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Preventing Maternal Mortality through Emergency Obstetric Care

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Preventing Maternal Mortality through Emergency Obstetric Care

I. Rationale for Increased Focus on Emergency Obstetric Care

All pregnant women are at risk of obstetric complications. Most life-threatening complications occur during labor and delivery, and these cannot all be predicted. Prenatal screening does not identify all of the women who will develop complications (Rooks, Winikoff, and Bruce 1990). Women *not* identified as "high-risk" can and do develop obstetric complications. Most obstetric complications occur among women with no risk factors.

For example, at a health center in Kasongo, Zaire, a prenatal care program was implemented where pregnant women were screened for their risk of developing obstetric complications. Those coming in with a bad obstetric history (history of stillbirths, medical intervention during delivery) were identified as "high-risk" for developing obstructed labor. The Kasongo data showed that only 29 percent of women who actually did develop obstructed labor were from the "high risk" group. More than two-thirds of the women who developed this complication were not predicted by the screening program (Kasongo project team 1986).

Similarly, evidence that obstetric complications are common despite intensive prenatal care and screening was illustrated in a study of deliveries in non-hospital birth centers in the United States (Weatherby 1990). In that study, one of every thirteen women categorized as "low-risk" and receiving intensive prenatal care developed serious complications.

Every pregnant woman needs access to facilities with capabilities to provide emergency obstetric care (EOC)[1]. Neither effective prenatal care nor identifying risk will help women if EOC is not available, not accessible, or not utilized.

[1] EOC includes specific interventions to manage "emergency" obstetric complications. Interventions may be intravenous antibiotics, oxytocics or

anti-convulsants, management of abortion complications, management of postpartum bleeding, assisted delivery for prolonged labor such as vacuum or forceps delivery, blood transfusion, and/or cesarean section.

The Safe Motherhood Initiative was launched in 1987 -- fully a decade ago. The prime goal of the Initiative was to reduce the number of maternal deaths by half by the year 2000. Yet, new estimates of maternal mortality indicate that globally in 1990, some 585,000 women died from complications of pregnancy and labor -- 80,000 more than earlier estimates had suggested (WHO 1996).

More than 99 percent of the deaths occurred in developing countries, where maternal mortality ratios range from an average of 190 per 100,000 live births in Latin America and the Caribbean to 870 per 100,000 in Africa (WHO 1996). It also is estimated that the majority or 75 percent of maternal deaths are direct obstetric deaths due to obstetric complications such as hemorrhage, unsafe abortion, hypertensive disorders, sepsis, and obstructed labor.

To date, the focus of safe motherhood programs in most countries has been on delivery of maternal services other than emergency obstetric care. The goal of reducing maternal mortality cannot be achieved if prompt adequate care is not available for obstetric complications. The challenge now is to shift focus and concentrate on improving efficient delivery of care for emergency obstetric complications *in addition to* ongoing maternal health care services.

II. Barriers to Timely and Appropriate EOC

The "3 Delays Model" developed by the Prevention of Maternal Mortality (PMM) Network identifies the points at which delay to EOC can occur:

1. delay in deciding to seek care;
2. delay in reaching a first referral level facility;[2] and
3. delay in actually receiving care after arriving at the facility. The PMM Network believes *the delay in actually receiving care after arriving at the facility the most critical*. The PMM Network has been involved in EOC-related activities in three West African countries -- Nigeria, Ghana, and Sierra Leone.

[2] First referral level facility is the facility to which a woman prenatally identified as high risk is referred or to which a woman is sent when complications previously unforseen arise during labor or delivery. The facility may be at a lower level of the health system such as an upgraded health post or health center capable of providing basic EOC, or at a slightly higher level of the health system such as a rural or district hospital, capable of providing comprehensive EOC including blood transfusion and surgical functions such as cesarean section.

2.1 Barriers to Receiving Care After Arriving at an EOC Facility

Studies carried out at facilities providing comprehensive EOC showed delay in treatment once women arrive at the facilities to be a major contributing factor to maternal mortality -- with admission-to-treatment intervals ranging from a mean time of 2.6 hours to 15.5 hours (PMM Network 1995). Long admission-to-treatment intervals were attributed to ***shortage or lack of essential supplies and equipment***, including drugs, gloves, sutures, and anesthetic agents at the facilities, forcing the patient to wait while relatives try to acquire required drugs and supplies in private pharmacies. In Senegal's Kaolak hospital for example, transfusion was not available for 80 percent of women referred in labor needing transfusion, nor was anesthesia available for 64 percent of those who needed it (Region medicale de Kaolak 1988).

Difficulty obtaining blood for transfusion is a major obstacle in the management of obstetric emergencies. For example, a study in rural Tanzania concluded that the difficulty in obtaining blood was responsible for 35 percent of maternal deaths (Price 1984). In a study at the University of Nigeria Teaching Hospital in Enugu, the survival rate for patients with ruptured uterus who were unable to have a blood transfusion was 57 percent compared to a survival rate of 76 percent for patients who received blood transfusion (Megafu 1985). Most of the health care facilities studied either did not have blood banks or had blood banks that were inadequately stocked (PMM Network 1992).

Lack of adequate operating theater space at the facility also contributed to treatment delays, since obstetric emergency cases had to compete with other surgical cases for the single general operating theater. The delays were found to be shorter during the weekends when the operating theater was more accessible because no general surgery cases were scheduled (PMM 1995).

Focus group surveys with community members identified lack of drugs, blood, essential supplies, and equipment as major barriers. The strongest concerns voiced after lack of supplies, were ***shortage of staff*** and ***shortage of competent staff trained to manage obstetric complications*** (PMM 1992). For example, a study in four regions of Tanzania indicated that delayed diagnosis or inappropriate management or both were implicated in 36 percent of maternal deaths (Mtimavalye 1984).

Lack of appropriately trained staff was also a major problem identified in a community-based study of maternal mortality undertaken in Zimbabwe during a two-year period from 1989 to 1990 (Fawcus et al. 1996). Avoidable curative-care factors were responsible for 87 percent of maternal deaths in the rural study area and for 70 percent of maternal deaths in the urban study area. The study identified inadequate treatment by incompetent staff -- specifically inadequate resuscitation of women suffering from hemorrhage and septic shock, insufficient antibiotic therapy and inadequate skills in surgery and anesthesia -- as avoidable factors for maternal mortality.

Lack of supervision of staff was an additional avoidable factor for maternal mortality identified in the Zimbabwe study (Fawcus et al. 1996). The study reported that the responsibility for managing emergency complications often was shouldered by relatively junior staff who failed to diagnose/recognize the severity of the complications. This was further compounded by limited supervision of the junior medical staff.

In a study in Tanzania, ***complacency attitudes among staff*** was identified as one of the major barriers (Mbaruku and Bergstrom 1995). The study found that most of the staff were convinced that maternal deaths were due to circumstances beyond their control such as delayed arrivals, cultural factors, and lack of drugs and equipment. All these reasons justified passivity especially when coupled with low staff morale due to low pay. Staff tended to forget their potential capacity to solve problems and few or no attempts were made to look for appropriate solutions to obvious problems.

2.2Barriers to Reaching a Facility with EOC Capabilities

Once a decision has been made that a complication needs medical intervention, availability of transportation and easy accessibility to a facility with EOC capabilities become factors of paramount importance. The Zimbabwe maternal mortality study reported unavailability of transportation contributed to 28 percent of deaths in the rural study area and 3 percent of those in the urban study area (Fawcus et al. 1996). The study also reported that among the deaths in the rural area, seven were women who had been staying in a specially designed shelter (similar to a maternity waiting home) as advised, but died because of the need for transport to a higher referral level.

In most areas, no ambulances are available and in remote villages, no car passes for days. In addition to ***distance*** and ***unavailability of public transportation,*** other factors such as ***condition of the roads*** (in several PMM sites, traveling on bad roads itself was considered a cause of hemorrhage), and ***travel costs*** have been identified as barriers to reaching a facility. Some focus group participants indicated they would go to a traditional practitioner closer by rather than risk the frustration and expense of going to a distant facility (PMM 1992). ***Distribution of facilities*** is another barrier. Facilities that exist are more often concentrated around urban areas and studies have repeatedly shown that urban dwellers have better access to health facilities than rural inhabitants (Thaddeus and Maine 1990).

2.3 Factors Influencing Decision to Seek Care Under Emergency Conditions

Even where facilities with capabilities for EOC are easily accessible, women may not use them. In the Zimbabwe study, delay in the decision to seek care contributed to 32 percent of deaths in the rural study area and 28 percent of those in the urban study area (Fawcus et al. 1996).

Women's status in the immediate and extended family generally underlies and shapes the decision to seek care (PMM 1992). Many studies show that women cannot and do not decide on their own to seek care; the decision belongs to a spouse or senior members of the family. In a survey in six Senegalese regions, 52 percent of the respondents said the decision would be made by the husband and 44 percent said another family member would make the decision (Dia et al. 1989).

Other factors influencing decision making under emergency conditions include ***perceived severity of the complication***. Pregnancy and delivery are regarded as natural processes and signs and symptoms of complications are not always recognized as reasons for concern. For example, focus group studies in Sokoto and Zaria, Nigeria, and Bo, Sierra Leone, showed that prolonged labor was not considered a complication and reason to seek care until two to five days had elapsed

(PMM 1992). Failure to recognize the severity of symptoms also was cited as a major reason for delay in seeking care in the Zimbabwe study (Fawcus et al 1996).

Societal expectations interfere with the use of health services in emergency conditions. Delivery at home remains one way for women to achieve status. For example, a woman who has to go to a hospital for delivery is thought to have failed in her essential role as a woman and is stigmatized (PMM 1992). In Benin, women of the Bariba tribe are expected to be stoic during labor and delivery, and the woman who manages to deliver without calling for assistance is especially esteemed (Sargent 1985).

Culture and tradition have great influence on the decision to seek care and, therefore, on maternal morbidity and mortality. For example, in many African settings, women's use of health facilities may be restricted by the necessity for privacy and/or the custom that a male relative must accompany them while traveling. For Saudi Arabian women, the requirement that care must be given by a woman has hindered the use of health care services.

The necessity of ***traveling long distances*** (often due to the inequitable distribution of facilities) and the ***lack of transport*** were deterrents in deciding to seek care, as was ***dissatisfaction with staff attitudes and performance.***

Users' fees. Users' fees may influence utilization of non-emergency services, but findings from PMM studies indicate that *users' fees have little impact on seeking care at an EOC facility in emergency conditions,* once the decision to seek care has been made. In fact, at several PMM study sites where fees for services were introduced, although normal deliveries decreased markedly, the number of complicated cases seen did not change.

III. Lessons Learned and Best Practices for Improving EOC

It is widely accepted by international experts that the route to safer motherhood lies not through expensive technologies but through strengthening and upgrading existing health systems to provide essential elements of obstetric care to all those in need. As shown by the following best practices, *appropriate life-saving EOC capabilities can be made available at each level of the health system.* For example, staff at a rural health post with basic EOC capabilities would not be expected to perform a cesarean section, but would be expected to make a correct diagnosis, resuscitate and stabilize the patient, and refer her.

3.1 Community Education and Involvement

a. Community Education to Make Early Decision to Seek Care

The "Warmi" (woman) project funded by USAID/MotherCare in Inquisivi, an isolated rural province in **Bolivia**, focused on community-level activities, such as forming and enhancing community women's groups and strengthening community education in order to foster greater responsibility for self care and early decision to seek care (Kwast 1995). The project identified and prioritized maternal and neonatal health problems prevalent in the community using community women ("auto-diagnosis"), and in collaboration with a local NGO active in the area, implemented community education programs through simple booklets and radio programs. At the end of a three-year period, the most striking result noted was the reduction in perinatal deaths (PND) from 75 deaths (pre-intervention) to 31 deaths (post-intervention). The project attributes the decline to: (1) safer birthing practices; (2) knowing when to reach out for assistance; (3) better care of neonates and; (4) increased knowledge and use of contraceptives. Although information on obstetric complications was not recorded, a decline in PND indirectly reflects a decline in some obstetric complications, such as obstructed labor and antepartum hemorrhage (third trimester bleeding), which are important causes of PND. Increased use of family planning in the area also may have had an effect on maternal mortality due to abortion.

Often, traditional birth attendants (TBAs) and community members know that a woman will die from bleeding or from eclamptic convulsions, but they frequently wait too long to seek care at a health facility (See Factors Influencing Decision to Seek Care Under Emergency Conditions). In the PMM study areas in **Nigeria, Ghana,** and **Sierra Leone**, community information campaigns using local channels of communication, such as town criers and community meetings, have been used for community information campaigns. The information includes danger signs during pregnancy and labor, where to go when a complication occurs, and what the initial costs will be.

b. Community Involvement

Training Community Motivators

In **Sierra Leone** and **Nigeria**, community motivators were trained to improve community awareness of obstetric complications, to establish village action groups for community loan funds, blood donation and emergency transport, to establish links with pregnant women in the community, and to facilitate referral for women with complications. About two-thirds of the cost of this activity came from PMM project funds and the remaining one-third came from the host government and the community.

Formation of Community Blood Donor Associations

Lack of blood is a constant problem that can delay treatment and result in death. Two PMM project areas in **Ghana** and **Nigeria** established community blood donor associations to increase voluntary blood donation. These associations were established through community mobilization sessions and non-cash incentives, such as certificates of honor, free blood screening, and priority assurance if a family member needed blood.

Establishing Community Loan Funds

Lack of money to buy essential drugs and supplies for EOC has been identified as one barrier to receiving treatment for complications. In a PMM project in **Sierra Leone**, communities were motivated to establish community loan funds. Per capita levies were set and repayment was enforced by the community chief. Funds were managed by village development committees and loans were granted to women who could not pay for treatment. Compared to communities without community loan funds, utilization of health facilities increased for emergency obstetric care by women from communities with community loan funds during the study period. Utilization remained unchanged in communities without community loan funds.

3.2 Strengthening the Referral System

A strong referral system starts from the community level up: beginning with trained traditional birth attendants at the community level, availability of emergency transportation, midwives posted at the health post level, maternity waiting homes established near a referral site, to health centers or district hospitals upgraded to provide basic EOC or comprehensive EOC at the first referral level.

a. Training Traditional Birth Attendants

Following the 1978 Alma Ata conference that launched the "Health for All by 2000" strategy, the government of **The Gambia** formulated its primary health care (PHC) action plan. A key component of the PHC action plan was the training of the traditional birth attendants (TBAs), who together with the village health workers (VHWs), form the core of the village health services. Under the PHC action plan, one TBA per village (from villages with a population greater than 400) was selected to be trained. The selected TBAs took a 10-week government training course and received birth kits that included clean dressings, scissors, string, ergometrine tablets and disinfectant. A study to assess the impact of the training on TBA practices showed a significant difference in knowledge between trained and untrained TBAs with respect to identification of high risk factors and the need for timely referral (Post et al. 1991).

Timely referrals by trained TBAs also increased in the study area and TBAs also accompanied women with complications to the health center for delivery by a trained midwife. Maternal mortality ratio fell from 2716 per 100,000 live births to 1051, a 61 percent reduction (Greenwood 1991). However, it should be noted that the health center in the study area was

upgraded to handle emergencies during the study period and emergency transport options were improved.

In some areas in **Nigeria, Ghana,** and **Sierra Leone**, the PMM teams are planning to train TBAs to provide some very basic obstetric first aid management. Hemorrhage is a major cause of maternal mortality contributing to about a quarter of direct obstetric deaths. TBAs can be taught to arrest bleeding through massage of the abdomen (fundus) or nipple stimulation, which produces uterine contractions. They also can be taught to squeeze the uterus with both hands (external bimanual compression) to slow the bleeding.

Training TBAs can have an impact on maternal health outcomes, but training TBAs alone cannot bring about significant changes in maternal mortality unless TBAs are supported by a functional referral system, effective referral facilities, and a good working relationship between the TBAs and the formal health system.

b. Emergency Transportation

Many women die while waiting for transportation or during transportation to first referral level facilities, because of the inadequacy of emergency transportation. For example in Addis Ababa, **Ethiopia**, 13 percent of maternal deaths recorded over a two-year period occurred on the way to the hospital. Transportation to an appropriate health facility was a major problem. In the PMM project areas, communities and associations of transport workers were mobilized to provide transport to emergency care facilities. In **Sierra Leone**, where vehicles are very rare at the rural level, a system was developed whereby women with complications were conveyed to a health facility in a hammock carried by four men. In **Nigeria,** where roads exist and cars are more common, community leaders were mobilized to collaborate with the local transport workers union to establish a roster of vehicles that could be used for emergency transportation. Union drivers were sensitized and a revolving emergency fuel fund was established. In **Ghana**, communities established a roster of vehicles that could be used for emergency transport in the area. In **Mali**, communities established community insurance funds from which money to buy up to 100 liters of gasoline for emergency transportation can be obtained. In **The Gambia**, the community invented motorized carts to take the women to a point where public transport and boats are available. In some parts of Africa, women's groups pool funds and lend them to various members in turn.

c. Expanding Midwifery Services

Posting Midwives at the Village Health Post Level

In **Matlab, Bangladesh,** government trained nurse-midwives were posted to rural health posts. The nurse-midwives were supported by a strong referral system that included a maternity clinic capable of providing basic EOC[3], which in turn was supported by a district hospital with comprehensive EOC[4] services. A transport system capable of referring the patient from the rural health post to the maternity clinic (via boat) and from the maternity clinic to the district hospital (via ambulance) was also in place.

[3] Basic EOC includes services other than surgery and blood transfusion. Services generally include antibiotics, sedatives for hypertensive convulsions, oxytocics, manual removal of the placenta for retained placenta with postpartum hemorrhage, assisted delivery such as vacuum extraction, forceps for prolonged labor and possibly manual vacuum aspiration for management of incomplete abortion. Basic EOC can also be as simple as obstetric first aid to stabilize the patient before referral (oxytocics for retained placenta, sedatives for convulsions, and antibiotics for infection).

[4] Comprehensive EOC includes basic EOC services plus surgical and blood transfusion capabilities. Usually a district hospital with 24-hours care.

It was reported that the mortality ratio declined substantially from 440 to 140 deaths per 100,000 births in the study area in the three-year period 1987-1989, while in the control area the decline was not as significant -- the mortality ratio fell from 390 to 380 (Fauveau et al. 1991). The conclusion drawn from the study was that stationing midwives in rural areas resulted in early diagnosis with treatment or stabilizing of obstetric complications and increased referral to the clinic, which was staffed by physicians (Maine et al. 1996). With a strong referral system and arrangements for transport in place, patients from the study area were able to get to the clinic and if necessary, from there to the district hospital in greater numbers, and probably in better condition. In addition to posting midwives at the village health post level, a functioning referral system was critical to achieving the decline in maternal mortality.

Expanding Midwife Outreach Services

The referral system was strengthened in West Kiang, a rural area of **The Gambia**, by establishing a midwifery outreach service. Villages of 400 or more inhabitants in the area were served by a health center staffed by a government midwife, and groups of five villages were served by a community health nurse and a government-trained traditional birth attendant (TBA). Under the improved midwifery outreach service, a second midwife was posted at each village health center. This ensured increased coverage of the villages by the midwives as well as increased supervision of the community health nurse and the TBAs.

An evaluation of the project's effectiveness using a control area without midwifery outreach service showed a greater number of referrals to the referral hospital in the study area (both antepartum and intrapartum), a greater number of facility-based deliveries, and a higher proportion of women delivered by trained TBAs (Foord 1995).

d. Maternity Waiting Homes (MWHs)

Maternity waiting homes are basic structures located near a health center or hospital for women from rural areas who are at high risk. In a rural district of **Ethiopia**, setting up MWHs near a rural community hospital for pregnant women at high risk led to a decline in maternal and perinatal mortality (Poovan, Kifle, and Kwast 1990). The labor and the material for building the MWHs were provided by village communities. Women using the facility supply their own food and buy firewood locally. During the study period, 13 maternal deaths occurred among women with complications who were admitted directly to the hospital, compared to no mortality among women who came to the MWH at term.

A hospital-based cohort study carried out in **Zimbabwe** to evaluate the effect of stay in an MWH also found that women who stayed in MWHs had a lower risk of poor pregnancy outcome -- namely perinatal death (PND) -- compared to women who came directly to the hospital from home during labor. The study found that women from the obstetric risk group that stayed at the MWH reduced their risk of PND by nearly 50 percent compared to controls (Chandramohan et al. 1995). The most likely mechanism for the reduced risk of PND among women who stayed at the MWH was rapid intervention in the event of intrapartum complications, such as obstructed labor and antepartum hemorrhage, which are important causes of PND.

Conversely, experience in **Zaire** showed that the MWHs in Karawa were underutilized primarily because of a lack of community involvement in designing and building the homes and consequent lack of consideration for community concerns, particularly related to patients' food preparation.

e. Upgrading Health Centers

In Kumasi, **Ghana**, a general physician was trained in EOC and posted to a health center, and midwives at the health center were trained in life-saving skills. The maternity ward and operating theater were refurbished and a revolving drug fund created for procurement of essential obstetric drugs and supplies. A running water supply also was established with community involvement (Djan et al. 1996). Since upgrading the health center, the number of women with complications coming for care increased almost threefold. This indicates that where quality services are available, people will use them. Most complications were ably managed at the upgraded center and the proportion of those who had to be referred to other institutions dropped from 42 percent to 17 percent. No deaths occurred among women treated. In addition to the salary of the physician, the cost of improvements was US $30,000, mostly for equipment and supplies and came from project funds, established NGOs in the region the government, and the community.

In **The Gambia**, maternal mortality declined at the Royal Victoria Hospital, one of the two referral hospitals, after upgrading the health centers to basic EOC facilities. The decline was attributed to initial care received at basic EOC facilities, which stabilized the patients' conditions before referral, increasing the chances for survival. Seven health centers were upgraded and equipped to handle emergency obstetrical care and staffed with midwives and nurse-anaesthetists who had been trained in essential obstetric care, including surgical contraception. The centers were supported by two referral hospitals and, at the community level, by mobile outreach teams and government trained TBAs. Under the program, emergency transport and communications also were upgraded. A radio communication network system was established to link the health centers to the referral hospitals and ambulances were provided for some health centers.

3.3 Improving Quality of EOC

An assessment of the Birnin Kebbi Hospital in **Nigeria** revealed poor quality in care of EOC. Focus group discussions with community members emphasized poor services as a reason for not seeking care. To improve quality, several specialist

obstetricians visited the hospital on a rotating basis over a one-year period and provided training to general physicians on care of emergency obstetric complications. Midwives were trained to identify and manage obstetric complications. In addition, an obstetric first aid box with essential drugs and supplies was introduced, and a revolving fund was established through which drugs and supplies were made available. Since improving quality of care at the hospital, the number of women with complications seeking care increased while the case fatality rate dropped from 22 percent to 5 percent (Oyesola et al. 1996).

The following case studies illustrate approaches taken to improve quality of EOC.

a. Training in Life Saving Skills

The MotherCare project, implemented in five countries including **Uganda** and **Nigeria**, aimed to improve the quality of maternal care by strengthening the knowledge and skills of midwives through life-saving skills training (Kwast 1995). The life-saving skills (LSS) training program provided midwives with an expanded number of skills for preventing and managing obstetric emergencies. The three-week competency-based training program includes:

1. monitoring progress of labor using the partograph;
2. preventing and treating post-partum hemorrhage;
3. managing difficult deliveries focusing on vacuum extraction;
4. hydration and rehydration;
5. preventing and managing sepsis; and
6. resuscitating the adult and the newborn.

The LSS training resulted in decreased postpartum hemorrhage, reduction of prolonged labor, improved infection control and reduction in postpartum sepsis.

In **Ghana,** midwives are being trained in manual vacuum aspiration (MVA) for management of incomplete abortions and MVA has been incorporated into Ghana's LSS training program.

b. Improving Interpersonal and Counseling Skills

Negative client-provider interactions have been identified in focus group research in several countries as a major barrier between the community and the health system. To guide client-provider interactions, the Program for Appropriate Technology in Health (PATH) in collaboration with other institutions (Georgetown University's Institute for Reproductive Health and a local NGO in Bolivia) developed a training manual to improve the interpersonal communication and counseling skills of providers. The training, focused on participatory skills, assisted providers to develop skills that enabled them to interact with clients in such a way that when information is given to the client -- such as recognition of complications, the importance of seeking care, or where to seek care -- the client can relate to the information given and therefore can make informed decisions. Most of the work related to interpersonal communication and counseling skills has been done only in Latin America and the Caribbean.

c. Expanding the Roles of Non-physician Health Care Providers

Expanding the roles of non-physicians, specifically in areas where there are few or no doctors, play a pivotal role in preventing many needless maternal deaths as documented by the following best practices.

In rural northwestern **Zaire**, selected obstetric nurses at Karawa and Wasolo hospitals were trained to perform emergency surgery, including cesarean section and surgical management of ruptured uterus (White et al. 1987). In Karawa, 278 of 321 cesarean sections were done by the trained nurse-surgeons during a period of 18 months, with two deaths (a fatality rate of 1 percent). In Wasolo, 32 cesarean sections were done by nurse-surgeons during a course of 13 months with one death. A combined total of 16 laparotomies for ruptured uterus also were performed by nurse-surgeons in Karawa and Wasolo, with only two fatalities. Without surgery, all 16 women would certainly have died.

In **Ghana**, the life-saving skills (LSS) training program is a continuing education project for midwives. Since 1990, nearly 400 midwives have undergone the two-week competency-based training course that provides midwives with an expanded number of skills for preventing and managing obstetric emergencies and complications. The trained midwives reported positive results including better management of postpartum hemorrhage, prolonged labor, toxemia, and infection (Taylor

1995). The results of the program indicate that with training and support midwives are capable of performing many interventions that were hitherto carried out only by physicians and obstetricians. They constitute an army of health professionals whose potential should be fully utilized.

d. Ensuring Availability of Drugs and Supplies

PMM in collaboration with hospitals, has developed *"pack systems"* and "*emergency boxes*" of supplies for treatment of obstetric complications in order that drugs and supplies necessary for EOC are readily available at the facility when needed. For example, PMM teams have developed different pack systems for treatment of leading causes of maternal mortality -- hemorrhage, obstructed labor, sepsis, and eclampsia. Packs for cesarean section also have been developed, which include supplies such as gauze, syringes, needles, anesthetic agents, antibiotics, intravenous fluids, and ergometrine (Update 1994 PMM Network). Packs used in treating an obstetric complication are then paid for or replaced by the woman's family. Other strategies implemented to increase availability of drugs and supplies at facilities providing services for EOC include: implementing small *revolving fund schemes* to purchase essential drugs and supplies for EOC and establishing *24-hour pharmacy services* (PMM 1995). The pack system has been so well received by some hospital management boards that similar pack systems have been developed for treatment of illnesses other than emergency obstetric complications.

At a rural hospital in Bo, **Sierra Leone**, the PMM team initiated the *establishment of a cost recovery system for drugs*. Essential drugs and supplies were procured through a commercial source outside regular government channels and emergency obstetric drug packs were then created and made available at prices calculated to cover costs plus an 85 percent mark-up. The drug packs were available 24 hours and prices ranged from 45 percent to 68 percent of the prices charged by the government hospital. Of the 26 patients who received emergency drug packs during the study period, 12 paid in full and 9 paid in part, accounting for recovery of 57 percent of charges. Those who paid in part were given credit and followed up.

e. Improving Management

The results from an intervention program at a regional hospital in Kigoma, **Tanzania,** focusing on improving hospital management to provide a conducive working environment revealed a reduction in maternal mortality from 933 to 186 per 100,000 live births over the period 1984-1991 (Mbaruku and Bergstrom 1995). The intervention program focused on clarifying responsibilities, delegating more responsibility to nurses and midwives, regular monthly meetings with increased feedback, regular staff evaluation, and increased on-the-job training programs. Other interventions included: regular maintenance of equipment using local materials and resources, identification of norms for patient management and referral, and development of a detailed plan for the continuous supply of essential drugs including the initiation of a sub-store in the maternity ward.

The improved availability of essential drugs due to the buffer effect of the sub-store, the availability of basic working tools due to regular maintenance schedules using local materials and resources, increased on-the-job training programs, clarification of responsibilities, and increased feedback and information sharing through regular meetings all resulted in significant improvement in the skills and the morale of the staff.

IV. The Cost of EOC

The results of a hypothetical model developed to evaluate the costs of providing EOC based on a population of 300,000, 95 percent coverage, a crude birth rate of 40, hypothetical figures related to infrastructure such as the percentage of deliveries that take place in a health service location and the average occupancy rate showed the following: salaries were the largest proportion of input costs associated with provision of EOC (31 percent), followed by infrastructure improvements (16 percent), drugs (10 percent), and laboratory (9 percent). When costs were broken down by intervention, management of normal deliveries represented the largest proportion (62 percent), compared to management of obstetric complications (37 percent), and neonate management (1 percent) (Cowley 1996).

It will be important to identify the most appropriate financing and cost-recovery measures for provision of services for EOC in different settings. In virtually all settings, people are already paying for at least some maternal care services. People traditionally pay traditional birth attendants in cash or in kind for their services and buy a variety of medicines including contraceptives. In fact, PMM studies indicate that *users' fees have little impact on seeking care at an EOC facility in emergency conditions*, once the decision to seek care has been made. Caution is needed, however, when fees are charged to low-income women. Fee structures based on income, fee exemptions for certain services, and subsidies for certain services have been used successfully in some countries (Tinker et al. 1993). Subsidies or allowances also can be provided to nurse-midwives working in remote rural areas.

V. Research Needs and Information Gaps

The following are research needs and information gaps that should be addressed in the development and implementation of EOC guidelines and services.

1. Studies on community perceptions of obstetric complications as determinants of women's health seeking behavior. Results will be useful for designing IEC messages.
2. Identification of innovative techniques for community education (to raise awareness of complications, to recognize complications, and the need to seek timely care) and community mobilization (to ensure availability of transport and availability of funds).
3. Identification of the most cost-effective approaches to extend obstetric care, including EOC, into the community. How do we best maximize essential obstetric care coverage including EOC? (Upgrade the skills of rural physicians in EOC? Upgrade the skills of non-physician personnel [nurse-midwives and midwives] to manage obstetric emergencies and delegate responsibility to them?)
4. Research and analysis to document best practices and lessons learned in delegating responsibility for EOC. (This should include impact of responsibility delegation, lessons learned, acceptability of greater responsibility of care by non-physician health staff and physicians, and approaches used to influence national policy regarding responsibility delegation).
5. In most African countries, midwives are reluctant to work in rural areas, and TBAs are the only alternative for pregnant women. There is a need to conduct local studies to determine the causes of attrition and increased turnover of trained personnel in rural areas and to identify ways of counteracting them.
6. Operations reseasrch on models of first referral level facilities. Some health centers as well as rural and district hospitals have been upgraded to provide EOC services. What has been learned so far about first referral level facilities? Evaluate first referral level facilities providing EOC to assess their efficiency, effectiveness, and impact on maternal mortality and morbidity. Identify best practices and lessons learned. Which services provided at first referral level facilities most effectively reduce maternal mortality and morbidity?
7. The referral system. Many women with obstetric complications die because of the inadequacy of the referral system. What factors constitute an effective referral system? What is needed for a functioning referral system? Research and analysis on adequacy, costs, and impact on maternal mortality and morbidity of different approaches used in different settings for referral to a facility with EOC services. What innovative strategies are likely to be required to enhance the referral system, linking providers at the community level, health center level, and hospital level to respond to obstetric complications?
8. Situation analysis of efficiency and effectiveness of current strategies for provision of EOC (includes infrastructure, human resource capacity, referral, and communications network capability). The information on institutional capacity provided by the situation analysis will be useful in the development of improved protocols, guidelines, and interventions.
9. OR on models providing EOC including assessment of relative cost-effectiveness of different EOC interventions.
10. Research to identify appropriate financing and cost-recovery measures for providing EOC services in different settings.

VI. Conclusions and Recommendations

Donors, policymakers, and health planners need to recognize that the objective of the Safe Motherhood Initiative to reduce maternal mortality cannot be realized by existing services alone; that provision of EOC services *in addition to* existing services will be essential to bring about a sizeable decline in maternal mortality.

Providing EOC capabilities does not have to be a formidable task; it is not an all-or-nothing proposition (i.e., either a hospital capable of performing surgery or nothing). Based on specific settings and availability of resources, there are interventions that can be effectively carried out at various levels of the health system starting from the community itself and community-level facilities such as dispensaries and health posts.

1. Community Education and Mobilization
   Where services are available, community education and mobilization can encourage early decision to seek care and increase utilization of EOC facilities.
2. Community Loan Funds
   Lack of money to pay for treatment has been a barrier to seek care at health facilities. Establishing community loan funds requires substantial mobilization efforts, but where communities are motivated to establish community loan funds, utilization of health facilities for EOC may increase.
3. Training Traditional Birth Attendants

A strong referral system begins with trained TBAs at the community level. Training TBAs in obstetric first aid can have an important impact on maternal health outcomes, but the training must be supported by a functional referral system, effective referral facilities with EOC capabilities, and a good working relationship between the TBAs and the formal health system.

4. Emergency Transport
   Availability of emergency transportation is a crucial element of a strong referral system. Improving emergency transport does not necessarily require ambulances. Commercial transport owners (taxi owners/drivers), transport workers unions, and communities can be mobilized to work together to identify schemes to provide affordable emergency transport from the community level.
5. Maternity Waiting Homes (MWHs)
   Maternity waiting homes are designed primarily to reduce intra-and postpartum complications. The use of MWHs has been recommended by WHO as a strategy to reduce maternal mortality and morbidity. However, for an MWH to be effective: (1) community involvement and community concerns must be considered in the design and building of MWHs and; (2) quality antenatal care and screening services must be in place to ensure that women with obstetrical complications are identified for referral and admission to the MWH.
6. Responsibility Delegation
   With training and support, midwives are capable of performing many interventions that were hitherto carried out only by physicians. They constitute an army of health professionals whose potential should be fully utilized.
7. Conducive Working Environment
   Given the financial constraints, health workers will always be the cornerstone for maternal health. Boosting staff morale through a more conducive working environment (i.e., availability of basic supplies and equipment, continuous on-the-job training, feedback and supervision, and adequate problem solving avenues) will be essential.
8. Ensuring Availability of Drugs and Supplies
   Revolving drug funds can help maintain consistent drug supplies at health facilities. Careful pricing is critical for the system to be sustainable. Mark-up must cover defaulters.
9. Improving Quality
   Improving quality of EOC services at the health facility level is feasible and can be built on existing resources. Interventions may include: improving availability of drugs and supplies via establishing revolving drug funds, training of rural health staff in life saving skills, and training to improve management.
10. Linkages
    Formal linkages need to be developed between the provider who delivers the woman at the community level and the facilities capable of providing EOC services. Ideal would be the use of written protocols that explicitly define and describe actions possible at each level of the service system so that everyone involved in care of the pregnant women can operate on a common understanding of each level's capabilities, responsibilities, and limitations.
11. Financing Options
    Optimal financing methods need to be identified in different settings, especially where a significant number of private sector providers exist. Private pharmacies and NGOs can also play important complementary roles in the organization, financing, and delivery of some EOC services.
12. Advocacy
    For operational change, advocacy and communicating findings from evaluation/research activities to donors, program managers, and policymakers is essential -- through activities such as disseminating state-of-the-art papers and regional and country-level meetings with key stakeholders.

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