiality could be maintained. The protocol was reviewed and approved by the Harvard University Faculty of Medicine Committee on Human Studies and the Ghana Health Service Ethical Review Committee.

RESULTS

Quantitative Study

In all 11 health facilities sampled, the volume and experience of obstetric referrals was satisfactory: all facilities were at least 5 years old, and all had several patient visits a day. With the exception of one CHPS compound which referred to a government hospital in the adjoining district because of closer proximity, all other facilities regularly refer to the St. Francis Xavier Hospital, the Assin North district hospital. In 2011, 28% of maternal deaths within the district hospital were from referred cases. Between January – June 2012, a total of 180 cases were referred to the hospital. Figure 4 illustrates the top ten obstetric cases referred to St. Francis Xavier Hospital from Jan-June 2012. The most commonly referred indication was prolonged labor (24%). Other indications included retained placenta (7%), postpartum hemorrhage (5%), Malpresentation (4%), Losing liquor (4%), Anemia (3%), Previous cesarean section (3%), CPD (3%), No midwife or doctor (2%), Not documented (10%). Within the same time period of January to June 2012, 16 cases were referred out from St. Francis Xavier Hospital to tertiary care hospitals including Komfo Anokye Teaching Hospital, Cape Coast Regional Hospital, and Korle Bu Teaching Hospital. The leading obstetric case referred out was severe eclampsia.

Table 6 and Table 7 summarize the availability and reliability of data investigating our indicators of interest. Key points are expanded below:

Records on early referral

Information on the number of women presenting in the first stage of labour was patchy. Apart from the fact that majority of the facilities did not provide deliveries service except for emergency cases those other four facilities that provided deliveries services did not use partograph consistently to enable this information to be recorded. In situations where partograph was used, this information was recorded in the patient record card/folder which they take home, making it difficult for it to be retrieved on a facility visit.

Records on Time Measures

Some key time measures on maternal complications such as, the time it takes to wait for transport, the time it takes to depart the referring facility, travel time to the receiving facility and the waiting time before the patient actually receive first treatment could not be reviewed. All these constitute the total delay for the patient but when we specifically asked how long women needing emergency transfer would have to wait before leaving the referral facility, this information did not exist in the records of any of the facilities visited. The same applied to the question on travel time to the receiving facility and the waiting time before the patient actually received first treatment.

Qualitative Study

The study identified a range of challenges of the referral system in Assin North Municipal District, as well as highlighted suggested ideas for improvement. Several major topics emerged related to the referral networks that resulted in type 1, 2 or 3 delays and that had the potential to be directly improved by health center staff and the health referral network systems:

- (1) Individual and Socio-cultural Factors
- (2) Referral Transport Systems
- (3) Communication Barriers
- (4) Clinical Skills and Management
- (5) Standards of Care and Monitoring.

Individual and Socio-cultural Factors

In Ghana, all pregnant women qualify for free government health insurance, and as a result do not pay large amounts out of pocket for receiving health care. However, high economic costs still confront many pregnant women seeking healthcare at local health posts and those accepting referrals to larger facilities. This often accounts for delays in seeking early care, resulting in the presentation of more advanced cases. For example, one CHO described her investigation into why a woman arrived late with delivery complications:

.... so I just tried to investigate [and] what I heard was that they [did not have] money in the house that's why they just let that person (pregnant woman in labor) wait for ...3 days in the house; so when they got like 100 [Gh cedis; equivalent to US\$50] ... then they brought the person here

- CHO, Gold Coast Camp CHPS compound

Several HCWs acknowledged that high transportation cost, opportunity costs (of missing work) and basic living expenses while staying in more expensive areas near district hospitals were key players in this delay of patients in seeking early care. Other individual factors that contribute to delays in seeking care include past negative experiences at the hospital. A few HCWs explained that patients often return with feedback that the lines are long at the hospital, and the excessive delays deter them from accepting future referrals. Several nurses also reported that patients say that they hesitate to follow through with referrals because of past experiences of being poorly treated by the hospital staff.

“when you go they’ll be tossing you up and down, asking you so many questions and sometimes the language may be abusive.....so the next time I will not go”

- MA, Health Center

A common theme that emerged from the response of several health workers revealed that patients often fear going to the district hospital when referred because it suggests poorer prognosis or imminent death.

“And they (patients) think...they are very close to us because normally we visit them in their homes so they are familiar with us but those there (nurses at the hospital) they think they are not familiar with them. And some people too are afraid of big places, as soon as you say (to patient) ‘...you’ll have to go to Fosu (district hospital) so that they test your blood’, (the patient says) ‘as for Fosu I am going to die!’. They are afraid to go. They think you only refer them because they are at the point of death.”

- CHO, Endwa CHPS Compound

HCWs suggested that there is a lack of transparency about what happens at the hospital, and this is often compounded by various cultural and spiritual beliefs that patients hold. Some patients in one community for instance refused to go to the district hospital for fear of receiving blood transfusion which violates some of their cultural and religious doctrines. Other beliefs affecting healthcare have included practices that revolve around farming days. In one community, pregnant women only came to the local health center only on sacred days for the gods because they cannot go to their rice farms then. Many women still patronize traditional birth attendants in most communities because of cost, convenience and cultural endorsement of services such as allowing women to deliver squatting rather than lying in bed. Finally, prayer camps and spiritual healing sites continue to attract a large number of patients, often sending patients to health facilities and hospitals as a last resort, by which time the conditions are well advanced and the prognosis bleaker.

“...Also some of [the patients] when you refer them, they say, “If these people (health post CHOs) couldn't [heal them] then it is a spiritual matter” ...so spiritual beliefs [are important]. So when they go and [traditional healers] work on the person and it doesn't work, then they come back; at times they survive, others too... [don't]. Sometimes when the priest sees that the condition is not getting better, he says, “Your body fluids are low so go to the hospital and get water drips and when she finishes, bring her back.” [This happens at] the prayer camps. Or [the priest might say] “she doesn't have blood, go and get blood from the hospital and come back. So those that come early are able to survive.”

- Nurse, St. Francis Xavier Hospital

Referral Transport Systems

Accessibility & Security

The closest health facility to the district hospital is 9 miles away (Fig. 2). Apart from a stretch of about 62-mile tarred road, all other roads within the district are dirt roads, often in poor condition, which are rendered especially inaccessible during rainy seasons (Fig. 5).

“....when it rains...people find it difficult to [travel]. At times when you are coming from Fosu (capital of district)...you have to get down [from vehicle] and walk some distance before you [get to your destination]”

- CHO, Health Post

Poor road security, especially at night, further compounds the problem of travel. One CHO explained that drivers commuting from remote parts of the district often hesitate to transport patients at night for fear of encountering armed robbers. In some of these communities, no vehicle leaves the village after 6pm.

Reliance on local transportation

To further complicate the limiting factor of bad roads, the transport capacities of most referring centers are often inadequate. One HCW explains:

“ ...sometimes they hire commercial vehicles and sometimes too they use the motorbike. If there is no commercial vehicle at the station, they will beg someone to use their motorbike to convey them to the nearest health center or hospital, and then maybe somebody’s private car. The person might sacrifice.”

- CHO, Health Post

‘Sacrificing’ in this regard refers to the liabilities undertaken by the driver or owner of the vehicle in helping to transport a patient. These include physical damages to their vehicle such as transporting a bleeding woman, or loss of revenue to the owner if the commercial vehicle travels to the major town without its full set of passengers.

The National Ambulance service provided an ambulance for the district stationed at the district capital in May 2012, but it was designed for use on tarred rather than dirt roads, making it less ideal for use in many areas in Assin North. It was also underutilized; as of June 2012, this ambulance had responded to only six emergencies, including one obstetric case; this low volume was related to an inability to operate at night due to lack of on-site housing for drivers during night call.

High cost of transportation

The financial burden to patients of obtaining adequate transportation remains a challenge in Assin North. According to one HCW, there was a recent death in one of the nearby villages due to the patient's inability to pay for transportation.

"...just this Saturday I heard a lady died in one of the interior villages... She was pregnant and not able to deliver. They wanted a car, they contacted the person, the person said he'll charge them 400,000 (Gh cedis, equivalent \$20); [it's] just that they don't have [the money]. So they asked her to go to the TBA. After the baby came the placenta was not coming, and they wasted time, and the lady too...[died].

- CHO, Health Post

In Assin North Municipal district, as in other districts within that region of the country, there is an agreement between the Ghana Health Service and the local transport unions which requests drivers to transport pregnant women without charge, and in return receive a coupon with which they can claim a prize at monthly raffle draws (Fig. 6). Despite this agreement, many patients still pay out of pocket for transportation. This is because the MOU is fully functional in only 2 of the sampled 6 sub-districts. Reports from a health worker at one facility showed that the owners of the vehicles often demand daily revenue from their employee drivers and refuse to accept any altruistic excuses for no returns.

Inadequate inter-facility referral transport equipment

The use of taxis, lorries and pick-up trucks as referral ambulances between health centers and the district hospital made it difficult to ensure appropriate care while en-route (e.g. maintaining IV drips and checking vital signs) during the trip. These can take up to several hours from the more remote areas. In 3 out of 11 facilities, makeshift ambulances constructed from pick-up trucks originally designed to transport drugs and facility equipment are used to transport patients in critical cases. With such alternative transportation methods, HCWs still face challenges with stabilizing and monitoring the patient. As one respondent noted:

“...[The patient’s blood pressure] was falling so we had to put in infusion and in the taxi you know it cannot be hanged...yes, so we needed the ambulance [...] If even there’s the need for oxygen it can be given in the ambulance and so on, but in the taxi, [those] kinds of facilities are not [available]”

– Medical Assistant, Health Center

Communication Barriers

Lack of Formalized Communication Systems between Key Stakeholders

In Assin North, there are no standard systems for communication, and so any communication is dependent on the initiative of individual providers. Those providers who take the initiative sometimes give their personal cell phone numbers to patients, call ahead to receiving units or accompany patients. However, this remains challenging because it does not routinely occur in all sites. One HCW described how the lack of advance notice from referring health centers makes it more difficult for hospital staff to prepare adequately:

“Apart from that [one] guy (HCW) who calls, the others don’t call so you’ll be here and such a case comes in. And....with...nobody accompanying... it’s really a challenge. Because if you know...somebody is coming with eclampsia... you know you’re supposed to prepare first so that you receive [appropriately].

- Emergency Nurse, District Hospital

One common limitation is the poor mobile network connectivity especially in the more rural parts of the district (Fig. 7). Many providers noted the difficulty in calling ahead to alert receiving units, because of the poor telephone network connectivity in their communities.

“When you go and [try to] get the network, you’ll have to stand somewhere in the bush.”

- CHO, Health Post

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Lack of feedback from the receiving hospitals is also a noted challenge. Nine of 18 HCWs expressed frustration that they do not receive feedback when they refer patients. From the perspective of receiving hospital staff members, high workload was a frequently reported barrier to providing this feedback.

Poor hand-off management processes

For effective referrals, HCWs accompanying patients to higher-level facilities should have knowledge of the case or accompanying documentation. However, respondents reported that this is often not the case. For example, a medical assistant at one health center reported that the nurses who accompany a patient to the receiving hospital are not always able to answer specific questions about what care has already been given.

Other HCWs reported that when they reach the hospital as accompanying health professionals, they sometimes assist in various tasks and procedures, which help facilitate the timely care given to the patient. However, there are other instances where they are mistaken for relatives, and not directly addressed or requested to debrief the cases, especially if they are not in uniform (as is usually the case for late night emergencies). All these factors interfere with an opportunity for communication, limiting the hand-off process and delaying the timely delivery of care to the patient.

Clinical Skill Limitations

Late/ no identification of high-risk patients

As shown in Fig. 1, each level of care offers a specific range of services outlined by the Ghana Health Service (GHS), and therefore cadres who work at different levels of the system are trained to perform the particular range of services offered at their facilities. However, patients did not always understand this hierarchical structure of capacity and associated limitations. For example, two CHOs explained that clients do not often understand why they need to be referred because they expect the nurse at that facility to be able to help them with all their health needs.

HCWs also reported some challenges related to poor quality within their designated skill set particularly for health workers in the lower levels of care. For instance, one HCW at a receiving hospital described how a patient presented with an advanced condition because the referring facility did not recognize the danger signs on time:

“...last time a pregnant woman came here.... And I was saying but there is a doctor at your place, so why did you rush here without a midwife accompanying you, and she said ‘Auntie, I had been admitted there for a long time. And each time the doctor came, he said let’s wait a bit more, and I was experiencing a lot of discomfort, and I insisted that they discharge me, so they finally reluctantly discharged me.’ And when she arrived here, true, it was twins. But one was IUFD (macerated) already. So she was able to get the first twin, but the second twin was macerated.”

- Midwife, District Hospital

Many HCWs also emphasized the importance of re-training in order to improve their skills and strengthen their skill sets. One midwife in charge of a health center noted:

“They (staff at the district hospital) need refresher courses... They should allow them to go to workshops so that they will see what is going on.... Me, I always learn from my junior nurses and midwives because I joined it [midwifery] about 10 years ago, and things are changing. Even the instrument[s] we are using [are] changing. .”

- Midwife, Health Center

Failure to stabilize patients before referral

An important challenge particularly relevant to resource-poor settings is the difficulties in stabilizing emergency obstetric cases given the low availability of resources to enable them work. Several HCWs remarked that the use of taxis, lorries and pick-up trucks made it especially difficult to hold up IV drips and check vital signs while en route to the receiving unit. From remote areas, the commute could take hours, worsening the clinical status of patients who do not get adequate clinical care en route.

Lack of readiness of receiving facility

A doctor at the district hospital remarked that a few times patients referred to tertiary care hospitals have had to wait in line because there were no beds with which to admit them. Other factors limiting the readiness especially of rural facilities to receiving referrals include lack of drugs, electricity or other resources to enable them effectively manage the cases.

Unreliable Standards of Care and Monitoring

Errors in use of existing protocols for referrals

The basic protocol for making a referral was often the same across all sites: recognize danger signs, stabilize patient, initiate referral, arrange transportation to next appropriate level of care, and complete referral. Even though a National Referral protocol published by the Ghana Health Service does exist, very few sites adhere to these guidelines. Moreover, the actual process in how it is implemented has notable disparities. For example, even though the national protocol encourages health workers accompanying referred patients, only 5 out of 10 respondents reported frequently accompanying the client to the district hospital. Of the remaining 5, two accompanied patients in critical cases only, and 3 rarely accompanied the client. Most explained they could not accompany clients because of the low workforce capacity of their sites, even though many understood the importance of accompanying patients to the district hospitals.

“Somebody who is fitting (or convulsing), a pregnant woman who is fitting... somebody (HCW) needs to accompany. But this is someone who is coming with relatives. They don’t know they have to turn the head to the side, [or] the person can aspirate saliva and any other thing[s].”
- Nurse, District Hospital

Poor documentation and monitoring of indications for referral

Another referral challenge is the inadequate documentation of referrals. Five sites regularly used recommended Ghana Health Service referral forms, one documented referrals in clients’ antenatal record cards, while the others used prescription forms and other paper forms. The information documented on these sheets was often inadequate. Of all 11 facilities sampled, only 6 maintained a register on site in which to document referred cases. Indications for referral were recorded only in hospital records but included limited depth and context (Table 6 and 7).

Inadequate supervision and monitoring

When health staff were asked if there was a role of leadership in referral, many responded in the affirmative, explaining that specific roles of leaders included negotiating with transport owners for price concessions, obtaining feedback, encouraging prompt and active case search, and initiating referrals. However very few mentioned their role in continuous supervision and monitoring. Some nurses at the district hospital noted that CHOs in remote areas were not adequately supervised because of the isolation and also that veteran nurses were not updating their skills owing in part to no supervision or accountability at their sites.

“....they [senior nurses] will never accept it [changes]. [They] have been in the system for 30 years...The Margaret-Myles (nursing textbook), haven’t they upgraded the edition?”

- Senior Midwife, Health Center

Figure 8 is a driver diagram summarizing the major barriers in Assin North.

Preliminary Ideas for Improvement

Based on referral challenges highlighted above, HCWs highlighted the following as potential strategies to the referral challenges in Assin North: standardizing implementation of the referral protocol, improving transportation systems, ensuring reliable data reporting and management systems, actively engaging the community, and providing continuous training for health staff.

DISCUSSION

Causes for Referral

In Assin North, prolonged labor was the most commonly referred condition to the district hospital (24%), which is consistent with current literature ⁵⁹. It is unclear why these proportions exist in Assin North as it was impossible to retrospectively examine individual cases or identify referring facilities. Nevertheless, it is reasonable to presume that the extent of delay in referral plays a major role in determining prognosis of these causes. Discussed below are the indications with the highest prevalence (obstructed labor), that with known highest case fatality rate in literature (PPH) and that directly reflecting systemic deficits (no doctor/midwife; no documentation is discussed separately in a different section).

Obstructed Labor

Prolonged or obstructed labor, the most common referral indication, occurs when the presenting part of the fetus cannot progress into the birth canal, despite strong uterine contractions, usually >24hrs since labor onset. Obstructed labor is an important cause of maternal deaths; it contributes to 11.3% of all deaths in hospitals and clinics in Bangladesh ⁶⁰, 26.2% in a community-based study in Uganda ⁶¹, and 45.5% in hospital-based study in Ethiopia ⁶². However, it is more commonly associated with maternal morbidity, representing 0.5% of global burden of all conditions and 22% of all maternal conditions. Complications include intrauterine

infections, ruptured uterus with subsequent hemorrhage, or shock. By far the most severe and dreaded complication of obstructed labor is obstetric fistula – a tract connecting the vaginal wall to the bladder (vesico-vaginal fistula) or to the rectum (recto-vaginal fistula) or both. They are caused by pressure necrosis causing impaction of the presenting part during the difficult labor⁶³. Given its fairly grim prognosis, there is an urgency to develop interventions that address this complication. Though not fully validated, various strategies exist to predict obstructed labor, and they may have some potential for reducing delays. The intervention with the most promise for predicting obstruction of labor is maternal height and shoe size. In a population-based case-control study in Harare, Zimbabwe, maternal height under 160cm was associated with a two-fold increase in cephalopelvic disproportion⁶⁴. Other interventions such as x-ray pelvimetry and estimation of fetal weight have no proven benefit⁶⁵. There are confirmed and widely accepted technologies that help reduce mortality from obstructed labor such as contraception, partographs, augmentation of labor, vacuum extraction, and cesarean section. Unfortunately, many of these interventions are often limited by low resources including equipment and staff especially in rural Ghana. Partographs, or labor graphs, for example help birth attendants evaluate progress of labor by plotting cervical dilatation and descent of the head, as well as other parameters, against time⁶⁶. In one randomized control trial, frequency of cesarean sections were less when the ‘action’ line (diagnosis of poor progress) was four hours compared to three hours after the expected active phase line⁶⁷. However in a large tertiary hospital in Ghana, only 16.7% of those expected to have partographs came in with a partographs⁴². Partographs are highly recommended in the guidelines by the MoH in Ghana, however they are inconsistently used in routine practice, as we observed in Assin North. There has since been a call to action to develop more innovative, cost-effective interventions. This has most recently resulted in an exciting innovation called the Odón Device, a low-cost vacuum extraction device engineered by a car mechanic from Argentina who used a fabric bag with sleeve sewn to extract a model baby from a model womb⁶⁸. While evaluation studies on this device, as well as others to address obstructed labor, are pending, such innovations represent an exciting time in medical device technologies, where low-cost interventions can be harnessed for improved maternal outcomes.

Postpartum Hemorrhage

Interestingly, postpartum hemorrhage accounted for only 5% of referral indications in Assin North which is somewhat inconsistent with data suggesting 2% of obstetric referrals in other parts of Ghana ⁴². Postpartum hemorrhage occurs during the third stage of labor, within the first 24 hours after delivery ⁶⁹. The single most common cause of maternal mortality is PPH, generally accounting for 25–33% of all maternal deaths ⁷⁰. Hemorrhage, if not timely treated or controlled, can quickly lead to shock and rapid death. A study in Egypt found that 88% of deaths due to PPH occur within the first 4 hrs postpartum ⁷¹. This rapid blood loss often in the setting of anemia in pregnant women can cause even more rapid decline of women, as was seen in Zimbabwe ⁷². In some cases of PPH, uterine artery ligation or hysterectomy may be warranted to control bleed when basic measures such as use of drugs or bimanual compression of the uterus fail. However, such surgical interventions are only available at tertiary or referral centers ⁷³. This rapid evolution and need for more advanced interventions highlight the need for skilled attendants, early recognition and management, and prompt referral to higher levels of care. Unfortunately many patients especially from remote areas do not receive the care they need, on time. The patient in our study for instance succumbed to PPH because she could not afford transportation costs to allow her to travel to the capital of the district for further management. This distinctly underlines the relevance of the intersection of social factors and medical outcomes in a way that should garner further inquiry to bridge the gap.

Despite its grim prevalence, PPH is not adequately being confronted in policy-making decisions because the unique resource constraints of developing countries limits the development of any uniform standard of care ⁷⁰. A recent Lancet report suggests that there are promising, relatively simple interventions to treat PPH in low-resource settings. These include universal use of active management of third-stage labor, increasing oxytocin (a hormone for uterine contraction) supply and use, use of oral or rectal misoprostol (a synthetic prostaglandin for uterine contraction), using non-inflatable antishock garment for resuscitation following shock from PPH, and using the hydrostatic condom balloon catheter to tamponade bleeding especially those secondary to uterine atony ⁶⁹. According to a randomized control trial of 1620 women in rural India, misoprostol was found to be associated with less rates of PPH compared to oxytocin ⁷⁴, and others find it especially well-suited to low-resource settings because of low cost, ease of administration (oral vs oxytocin injection requiring more skilled staff), and good safety profile ⁷⁴. While this research did not focus on current medical interventions in Assin North, it does

stimulate interest in what the current pharmaceutical standard of therapy for PPH is in the region, and how it can be optimized for obstetric emergencies. Regardless, further clinical operational research is needed to further investigate these potential technologies, in a way that is translational to low-resource settings.

No Midwife or Doctor

In Assin North, a small percentage of referrals (2%) are due to lack of midwife or doctor at the referring site. This is a reflection of the direct impact of acute health worker shortages in the country, particularly in rural parts. In Central Region of Ghana where Assin Fosu is located, the doctor to patient ratio is 1: 15,325 and doctor to nurse ratio is 1: 1,117. This compares to 1: 2,860 (physicians) and 1:510 (nurses) in Greater Accra Region, the region with the capital city Accra and arguably the most developed part of the country ⁷⁵. This clearly demonstrates the marked disparity in health service distribution even within the country. In Assin North, doctors were only found in the district hospital. Health centers were each run by one MA and health posts each by one CHO. As would be expected, the complexity of cases seen at these facilities parallels this skill set structure: least complicated at health posts, most complicated at district hospital. In a way, this data reflects why self-referral of a non-complicated patient to the district hospital (bypassing phenomenon) may occur; perhaps simply because of no skilled attendant present at the local site at time of labor. This calls into question whether or not midwives, physicians and MAs are the only cadres qualified to provide maternal health care, and whether other auxiliary health care workers can be trained to give skilled delivery.

The United Nations Population Fund (UNFPA) and the World Bank define a skilled birth attendant as an accredited health professional (midwife, doctor or nurse) who has been trained in the management of uncomplicated pregnancies, childbirth, and postpartum care ⁷⁶. Among the 224 countries reporting to the WHO in 2005, 66 did not meet the UN target of 80% of births attended by a skilled attendant. Worldwide, 63% of births take place with a skilled birth attendant, but in South Asia and Sub-Saharan Africa 60–80% of births are not attended by skilled professionals. Current evidence estimates that developing countries need at least 333,000 additional skilled attendants to meet UN targets for reduction of maternal mortality by 2015 ⁷⁰, stressing the key role of human resources in health. To address this, the WHO and several

organizations advocate for widespread skilled delivery by skilled attendants. However the reality on the ground is that most deliveries especially in remote areas are performed by traditional birth attendants (TBAs). TBAs are individuals who assist the mother at childbirth and who initially acquired the skills delivering babies themselves or by working with other TBAs ⁷⁶. They are not considered skilled attendants because they do not undergo formal training. As of 1994, TBAs assisted in one-third of all deliveries in Ghana ⁷⁷. Even though this proportion has since declined due to more effective maternal health interventions, it highlights their potential roles in possibly mitigating maternal deaths.

Since 1973, the Danfa Rural Health Project in Ghana has trained and supervised TBAs. TBAs are trained to encourage women to seek prenatal care, to recognize high-risk women and refer them to a health facility, to encourage family planning practices, and to perform simple, uncomplicated deliveries in a clean and safe environment ⁷⁸. However, the value of TBA training remains controversial. Training TBAs have been associated with reductions in postpartum fever ⁷⁷, but no significant differences in rates of excessive bleeding, family planning rates or infant mortality ⁷⁷ nor detection rates, or referral rates ^{26,79} between intervention and non-intervention arms. A systematic review showed that several TBA programs did not focus on detection and referral of obstetric complications suggesting this might be the source of the problem. As well they estimate that TBA training on TBA and maternal behavior are likely to be small given the complexity of referral systems and the difficulty in isolating the effects of TBA ⁸⁰. Task-shifting might hold great promise especially in areas with acute health worker shortages; training MAs to provide cEmOC including deliveries and cesarean sections for example yielded equivalent maternal outcomes as physicians in Ethiopia ⁸¹. However when it comes to TBAs, questions should be reframed to reflect the context of the broader medical and ecological perspective.

Barriers to Referral

Using provider narratives, we identified important gaps in referral processes due to root causes in four domains: 1) individual and cultural factors 2) transportation 3) communication 4) clinical skills and management, and 5) standards of care and monitoring. These findings concur with

some of the major barriers and challenges identified in previous work in similar settings ⁵⁶, as well as a number of context-specific ideas for improving access to obstetric care in Ghana.

Individual and Socio-cultural Factors

Referral decisions are not just a matter of technical or organizational issues. It can also involve stress, fear, anxiety and other emotions on the parts of both the nurse and the patient. This effect has been well-documented in developed countries but is fairly limited in literature in developing countries ^{30,82}. However, such individual factors are important factors to consider especially where transportation or other more infrastructural barriers do not seem to play a major role ⁸³. In Assin North, cultural factors included fear of death at referral centers, fear of blood transfusions and a general fear of violating farming taboos. Such findings are fairly consistent with other studies, which have identified important individual and cultural barriers to access to care such as in Niger, where referrals are often seen as proof of failure especially if it is done by a traditional healer ⁸³. Why do such individual factors matter? They are important because cultural acceptability of interventions to improve referrals is key in referral systems strengthening. In rural Malawi, bicycles were implemented as a means to improve transport of pregnant women with complications to the tertiary facilities. However, most women were deterred from using the bicycle ambulances because they believed that making themselves public at the onset of labor summons evil spirits resulting in obstructed labor ⁸⁴.

Prior negative experiences especially related to nurse or physician abuse also play into the perceptions that militate against adhering to a referral ⁸³ with several studies documenting poor treatment of poor rural women seeking care ⁴³. Health promotion through durbars, radio shows, use of VHWs and TBAs are few examples of interventions to increase public awareness of the importance of referrals. Impact studies of community education are however mixed. In Kebbi Nigeria, a community education effort to enhance public awareness of the importance of referral resulted in knowledge gains in over 30% of local residents, but showed no change in utilization of emergency obstetric services ⁸⁵. Still, it is imperative to brainstorm creative ways to use community outreach in a way that translates audience knowledge through increased utilization to improved health outcomes.

High costs are other major constraints to referral adherence in Assin North. Patients were often reported to struggle with paying transportation fees, hospital bills, food, and medical supplies, and this anecdotally has been associated with some maternal deaths in the district. Opportunity costs related to hospital admissions are also important ⁴³ though it has not been well-explored in current literature. Especially in rural Assin North, farming is the predominant occupation, and income is based on seasonal produce. As well, hospitalization during farming season prevents patients from making income for that year. The double economic impact of lost direct income and lost potential income worsens the financial outlook for most families affected, and deters them from seeking timely care.

While financial constraints are well-known challenges confronting maternal health systems especially in resource poor settings ^{51,59,78,86-88} well-managed financing of health systems remains elusive to most governments. According to a 2004 review of health financing for maternal health, user fees were previously popular as a solution to low utilization of obstetric services. Although in principle, they were thought to help ensure proper use of referral system and reduce frivolous demand for care, they were quickly challenged because use of maternal health services fell after its introduction, especially for the poorest in the community ^{86,87}. In Ghana, despite the health insurance coverage ensuring free delivery for pregnant women, many have reported fees charged for gauze, toilet paper and other materials used during the delivery. Not surprisingly, this makes institutional delivery unpopular for the women, and has anecdotally been a deterrent in resource-poor settings. In the place of user fees, several innovative options have been developed, including cost-sharing schemes in the form of community loan funds, vouchers, conditional cash transfers, and health insurance ⁸⁷. In Assin Fosu, as in rural Kenya ⁸⁸, emergency transport financing schemes were established with help from local transportation unions, however support for this effort dwindled due to lack of reliability, seasonal changes and poor support from local owners. This is fairly unfortunate especially given reported increases in referral rates with effective health financing and cost-sharing schemes ⁸⁹. There are strong incentives to develop and maintain appropriate and effective health financing schemes in Assin North. In order to do that, the district health directorate would need to select a financing strategy adapted to their local context, estimate resource requirements to implement strategies, seek additional funds, and show that the funds have been useful.

Referral Transport Systems

Similar to our findings, transportation has been noted as one of the most common and most documented barriers to timely referral of pregnant women in resource-poor settings^{43,51,78}, especially in more remote rural regions. Poor road networks and insufficient transportation options coupled with high transport costs have confronted the referral system in Assin North. The Ghana National Ambulance system was introduced in 2004 to help alleviate the growing demand for emergency transport services, but its supply has not matched the current need. A recent study showed that during 2006-2007 the highest number of ambulance use nationally were made for delivery complications compared to other emergency health conditions⁹⁰, further demonstrating the need for more affordable, and effective options for emergency obstetric transport. Rural communities in other parts of the world with little access to ambulance services have developed innovative methods to address the transportation challenge, including community financing schemes in the form of emergency fuel funds^{88,91} and auto-rickshaws⁹². Pick-up trucks are occasionally used in Assin North; though promising in terms of surmounting the poor terrain, can be challenging in terms of coordinating equipment and emergency procedures while en-route. In Bo, Sierra Leone, when motorbikes were used to summon four-wheel vehicles, number of women with major obstetric complications arriving to the government hospital from the project area increased from 0.9 to 2.6 per month, and the case fatality rate dropped from 20% to 10%⁹³. In Malawi however, bicycle ambulances did not seem to have any appreciable impact on time, cost effectiveness, and cultural acceptability of the bicycle ambulances⁸⁴. Available evidence on effects of such interventions therefore remains sparse and no clear benefits are evident. However, it is widely acknowledged that major challenges affecting transport include poor roads, fuel shortages and costs, and costs to patients^{33,91}. Perhaps a direct focus on these shortcomings can generate a more robust effect of transportation on maternal health outcomes.

Within the realm of transportation, field intervention have ranged from ambulances through pick-up trucks, taxis, buses, reconditioned vehicles, tractors, tricycles with trailers, motorboats, canoes, wheelbarrows, oxcart and homemade stretchers⁹⁴. Depending on the cultural context, any of these could be replicated in Assin North. Ongoing plans to scale-up current provisions

between the Ghana Health Service and certain local transport unions presents a unique form of health financing. These collaborations allow bus and taxi drivers in Assin North to transport pregnant women without charge, in return receiving coupons redeemable for monthly prizes. These efforts are identical to similar interventions in Kebbi, Nigeria where community leaders negotiated with local bus drivers unions to provide transport to women with obstetric emergencies in return for reimbursement from a community fund. In some cases, even private car owners were involved ⁹¹. There are yet some villages in West Africa who have developed a fairly innovative means of alerting truck drivers: they place yellow flags on the side of major roads to literally flag down passing trucks that then transport the pregnant women to the hospital ⁹⁵. Although empirical evidence is somewhat sparse, accumulating evidence suggests that motorized transport is likely to be the most acceptable and effective option for obstetric emergencies. Tools for assessing effectiveness could consider ability to shorten travel time, cultural acceptability, community sponsorship and ownership as some key measures in predicting success.

Maternity waiting homes (MWHs) present another fascinating model of mitigating transportation-related delays for high-risk women. They are facilities within easy reach of a hospital or health center, which provide emergency obstetric care ³⁹. A typical stay is about 4 weeks. Although MWHs are widely recommended, research on their effectiveness is weak. Overall, evidence suggests that women from remote areas, with poor access to transport, and/or with first pregnancies stand to gain the most benefit from MWHs ⁹⁴. The definition of high risk however remains tenuous, and some have suggested it be expanded from medical risks only to include geographic and social risk factors as well. Evidence from remote regions in Sri Lanka, Ethiopia and Zimbabwe has shown improvement in maternal outcomes with MWHs, however lessons from Malawi show that low utilization remains a critical challenge ⁹⁶. However by targeting mother's perceptions of value and benefits in another part of Malawi, utilization appropriately improved and admissions of complicated cases to the nearest referral hospital declined ⁹⁴.

Communication

In care delivery at the district level, there is a need for formalized systems of communication to ensure effective coordination of care. In Assin North, poor mobile network connectivity coupled with a lack of standard systems for follow-up and feedback weakens the referral process. Several studies have underscored the critical need for communication for maternal health ⁹⁷⁻⁹⁹, with use of low cost radio systems ⁴⁸ & four-wheeled referral vehicles ⁹³, helping achieve lower maternal mortality rates in similar rural communities. In Iganga district in Uganda, the UNFPA helped equip traditional birth attendants with a solar-powered VHF-radio communications system that included a fixed base station, walk-talkies and ambulance back-up. Per the UNFPA, these improvements in communication and transport links reduced maternal mortality by more than 50% over 3 years ⁹⁴. In Uganda, Malawi and Ghana, MotherCare, a USAID's flagship global maternal health project, provided support for programs using radio communications. In Malawi, the use of radio-telephones (with transport and referral systems) in health centers reduced transport delays from 6 to 3 hours. Subsequently, all three countries have since been moving towards rehabilitation regional radio transmitters ⁹⁴. Assin North tries to use more sophisticated communication technologies such as cell phones which, even though practical, do not seem effective especially in regions with poor network reception. Moreover the usage and effectiveness of such mobile devices have not been evaluated. Communication options globally have ranged from chits, one-way radios, two-way radios, telephones and cell phones. Reported constraints have included cost, poor communications infrastructure, and need for electricity to power equipment, and options like solar-powered two-way radios have sought to address these limitations ⁹⁴. Even more recently, there has been the introduction of telemedicine and decision support systems via cell phones called M-health to facilitate clinical decision-making which have garnered great enthusiasm and support from the global community ¹⁰⁰. Compared with transportation, there are fewer options and permutations in communication technology, but what currently exist present a fairly innovative assortment that could be replicated in Assin North.

Clinical Skills and Management

Reducing referral costs and distance barriers is not sufficient to streamline faulty referral systems. There is a coupled need of investing in health workforce and upgrading their skills. Yet, as many providers can attest, a functioning referral system works on the premise that highly

skilled medical staff exist to address clinical emergencies. Unfortunately, that assumption seldom holds in low-resource settings. In Assin Fosu, a pregnant woman with twins lost one of her babies because of an inability by HCWs to recognize danger signs. Likewise, a hospital-based study in Nigeria found that referrals to the hospital for appropriate management were made only after prolonged delay and onset of complication, and health centers often misdiagnosed cases ¹⁰¹. Enhanced training programs for physicians and midwives by visiting obstetricians at a state referral hospital in Kebbi state, Nigeria for example reduced the case fatality rate of obstetric complications from 22% to 5% over 5 years ¹⁵. Semi-structured interviews of nurses in rural Niger demonstrated incongruence in indications for referral between their knowledge and the recommended guidelines. For instance, the nurses described the need for referral only “when surgery becomes inevitable” or as “what is done in case of shortage”, and they are often reluctant to refer because it would hurt their prestige ⁸³. Similarly, in Assin North, deficits were noted in recognizing danger signs, stabilizing patients, and handing over to receiving staff. These represent fundamental inadequacies in training and retraining that warrant further investigations into ways to eliminate such direct threats to patient safety. Further compounding these inadequate skillsets are marked inequalities existing in the standards of care provided. These were noted in the use of accompanying nurses, calling ahead to alert receiving units, following up with patients, and documenting cases. Moore in 1994 proposed a safe motherhood checklist which aims to increase awareness of safe motherhood concepts and practices to both providers and community members as a means to reduce maternal deaths, especially in resource poor settings ¹⁰². Pre-existing guidelines should be reviewed and rationalized. Eventually, it should be operational for referral emergencies and incorporated into district health services. Obstetric referrals presents a good starting point because it constitutes a significant part of overall emergencies, can be prevented by timely management, and can be effectively quantified and monitored. Knowledge from such pilot studies can be easily translated to other emergency conditions. Regions like Assin North might benefit from training and retraining of providers especially as it addresses identified problems related to both clinical skills limitations and unreliable standards of care.

Standards of Care and Monitoring

Accountability is fundamental to performance improvement. It is a guiding principle that, if

effectively done, guides interactions, demands sustained commitment, safeguards continued progress, reflects ownership and ensures sustainability. There does not appear to be any robust formal sense of accountability within the Assin North health system. Perhaps this is due to the strong hierarchical structure in the various health facilities that makes leaders prone to inertia and often immune to scrutiny. In Assin North, as in various parts of sub-Saharan Africa, there is very little incentive to improve standards or innovate because of low supervision in the hospitals, among other things. This stands in sharp contrast to the expectations by the MoH in Ghana. Currently, there are referral guidelines composed by the MoH to guide clinical and strategic decisions based on patient presentation. However, many of the healthcare providers in this study were either not aware or did not follow the guidelines if they were because of resource constraints, as well as the complexity that underlines the guidelines. This is not uncommon. In a study of nurses in a hospital in Niger, they did not have full appreciation of referral guidelines, noting that “the decision trees disable people from thinking clearly”⁸³. Simple dissemination of written guidelines is often ineffective. Supervision, audit and feedback are more effective at ensuring guideline adherence among staff, and should be more thoroughly enforced.

Data collection and management is an enormous challenge especially in regions with low literacy, limited access to care and poor infrastructure¹⁰³. In Assin North, the only obligation for the healthcare provider is to collect outcome data pre-determined by the MoH in a notebook and to report monthly data to the district health office. Data is not verified, and is not useful for much besides being used to augment a report. It is therefore little surprising that the quantitative aspect of our study was significantly limited, given poor data quality in many of the health facilities in Assin North. Arguably our data quest had somewhat more complexity, which could predispose it to poor reporting and quality. However, this trend of generally poor data reporting is fairly commonplace in other parts of Ghana. For example, a study in a remote rural hospital in northern Ghana showed that no data were available for April to May 1991 because pages had fallen out of the book and had been lost. Pregnancy outcome data showed 6.7% cesarean sections and 1.9% vacuum extractions in the region; however other studies in the same region reported 18-25% intervention rates during delivery, suggesting likely inaccuracies in data reporting¹⁰⁴.

Three accountability-enhancing strategies have been posited to help target the problem: reducing abuse, assuring compliance with procedures and standards, and improving performance/ learning

¹⁰⁵. A recent pilot study in the Sene District in Ghana reports success with the use of cell phones by ten TBAs for real-time data entry on PPH outcome measures during the event ¹⁰³. The study in Northern Ghana further argues that staff encouragement should not be devoid of structural changes such as equipment, staffing, regular feedback and utilizing data to stimulate change to facilitate the process ¹⁰⁴. These are aligned with expectations by HCWs in Assin North who are already realizing this berth between current standards and the ideal.

The Value of HCWs in Quality Improvement

The Institute for Healthcare Breakthrough Series proposes a collaborative model for accelerating quality improvement that places emphasis on the important role of healthcare providers in stimulating and sustaining change ⁵⁴. This inspired the design of our study in the way we generated primary data from provider narratives, and stimulated further discussions about most effective strategies for designing interventions. Patient accounts are also important and our study is by no means exhaustive, but we decided to focus on HCW input as a first step to streamlining the referral process in Assin North. Recognizing that providers may more reliably influence delay 2 and 3 barriers of Thaddeus and Maine's framework, we argue that HCWs are in a position to reflect on delay 1 factors as well. Moreover, we believe that delay 1 factors could also indirectly be influenced if interventions modulate the experience patients have with the healthcare system in general. Figure 9 is a process map developed with help of providers, and a task that demonstrates the critical role of HCWs in supplying such practical information (compared to patients, other key stakeholders).

In developing countries, local HCWs are essential for the delivery of health interventions. Early involvement in quality improvement projects garners more support, ownership and a higher likelihood of sustainable results. This presents an important, often under-appreciated non-financial incentive in provider motivation. Despite interest in this issue of human resources, human resource management and solutions to improve healthcare worker motivation through non-financial means have received little attention in the developing world. There are significant limitations on financial motivations and a small, but growing body of studies are beginning to highlight the role of non-financial motivations as well ¹⁰⁶, including the ability to participate in collaborative quality improvement initiatives ¹⁰⁷. Interventions to improve quality of obstetric

care in Dinajpur, Bangladesh including team-building among providers, case reviews, and stakeholder's committees for example improved met need in the region by 24% compared to 13% in the comparison region¹⁰⁸. Local HCW in Assin North appeared ready and engaged in a move to bring change to Assin North presenting an opportune moment to encourage homegrown solutions to referral barriers within the district.

Developing Comprehensive Solutions to Obstetric Referral Challenges: A Framework

Given the diversity of health systems, geographical conditions and infrastructure it is impossible to develop a generally applicable blue print for referral systems. However, we can identify a framework that describes strategic interventions that can effectively address these challenges. An ideal model for improvement should aim to create new approaches that achieve ambitious levels of improvement, while at the same time maintaining feasibility and sustainability of results. These new approaches should target specified barriers to referrals, but should be wary of neglecting other contributory factors to maternal mortality. Reexamining barriers to referrals as referral process maps and their associated bottlenecks could provide an alternate means to better appreciate how isolated interventions can be less effective at improving health outcomes.

Figure 9 aims to illustrate how different barriers to referral are intricately linked in the care delivery paradigm when viewed in a process map. In the setting of Assin North, individual and sociocultural factors could prevent a pregnant woman from seeking care at a health facility. This represents challenges that are largely community-based. Even if she does seek care, lack of recognition of danger signs, poor stabilization, and poor documentation are examples of facility-based challenges that could negatively impact the quality of care she receives. More importantly, negative experiences of the patient at the facility owing to such systemic deficits could influence future decisions she takes to seek early care, feeding back to community level decision factors, and illustrating the vicious cyclical nature of facility and community-based referral challenges.

The process map also argues how developing solutions to referral challenges entails more than implementing isolated interventions. For example if an ambulance vehicle is introduced to transport pregnant women to the nearest facility (addressing transportation barrier but no interventions are put in place to promptly and accurately triage (clinical skills limitation),

bottlenecks would still exist in the referral process, and health outcomes may not necessarily improve. It is important to acknowledge how factors at both individual, community and facility levels intersect in important ways in the referral network. A more effective intervention should thus not overlook the complex nature of how barriers to referral are inherently interlinked, and should aim to prioritize holistic change packages that are most effective in producing results.

The question remains as to how best to target interventions that address barriers to referrals for pregnant women in Assin North Municipal District. After being asked to highlight barriers to referral, each participant in our study was asked to give suggestions of ways these barriers could be addressed. The major classes of interventions that were deemed most pertinent by the respondents included: Standardizing the referral protocol, Improving transportation systems, Ensuring reliable data reporting and management systems, Actively engaging the community, and Providing continuous training for health staff. Table 8 reproduces this list of suggested interventions, and more importantly generates a set of ideal features that these interventions could have based on prior discussions with examples that illustrate how ideal interventions should concurrently target multiple barriers to referral. For example a standardized referral protocol must consider reducing wait times for patients, integrate cultural aspects of care delivery, facilitate timely transport, have built-in aspects for communication and feedback, minimize variations in quality of care provided, and provide a metric for continuous assessment and quality improvement. All these can be accomplished with a checklist. The next reasonable step would be to assess the utility and effectiveness of such integrated solutions, and perhaps compare them to those of other more targeted interventions. A functioning referral system is generally considered to be a necessary element of successful interventions to improve maternal mortality. Box 1 summarizes our findings, and highlights the main requisites of an ideal referral system.

The Lancet Neonatal Survival Series called for action to addressing neonatal mortality using both facility and community-based interventions, highlighting the important role of maternal health outcomes in achieving improvement ^{109,110}. Such multi-pronged approach could be implemented in Assin North, with the added advantage from this study of targeting identified underlying barriers to care, a theme mentioned but not expanded in the Lancet series. Quality improvement involving healthcare workers presents another framework for using ideas from the

grassroots to effecting change on local levels. Assin North has begun this process, and further work would be needed to assess utility, effectiveness and outcomes as they pilot interventions to reduce maternal mortality in the district.

Study Limitations

The small participant pool and the specific geographical focus limit the generalizability of these results. However, this study has identified themes that are highly relevant for the target region and population, with a good chance that recommendations may hold for other regions with similar demographic and provisional characteristics.

Additionally, this study focused specifically on health care worker perspectives and therefore our analysis focuses on the systems limitations that are directly within the control of these health care workers. Further study is needed to fully understand patient-level perspectives of health care system barriers, as well as community-level and individual-level factors that also influence how and when women access critical EmOC services.

Thirdly, while our quantitative component was more elaborate in pre-planning design especially with regards to time measures, it yielded fairly scant results at completion of project due to poor data reporting at the health facilities. This could be viewed as a study limitation because one could argue that it did not add much to the overall research project, and its scarcity perhaps prevented fuller depth and understanding of our qualitative study; others may further argue that it be excluded altogether. While we acknowledge these limitations, we still chose to include our quantitative data results (though scant) in our report to highlight the prevalence of obstetric medical conditions whose outcomes are closely intertwined with socio-economic barriers in Assin North, to reinforce the points discussed extensively in the qualitative component. In addition, we chose to show and underline the scarcity of the quantitative data to illustrate the worrisome gap in data monitoring and management in Assin North, and how it could challenge evidence-based quality improvement work.

Finally, that the data collection and analyses were executed by one individual (the author of this research paper) could limit the internal validity of this work. Ideally, having at least one other independent data collector and/or analyst could have allowed for inter-interviewer collaboration and comparison, making the findings more robust. However, operational logistical challenges on the project site prevented recruitment of additional project members. In the meantime, the author tried to triangulate data as an alternate, though not most ideal way, to make the findings more robust given her logistical limitations.

CONCLUSIONS

A significant component of maternal deaths in the developing world are attributable to referral systems that are confronted with multiple barriers in the care delivery process, prompting the need to investigate high-impact bundle approaches that target these bottlenecks concurrently. Healthcare workers play a key role in this process, and are currently engaged in Assin North through *Project Fives Alive!* to further define the challenges highlighted in this paper, with plans to test and retest change ideas according to the improvement model. Still, more work remains to be done to refine and evaluate these interventions as they apply to Assin North Municipality, with implications that could potentially inform similar work in other settings that strive to improve maternal outcomes in the face of limited resources.

SUGGESTIONS FOR FUTURE WORK

The data we have reported in this paper establish a baseline for the monitoring of future trends in Assin North's referral systems. More work however still needs to be done. Firstly, research is needed to generate evidence on the effectiveness, cost and acceptability of referral interventions, especially bundle approaches to streamlining referral. Secondly, existing impact studies of referral interventions have often yield mixed results, and it might be worthwhile stratifying results by factors such as risk, socioeconomic status to see if any trends evolve or if any effects become more robust. Thirdly, evidence on inter-program and cross-national learning and knowledge exchange is fairly lacking and further studies can determine optimal, cost-effective

methods of sharing so as to not to reinvent the wheel across countries. Fourthly, the use of quality improvement to improve healthcare worker motivation is fairly new, and perhaps warrants further exploration, as it holds promise for maximizing gains for the health system. Fifth, the importance of access to obstetric emergency care is undisputed. However, there might be some relevance to elective referrals for maternal reasons, particularly when the line between emergency and elective is blurry (e.g. mild hemorrhage), and this could be further explored. Sixth, another less studied topic is the role of emergency obstetric initiatives in informing referral of other emergency conditions such as trauma. Further studies could examine how best to expand cost-effective solutions in maternal healthcare delivery to other emergency medical conditions. Seventh, more in-depth social and organizational inquiry is required on the referral care needs of the poor and underserved, and on the maternity workforce and organization. An increasingly mixed economy of healthcare and a proliferation of different types of non-government maternity care provision pose new challenges for collaborative referral networks; the implications of the mixed economy of healthcare for referral networks on maternal outcomes need to be explored. Finally, several interventions to improve maternal health affect neonatal health as well. More research is required to determine how maternity referral fits within newborn health priorities and where the needs are different.

SUMMARY

In Ghana, maternal mortality stands at about 350 deaths per 100,000 live births, reaching higher rates in rural areas. These high mortality rates are often due to delays in obtaining emergency obstetric care. Using a referral network in Assin North Municipal Assembly, a rural district in Ghana, we aimed to investigate baseline referral systems in obstetrics with a focus on describing barriers, solutions and the value of healthcare workers (HCW) in identifying system-based bottlenecks. We used a mixed methods approach: for the quantitative component, we reviewed facility registers for major causes of referral in obstetrics and delay indicators; for the qualitative section, we used semi-structured interviews of 18 healthcare workers to obtain provider narratives regarding existing referral protocols, perceived barriers and process improvement interventions to streamline referrals. Results showed that between January – June 2012, the leading causes for obstetric referrals to the district hospital were prolonged labor, retained placenta, postpartum hemorrhage, malpresentation of baby, and premature rupture of

membranes. From the district hospital to tertiary care hospitals, the leading cause of referrals was severe eclampsia. Delay indicators were not obtained due to poor documentation. From the qualitative study, we identified important gaps in referral processes in Assin North, with the most commonly noted including recognizing danger signs, alerting receiving units, accompanying critically-ill patients, documenting referral cases, and giving and obtaining feedback on referred cases. Main root causes identified by providers were in five domains: 1) individual and socio-cultural factors 2) transportation, 3) communication, 4) clinical skills and management, and 5) standards of care and monitoring, and suggested interventions that target these barriers. Mapping these challenges allowed for better understanding of next steps for developing comprehensive, evidence-based solutions to identified referral gaps within the district. Addressing referral processes may hold better promise for reducing maternal mortality if frameworks for designing solutions target multiple referral challenges concurrently. Providers are an important source of information on local referral delays and should be better engaged in the development of approaches to improvement responsive to these gaps. Similar work is needed to integrate their perspectives with those of patients and their communities.

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Tables and Figures

Table 1. Summary of Literature Review on Referral Systems	
What We Know	Sample Studies
<ul style="list-style-type: none"> Emergency obstetric care is a critical component of work to reduce MMR Delays at the facility and community levels contribute to high MMRs Solutions to fix gaps in referral processes are effective if the system itself is strong and quality of care is ensured 	<ul style="list-style-type: none"> 17,23,25 25,27,33,56 45,51,57,96
What We Don't Know	
<ul style="list-style-type: none"> How the facility and community intersect in their roles in the referral paradigm An ideal process map for referrals in resource-poor settings that integrates both community and facility How best to design interventions to target multiple gaps and bottlenecks in the referral process 	

Table 2. Delays in Getting Care Once at a Facility or with Health Care Provider		
Indicator	Definition/Metric	Data Source
Time to Treatment – Intrapartum Complications	Average time from arrival at the hospital to definitive* treatment for intrapartum complications	Health Records Review
Time to Treatment – Postpartum Complications	Average time from arrival at the hospital to definitive treatment for postpartum complications	Health Records Review
Recognition of Danger Signs for Maternal Complications	% of providers who recognize danger signs of maternal complications	Health Worker Interviews
Referral Documentation	% of referrals from HCs to hospitals for which documentation is complete	Health Records Review
Intra-facility Referral Due to Doctor Absence	% of referrals from one facility to another due to absence of doctor	Health Records Review

Table 3: Deaths Specific to Phase III Delays		
Maternal Deaths Among Women Both Referred and Admitted	% of maternal deaths following both referral and admission to the hospital/HC	Health Records Review
Maternal Near Miss	% of women arriving with a life-threatening complication* who survived	Health Records Review

Table 4: Factors Influencing Referral Processes between HC and DH	
Broad themes	Sub-themes
Access	Distance from HC/DC; Proximity to tarred roads
	Transport Capacity of HC/DC
	Range of Maternal and EMOC services provided
	Cost of services and transport
	Strength of Infrastructure & Partnership
Communication	Systems of communication
	Number of inter-facility workshops/ meetings per year
Skill Sets	Cadres and roles of clinical staff available
	Volume of the clinic and Experience
Leadership	Role of leadership in ensuring referral
	Turnover rate of staff

Table 5: Roles of Health Workers Interviewed	
Health Cadre (number interviewed)	Obstetric Services Provided
Community Health Officer (CHO) (n=4)	Antenatal and postnatal care, emergency, non-complicated deliveries only
Medical Assistant (MA) (n=3)	
Midwife (n=8)	Antenatal and postnatal care, emergency, non-complicated deliveries Routine, non-complicated deliveries
Other Nurse (Hospital Emergency and Children's Department) (n=2)	First point contact for emergency obstetric and neonatal cases, stabilize and triage cases for advanced management
Physician/ Obstetrician (n=1)	Emergency deliveries requiring advanced management, Caesarian Sections

Table 6. Delays in Getting Care Once at a Facility or with Health Care Provider ¹				
Indicator	Reliably Collected	Unreliably Collected	Not Collected	Comments
Time to Treatment – Intrapartum Complications				Expected to have it documented in different records eg. Referral registers and patient records
Time to Treatment – Postpartum Complications				Expected to have it documented in different records eg. Referral registers and patient records
% providers who can recognize danger Signs for Maternal Complications				Qualitatively obtained though health care worker interviews
% completion of referral Documentation				Unreliable documentation due to stock out of referral forms
Intra-facility Referral Due to Doctor Absence				Available from hospital registers though reliability unclear

Table 7: Deaths Specific to Phase III Delays				
Indicator	Reliably Collected	Unreliably Collected	Not Collected	Comments
Maternal Deaths Among Women Both Referred and Admitted				
Maternal Near Miss				

Table 8: Ideal Impact of Interventions on Barriers						
Suggested Intervention						Example of Intervention
	Individual and Cultural factors	Transportation	Communication	Clinical Skills and Management	Standards of Care and Monitoring	
Standardized Referral Protocol	Reduces wait time for patient, and integrates cultural aspects of care delivery	Facilitates timely transport of patients	Clear language with strong built-in feedback and pass-off system	Minimizes variations in quality of care provided	Provides a metric for continuous assessment and quality improvement	Referral checklist
Improved Transportation Systems	Reduces financial burden to providers and patients, and appropriates intervention for cultural setting	Improves efficiency of transportation	Encourages effective communication between drivers and patients	Allows stabilization and monitoring of patient	Diffuses responsibility from health staff to community	Rickshaw motor vehicles adapted for transport of referred patients

Reliable Data Reporting and Management Systems	Encourages post-discharge follow-up of patients and at-risk populations, and monitors important sociocultural markers affecting health outcomes	Allows easy physical transfer of data especially when online networks not robust	Develops a common language/metric for comparison between sites and easier communication between health staff	Facilitates the use of evidence-based methods to improve care delivery	Allows for close supervision and monitoring of health staff	Combined Referral forms with stenciled-feedback and follow-up slips
Active Community Engagement	Encourages early care seeking behavior; and targets specific social and cultural barriers to early self-referral	Engenders community involvement in providing affordable means of transportation	Clear, innovative means of communication that translates into improved outcomes	Encourages patient self-advocacy, by educating them on danger signs and the expected benefits of early referral, as well as understand the clinical limitations of each level of care	Rope in community stakeholders as additional accountability partners in referral discourse	Community Education using Radios and Periodic Durbars
Continuous Training and Re-training for Health Staff	Helps reduce doubt patients have about competence of health staff and restores patients' trust in the formal health care system, when they compare with alternative forms of healing	Facilitates easy transport of health staff, including removing financial costs	Helps improve communication methods between both facility and community stakeholders	Improves the clinical skill sets of all cadres of health workers to better recognize and manage emergency cases	Invests in leadership training to sustain results	Periodic re-training on emergency preparedness, and management of emergency cases

Box 1: Requisites of an Ideal Referral system: Summary

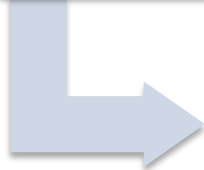
1. be aligned to the needs of the population
2. target multiple barriers simultaneously
3. encourage teamwork and active collaboration between different levels of care
4. be adequately resourced
5. have communication and feedback systems
6. designated transport
7. agreed setting-specific protocols for identification and management of complications
8. supervision and accountability of provider's performance
9. affordable service costs
10. capacity to monitor effectiveness
11. have an effective data reporting and management system
12. have policy support

Figure 1: Range of Maternal Services Expected to be Provided at the Various Levels of Care



HEALTH POST

- Antenatal Care
- Postnatal Care
- Family Planning
- Emergency Deliveries Only (Non-complicated)
- Community Outreach Services



HEALTH CENTER

- All CHPS Compound services plus
- Routine, Non-complicated deliveries



DISTRICT HOSPITAL

- All Health Center services plus
- Deliveries needing advanced management

Figure 2. Map of Assin North Municipal District

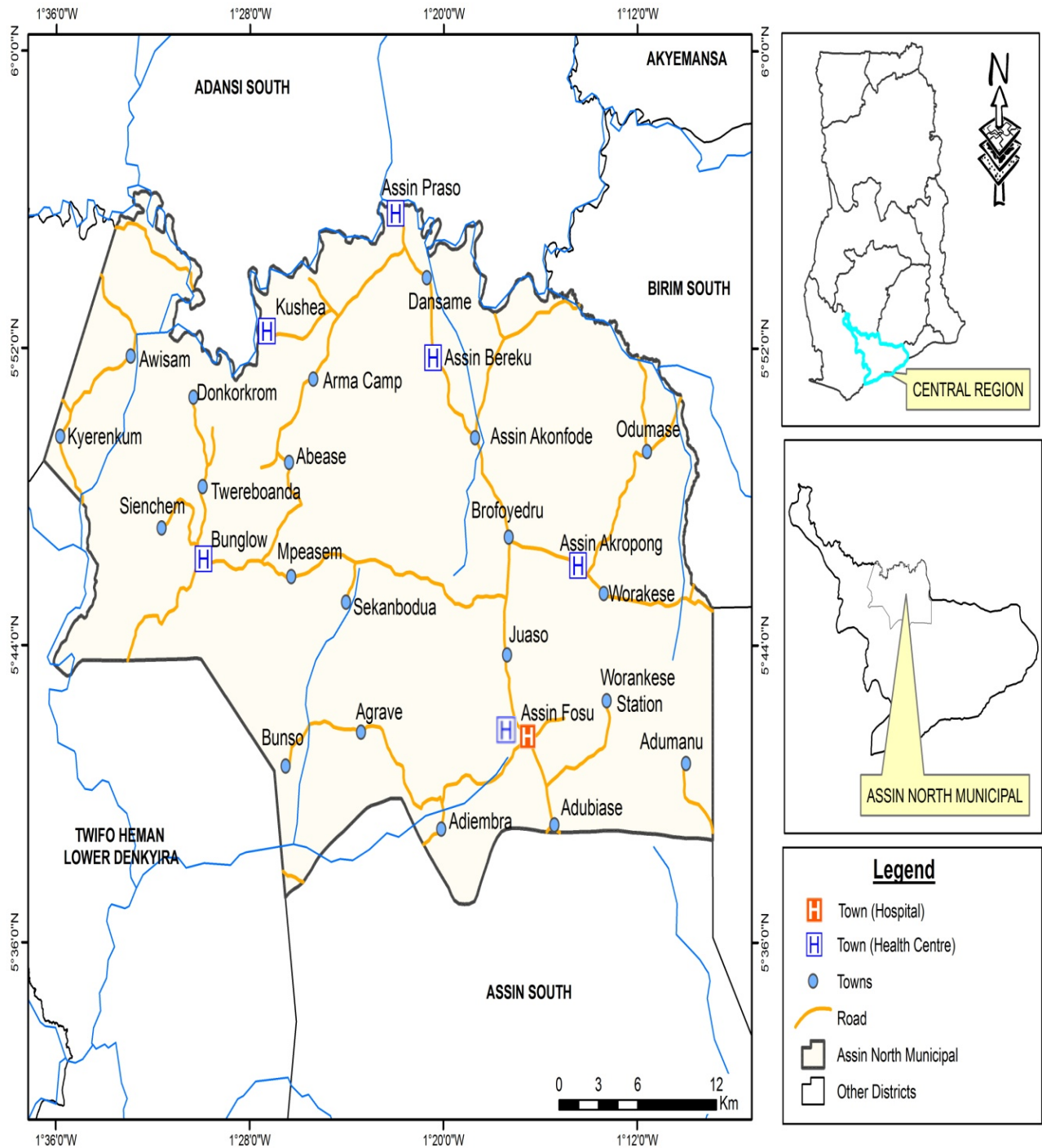


Figure 3: Health Workers Interviewed, N = 18

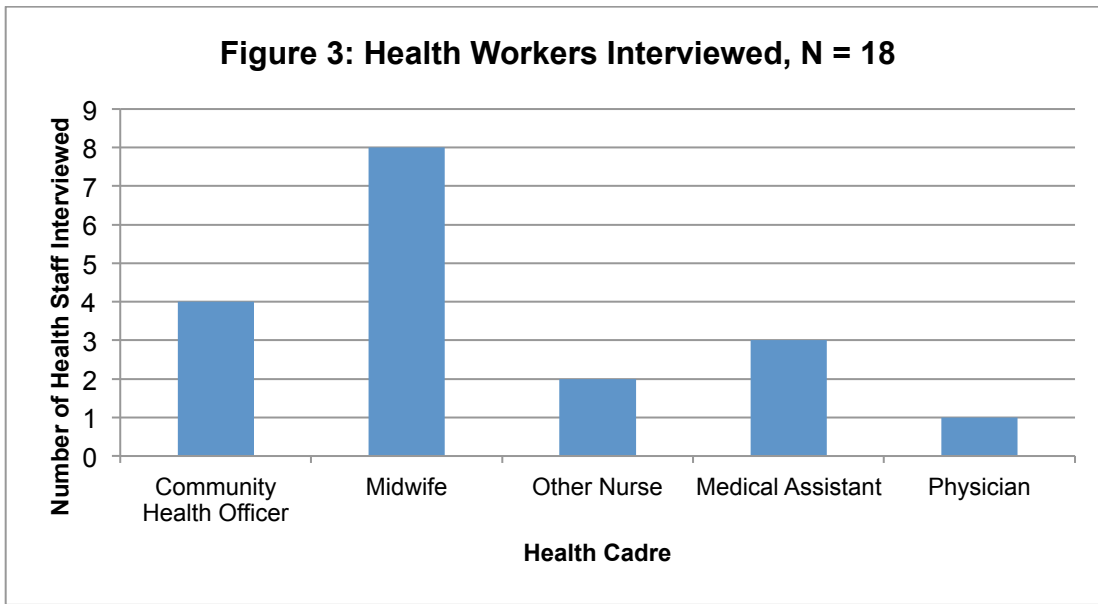


Figure 4: Top Ten Causes of Obstetric Referrals to St Francis Xavier Hospital (Jan - June 2012)

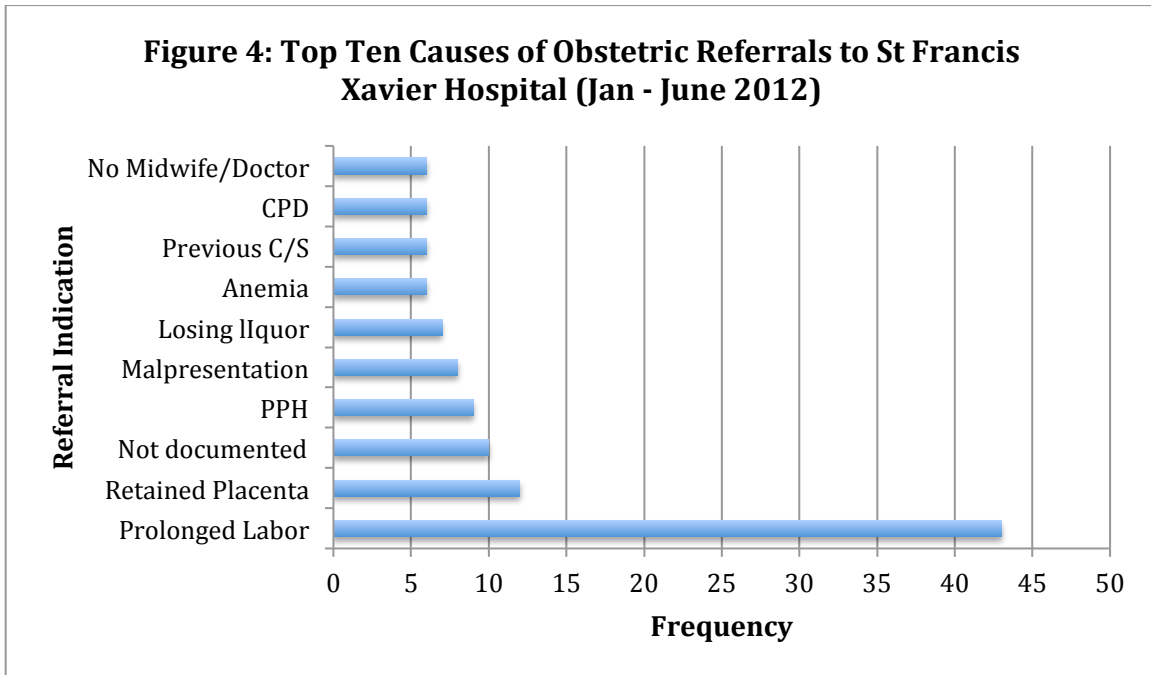


Figure 5: Road to A Health Post. Running through the middle is a streamlet in continuity to a nearby river, which overflows and cuts off road during rains



Figure 6: Poster Ad on the agreement between the MoH and transport unions



Figure 7: Phones positioned on wooden poles at a Health Center. Only spot on the entire compound where there is mobile phone network reception



Figure 8: Driver diagram summarizing the major and subsidiary barriers to obstetric referrals in Assin North Municipal District, Ghana.

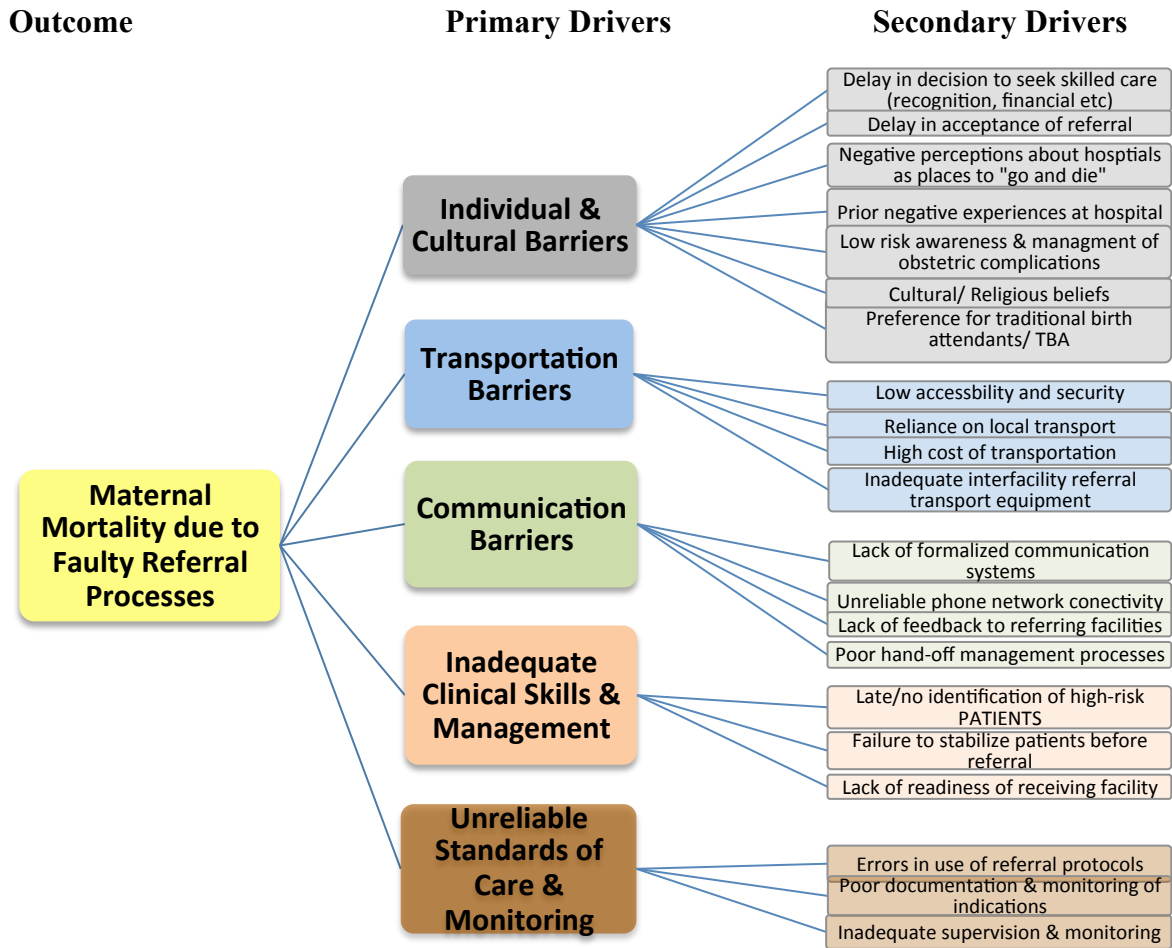
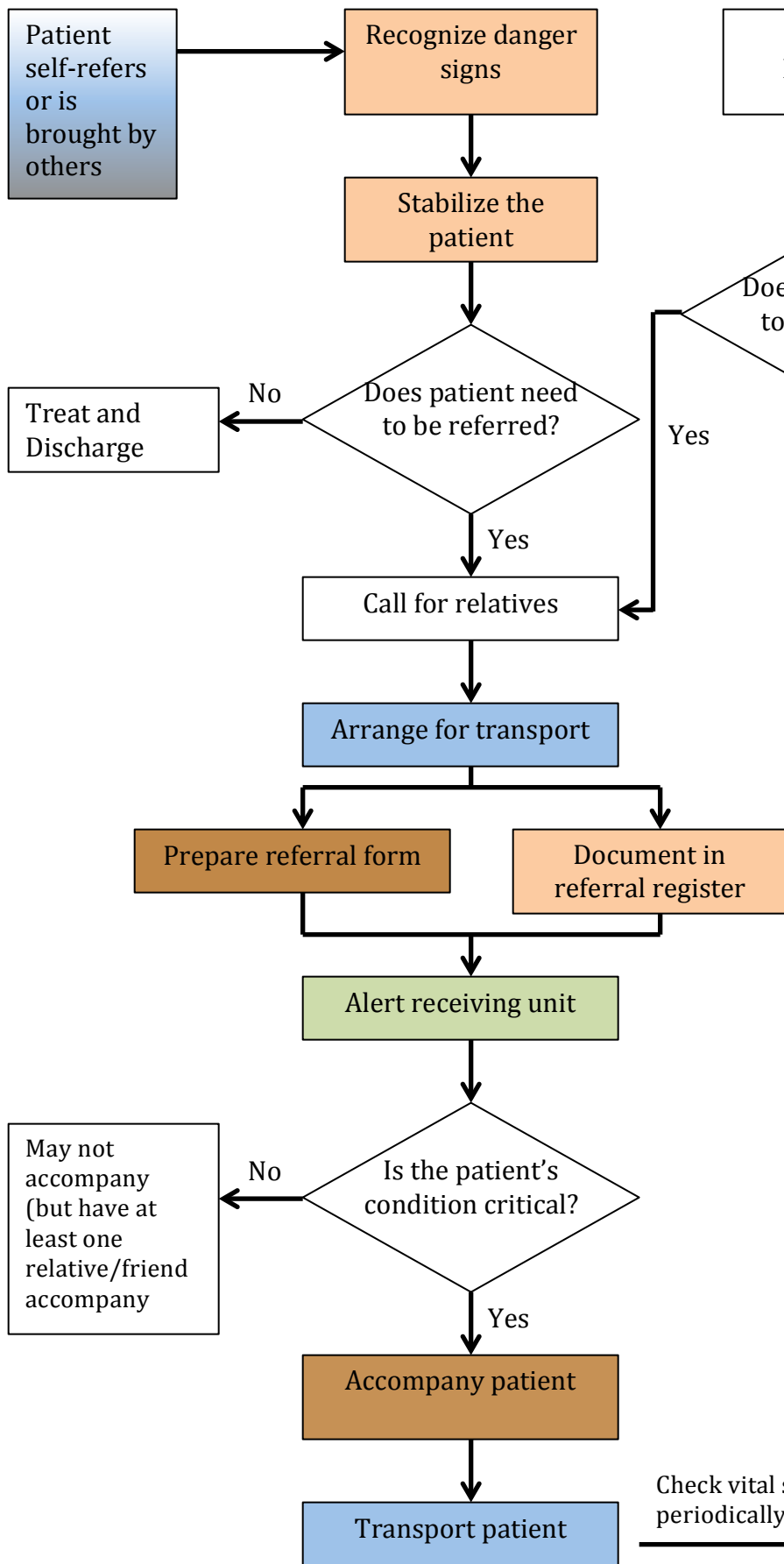
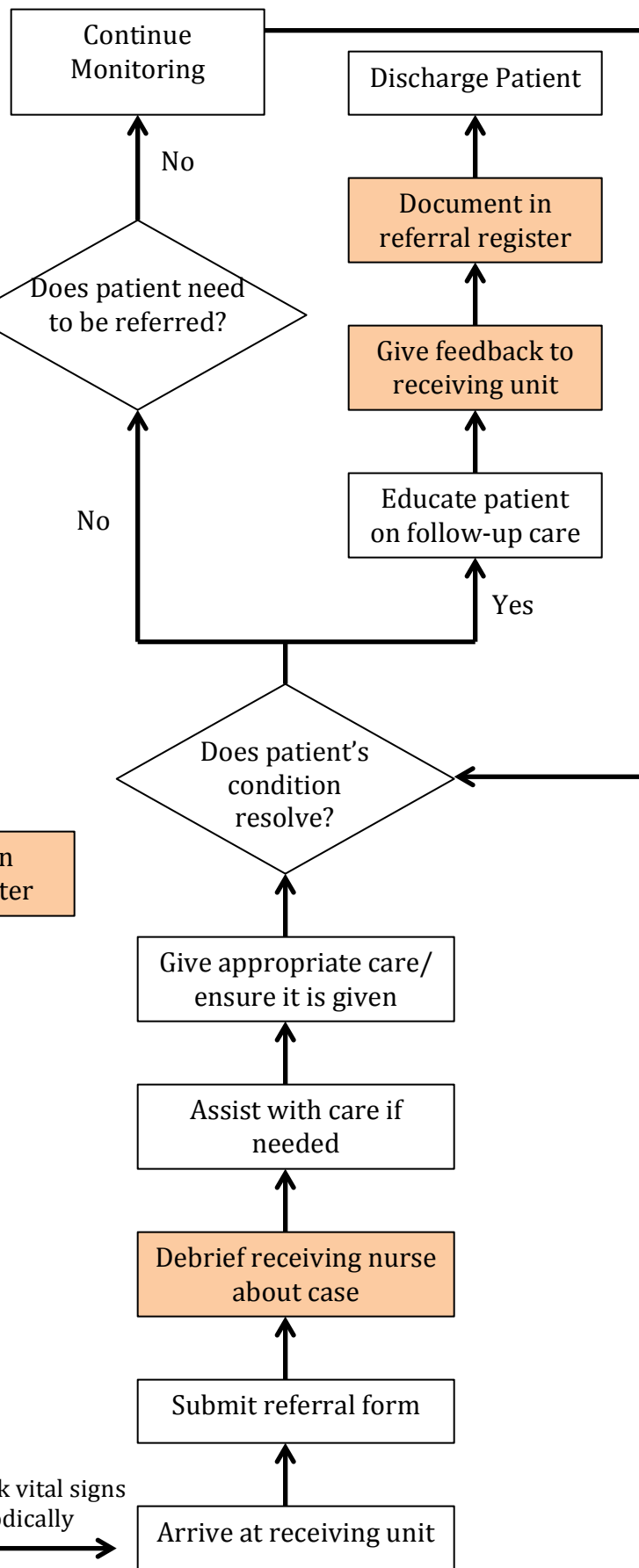


Figure 9. An ideal baseline referral process map, showing major gaps (colored boxes) in referral processes reported for Assin-North Municipality. [Gaps color-coded to reflect major domains of referral challenges. Grey = Individual/ Socio-economic, Blue = Transportation, Green = Communication; Orange = Clinical Skills; Brown = Standards of Care].

Referring Unit Protocol



Receiving Unit Protocol



Appendix

Qualitative Interview Guide

Introduction:

Thank you very much for agreeing to do this interview with me today. We are interested in learning about your opinions about the referral process for pregnant women who experience complications during pregnancy, labor and delivery, or newborn complications following birth.

Do you have any questions before we begin?

1. To begin, I would like to ask you how long you have worked as a health facility staff?
What is your role in this facility?
2. What kinds of maternal and emergency obstetric services are provided in this facility?

Probes: What are the ranges of costs of services provided? How many women visit the clinic in a week?

3. What are the transportation options in this community for getting to the nearest health clinic and hospital?

Probes: What is the transport capacity of this facility?

How do most women find transportation if they have an emergency?

Does this community have an ambulance in this community?

Tell me about your perception of this ambulance service...

How far away is the nearest hospital? What is the condition of the road?

How much does transportation to the nearest hospital cost?

4. What are the communication options in this community?

Probes:

- How can a woman communicate with a provider or facility if she is concerned about her health during pregnancy?
- How can a staff at one health facility communicate with another at a different health facility?
- How often does this happen?
- Are there inter-facility workshops or events in this district? If so, how many per year? If not, why not?

5. What is the dynamic or relationship between this health facility and the district hospital?

Probes: How could this dynamic be improved?

6. Within this facility, what do you consider to be the main barriers to women receiving timely referrals and emergency care during complications?

Probes: Are there any complications for which this is especially challenging? Why do you think this is the case?

7. How could these barriers be addressed?

Probes: What are the gaps? Did you have any in the past and how you overcame? Do you have any areas you would suggest for improvement?

8. What is the turnover rate of the staff at this facility?

Probes: How often does staff leave this facility for other places? How many leave in a year?

9. What do you think is the role of the leadership of this facility in ensuring effective referral processes?

Probes: How could this be improved?

10. Are there any topics or procedures where training could improve referral and management of complications within this facility? Tell me more about what kind of training you think would be helpful.

Is there anything else you would like to share? Do you have any questions?

Thank you very much for your time.