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**ACHIEVING SAFE MOTHERHOOD WITH
LIMITED RESOURCES: A CASE STUDY
OF MATERNITY CARE IN GRENADA**

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ACHIEVING SAFE MOTHERHOOD WITH LIMITED RESOURCES: A CASE STUDY OF MATERNITY CARE IN GRENADA

Maternal death, while a rare event in North America and in most parts of the Caribbean, is one of many routine risks of motherhood that is unavoidable for women in most developing countries. Complications of pregnancy are responsible for an estimated 10 to 50 percent of deaths to young women in developing countries. The risk of mortality in pregnancy for women in some developing countries is 50 to 100 times greater than for women in developed countries. In addition, the death of the mother very frequently foretells death for the infant who, together with any other siblings, is deprived of maternal care. Recent efforts to improve maternal and child survival have not been limited to family planning and immunizations but have also begun to examine the potential for improvements in health care to pregnant women.

In 1987 the World Bank, World Health Organization, and UNFPA sponsored the Safe Motherhood Conference in Nairobi to launch a world-wide effort to develop and implement improved approaches to maternity care in order to bring about reductions in maternal mortality and morbidity and improvements in child survival. The World Health Organization and the United States Agency for International Development (USAID) joined with a broadly-based group of interested organizations in making a commitment to this problem.

As part of the USAID sponsored effort, Grenada was selected as the focus for a case study of maternity care recognizing that maternal and perinatal mortality is relatively good despite limited use of advanced medical technologies. In the Caribbean region, with a few exceptions, the maternal mortality ratio is already low compared to most of the developing world. There were only 6 maternal deaths in Grenada between January 1, 1987, and December 31, 1988, among 5,803 births, for a ratio of 104 per 100,000 live births. The World Health Organization estimates a maternal mortality ratio for Latin America of 270 per 100,000 live births, nearly three times the ratio in Grenada. Because of this relatively low maternal mortality ratio, it was decided to undertake a population-based study of prenatal and maternity health care in this small island nation with the hope of achieving two goals, to provide guidance for those involved in world-wide efforts to improve maternal mortality, and also to develop recommendations that would be useful to the Ministry of Health in Grenada in their continuing efforts to provide the best possible care given their constraints of budget and geographical location.

This working paper is intended primarily to provide an overview of the most salient features of the results from the Grenada case study and draw inferences from the results that may guide efforts to improve the safety of childbirth for poor women elsewhere.¹

¹ The full report, which includes recommendations addressed to Grenadian policy-makers, is available from the MotherCare Project, John Snow, Inc., 1616 North Fort Myer Drive, 11th Floor, Arlington, VA. 22209.

I. GRENADIAN MATERNITY CARE: A QUALIFIED SUCCESS

The maternity care system in Grenada can be described as a qualified success in attaining and maintaining a low level of maternal mortality. The major maternal and infant complications are summarized in Table I. The source for most information on pregnancy complications was records from the General Hospital which serves as the obstetrical referral center for the entire country and also delivers many low risk births. Overall 59% of births in the nation are at the General Hospital. As most of the complications present at the General Hospital, their records provide a relatively complete picture of the pregnancy complications for Grenada. In those cases where hospital records were used as the basis for the rates, the rates are somewhat inflated. The major points from this review are the following:

- Two of the 6 maternal deaths were due to eclampsia; the rate of eclampsia was 1.3 per 1,000 General Hospital deliveries. Pre-eclampsia occurred in an estimated 2.2% of General Hospital deliveries and thus it seems apparent that the low rate of maternal death was due in part to early diagnosis and successful treatment of an estimated 64 pre-eclampsia cases annually. However, infant death and stillbirth were common in pre-eclampsia cases.
- There was one maternal death due to each of the following conditions: antepartum hemorrhage, ruptured ectopic pregnancy, sepsis, and postpartum hemorrhage.
- The frequency of breech presentation was 2.2%. However, no cases of obstructed labor occurred.
- Prolonged first stage of labor (> 12 hours) occurred in an estimated 2.5% of General Hospital deliveries, and Caesarian sections were performed in over 60% of these. Oxytocin was rarely used to induce labor, even in these cases.
- There were 9.6 admissions for diabetes per 1,000 deliveries but no deaths occurred in diabetic pregnancies. In most cases it was not possible to detect whether the diabetic condition occurred prior to or during pregnancy because utilization of general medical care is limited and diabetes is rarely detected before it becomes symptomatic.
- Forceps deliveries were rarely used (7/1,000 General Hospital deliveries) and Caesarian operations were performed in 3.9% of General Hospital deliveries. Among Caesarian births in the chart review, about 20% were due to malpresentation (breech or face presentation or transverse lie.)
- Postpartum hemorrhage occurs frequently in Grenadian births, perhaps because of a high prevalence of anemia. In 1987-88, 7.7% of General Hospital deliveries resulted in bleeding in excess of 500 mls. The vast majority of bleeding complications were treated successfully.
- Postpartum infection or sepsis is one of the principle causes of maternal death when maternity care services are inadequate. In Grenada, although 86 percent of all births occurred in institutions, patients are usually discharged within 24 hours, before signs of infection have time to develop. Patients are given instructions to seek care immediately at any health center or station if signs of infection develop and are instructed in particular signs to observe. It was not possible to estimate

the prevalence of postpartum infection in Grenada since care is obtained at so many sites throughout the islands. Inferential evidence of the success of this community-based treatment can be drawn from the fact that only one death resulted from maternal sepsis in the two-year period.

- The stillbirth rate in Grenada, 21.5 per 1,000 deliveries, is higher than for several other Caribbean nations that have reported to the Pan American Health Organization. For example, Trinidad reported 16.7 stillbirths per 1,000. However, the quality of the available data is unknown.
- Low birth weight (less than 2500gm) occurred in 8.7% of deliveries and 2.9% were premature. Twenty-three percent of Grenadian births were to teenage mothers.
- There were 15.6 neonatal deaths per 1,000 live births. The hospital chart review revealed that over half of the neonatal deaths were to infants who were severely asphyxiated at birth. In about 15%, birth defects were noted and in 15% the charts reported meconium aspiration. Half of the neonatal deaths occurred within 24 hours of delivery.

TABLE I

Summary of Maternal and Infant Conditions Grenada 1987 - 1988

Maternal Outcomes

Maternal deaths	1.03/1,000 deliveries nationally
Pre-eclampsia	2.2 % of General Hospital deliveries
Eclampsia	1.3/1,000 of General Hospital deliveries
Breech presentation	2.2% of General Hospital deliveries
Obstructed labor	0
Prolonged labor	2.5% of General Hospital deliveries*
Forceps deliveries	7/1,000 of General Hospital deliveries
Caesarians	3.9% of General Hospital deliveries
Diabetes	9.6/1,000 of General Hospital deliveries**
Postpartum hemorrhage	7.7% of General Hospital deliveries

Infant Outcome

Perinatal mortality	Unknown
Stillbirths	21.5/1,000 total births nationally
Neonatal deaths	15.6/1,000 live births
Premature	2.9% of General Hospital deliveries
Neonatal jaundice	6.9% of General Hospital live births
Twins	1.2% of General Hospital live births

* Estimate from chart review sample; General Hospital, Grenada.

** Estimated from hospital admission records.

II. BACKGROUND

A perspective on the efficiency of maternal care in Grenada can be gained through some background on the country. The island of Grenada is located in the southern Caribbean 90 miles from the mainland of South America. Together with the smaller islands of Carriacou and tiny Petite Martinique, it forms an independent nation, a member of the British Commonwealth. Grenada is about 210 square miles and Carriacou is 13 square miles; Petite Martinique is 586 acres.

The geography of the islands is mountainous and the climate is tropical. There is a system of paved roads that permits access to the major towns and most villages. The main form of transportation is by vans that serve as point-to-point taxis throughout the island. During most of the year, the climate is moderated by trade winds. The island supports a variety of tropical food crops and 2 principal exports, nutmeg and bananas. Since 1984, the government has taken steps to attract industrial development and to revitalize and expand tourism through the development of infrastructure and improved facilities. Projects to repair roads and bridges, to improve electrical power generation capacity and to expand telephone service have had an impact on the quality of life and prospects for development. Per capita gross national product in 1987 was \$1,400.

At the time of the 1980 census, the population was 59% Roman Catholic. Among women over 20 years of age, 58% were never married and among those 40-45 years, 46% were never married. Again in 1980, 95% of those over 40 years of age had not gone beyond primary school and among those 20-29 years, 75% had not attended secondary school. Family planning prevalence is estimated at 31% for all contraceptives and 28% for modern contraceptives (Population Reference Bureau, 1990). The total fertility rate is 4.9.

The population of the nation is estimated to be between 98,000 and 110,000. The population of Carriacou is about 5,000 and Petite Martinique is home to about 500. A population census is planned for 1991.

Health care is delivered through a network of 7 primary health care centers, one in each of the parishes of Grenada and one in Carriacou. Petite Martinique is served only by a health station with referral to Carriacou and Grenada. There are 29 smaller visiting or satellite health stations that provide more limited health services.

The health centers provide a broad range of primary care services and are served by part-time District Medical Officers as well as District Nurse Midwives and Public Health Nurses among others. Each provides medications free of charge at the dispensary. The smaller visiting stations provide weekly prenatal clinics, urgent care and referral. Ambulance services are available at the General Hospital and the one other hospital in Grenville and at the health centers in Gouyave and Sauteurs. In emergencies, the ambulance from the nearest health center or hospital is summoned by telephone.

III. METHODS OF STUDY

Data on live births and infant deaths were obtained from the Office of the Registrar General in the Ministry of Health. Registration data from 1989 were not yet available so the study used 1987 and 1988 as its target years. All births and deaths in Grenada are registered at local registry offices in each district and those occurring in the hospital are reported to the medical records staff. These reports are accumulated and forwarded to the Registrar General who has responsibility for registration of births and deaths. This process is generally considered to be quite accurate since birth certificates are needed for school entry and other services and death certificates are needed to bury the remains.

Data on prenatal care were obtained through direct observations in health clinics, interviews with midwives and data collection in a sample of health centers around the country. Of the total of six health centers and twenty-four stations that were active at the time of the study (January to June 1990), every full-service health center was visited. In addition, a systematic sample of one in three (8 of 24) health stations in Grenada was selected for data collection and interviews. A trip was made to Grenada's sister island of Carriacou to obtain data from the Princess Royal Hospital and the health center there.

A hospital chart review of complicated maternity cases was undertaken to obtain information on treatment of maternity complications and specifics of routine care in 1987-88. The great majority of prenatal and intrapartum complications in Grenada are referred to the General Hospital in St. George's for treatment because the small sixty-bed district hospital in Grenville is not equipped to handle obstetrical emergencies. Hospital charts were selected for review from the maternity ward log books for all cases in 1987 and 1988. A list was developed of all patients experiencing the specific complications.

To validate the accuracy of the log book entries, a consecutive series of twenty-five charts was pulled to determine if they agreed with log records. The concordance was very high except for cases which experienced several complications. The validation showed that occasionally not all complications were logged, only the major complication. For example, occasionally cases were logged as caesarian sections although prolonged labor was also charted but not noted in the log book. However, in every case with no complications logged, none were found in the hospital chart, except that there were some breech presentations which delivered uneventfully that were logged as cephalic presentations. Since log records accurately identified all complicated cases, with the exception of uneventful breech deliveries, we deemed it to be an acceptable sampling method to select complicated cases for more complete analysis. For total incidence of most complications, the hospital charts would give a more complete count but are limited by small numbers for rarer events. From the list of all complicated cases, a systematic sample of every fifth case was drawn. In addition, an augmented sample was drawn to provide an adequate sample size for rarer complications that are, or may be, life threatening for mother or fetus and can be prevented with adequate care. This augmented sample consisted of every case not included in the first sample that fit the following criteria: stillbirths, neonatal deaths, postpartum hemorrhage of greater than 1,000 mls and multiple births. The nurses' log books were used to derive denominators for all live births and "uncomplicated" normal deliveries occurring in hospital. Vital registration data (described above) were used as denominators for domiciliary births (data for other health facilities are described below). The hospital record room was able to locate 93% (262 of 281 charts) selected as the final sample to be abstracted.

Hospital chart data were abstracted by Drs. Laukaran and Bhattacharyya, assisted by a data collection assistant and students enrolled in a research elective at the St. George's University School of Medicine. Data from 253 hospital charts were abstracted representing both the systematic sample of 151 cases (the main sample) and the augmented sample of 102 cases. The hospital chart data consisted of information on maternal and infant complications, diagnostic tests, treatments and outcomes as well as such background information on the mother and her prenatal care and previous medical and obstetrical history as were available. Regrettably, only abbreviated information on prenatal care was included in hospital charts. The EPIINFO computer program developed by the U.S. Centers for Disease Control was used for entry, editing and analysis of the hospital chart data.

Data on births in 1987 and 1988 at the outpatient maternity centers in Gouyave and Sauteurs were obtained from registry books in those facilities. Information on births was obtained for the same years from the maternity unit log book at the district level Princess Alice Hospital in Grenville. In addition, admission and discharge records from Princess Alice Hospital were examined to determine the number of maternity patients transferred to St. George's Hospital. Hospital charts for cases transferred from Princess Alice Hospital to the General Hospital were examined to determine the medical complications that lead to transfers.

Data on maternal deaths were obtained from hospital registry books, from ward and medical staff, from District Nurse Midwives and from the Registrar General's Office. A search was made of the registry list of all deaths registered in 1987-88 among women and girls 12-48 years of age and death certificates were examined for any that mentioned pregnancy or might plausibly relate to reproductive causes.

IV. OVERVIEW OF MATERNITY CARE

Two of the health centers, in the towns of Gouyave and Sauteurs, have outpatient maternity units on the premises. Staffed by nurse midwives, each of these units delivers a small number of babies annually, 50-60. The General Hospital in the town of St. George's has a 29 bed maternity unit, laboratory, blood bank, X-ray unit with ultrasound facilities, pharmacy and 2 operating theatres and delivers about 1500-2000 women annually. Among the General Hospital deliveries in 1987-88, 3.9% were caesarian sections, less than 1% were assisted by forceps and no vacuum extractions were performed. The smaller district hospital at Grenville has a 14 bed maternity unit with X-ray and pharmacy but no operating theatre, laboratory or blood facilities. About 575 midwife-attended deliveries are performed there annually and complicated cases are referred to St. George's by ambulance.

There is also a small 35-bed infirmary/hospital in Carriacou that is able to provide only limited services with referral to St. George's. The maternity unit at Carriacou delivers about 100 babies annually under the care of nurse midwives. In 1987-88 the stillbirth rate for Carriacou deliveries was 1.55 per 100 births and the neonatal death rate prior to hospital discharge was 0.9 per 100 live births. Women requiring caesarian sections and those with pre-eclampsia and other serious complications are transferred to St. George's by air or sea. In 1987-88, 13 maternity patients were transferred from Carriacou to Grenada.

Petite Martinique presents special problems for maternity care delivery since the number of births to women there is small and it can only be reached by boat. Women in labor normally hire a boat to carry them to the Village of Hillsborough, Carriacou and then hire a taxi for the 15 minute ride to the hospital. Costs for boat and taxi hires are significant. In cases where a brief labor is anticipated and in complicated cases, women are obliged to go to Carriacou and stay with relatives or friends when confinement is anticipated.

Physician-attended births are primarily limited to complicated cases, caesarian and forceps deliveries and a limited number of private patients. There are no practicing untrained midwives, presumably because of the good access to qualified nurse midwives. Most births occur in medical facilities but 10% of women deliver at home. The health service guarantees assistance at home deliveries on request of the family and this service is performed by District Nurse Midwives who are stationed at health centers and stations throughout the country.

Prenatal care is provided to most patients through the network of multipurpose health centers and smaller health stations throughout the country. Although it was not possible to estimate the coverage of prenatal care, clinic records showed that most patients have their first prenatal visit about the fourth or fifth month of pregnancy, and the coverage for third trimester prenatal care seems to be high, most likely over 75%.

It was not possible to estimate the exact proportion of private practice and public maternity cases but private deliveries are rare. Of the approximately 90 percent of births attended by nurse midwives less than 1% were in private practice. Less than 1% of births were performed by general practitioners in private practice. In 1988, 9% of vaginal deliveries at the General Hospital were performed by obstetricians. Many, perhaps most, of these would have been for private patients.

In order to shed light on the features of the maternity care system that have been implemented successfully in Grenada, both organizational and clinical aspects of care were examined. The following pages will focus on features of the organization of prenatal, intrapartum and postpartum care and clinical management of specific conditions which seem to be related to the low maternal mortality ratio in Grenada.

V. ORGANIZATION AND DELIVERY OF MATERNITY CARE

A. Comprehensive prenatal care is accessible to all women free of charge.

Easy access to prenatal care is made possible by the network of health centers and stations which are within a short distance, usually within walking distance, of most villages. Each is staffed, at a minimum, by a full-time District Nurse Midwife. Weekly prenatal clinics are offered at each center or station and referral is made, when needed, to an obstetrical clinic in St. George's at the hospital. Some fees are charged for laboratory work, but no fees are charged for other services. Physician services for other health problems are offered weekly when the District Medical Officer makes a circuit of clinics at each station. Health centers offer several special clinics, for example, for diabetes, hypertension and pediatric problems. Prescription medications are dispensed free-of-charge.

B. The women's prenatal record card is a key feature of the organization of care.

Each patient is given a personal prenatal care record card on her first visit (see Figure 1) which she is asked to present at each visit during pregnancy and to take to the maternity unit or hospital when delivery is imminent. Information from each visit is recorded on the card.

Services provided to prenatal patients include serum hemoglobin level, sickle cell test, VDRL tests for syphilis, and blood group determination. Physical examinations include blood pressure measurement, a physical examination to determine the height of the fundus, size of the abdomen and to auscultate the fetal heart and check for edema. Urinalysis is conducted at each visit and appropriate tetanus toxoid immunization is given routinely in pregnancy. The recommended schedule for prenatal care is for monthly visits until 28 weeks gestation, bi-weekly visits until 32 weeks and weekly visits thereafter.

The nurse midwives record results of each examination on the card, together with all laboratory work including blood tests and other pertinent information. The card also includes social information that is needed to complete the patient's chart when she reports for delivery and provides proof that the mother has received prenatal care. The patient retains this card and there is some incentive to keep it up-to-date and present it at delivery since the delivering midwives are very adamant about having information from the prenatal record. Grenadian women generally seem to understand that the card contains information that allows them to receive better care more quickly.

C. Health education is given strong emphasis in prenatal care, particularly for primigravidas.

Direct observations in clinics revealed that methods of health education include either individual counselling or group sessions depending on the size of the clinic, the pattern of attendance and the priorities of the nurse midwife. Student midwives on rotation hold group sessions in clinics as part of their training. The walls of the health centers are covered with posters addressing many pregnancy-related health promotion themes such as breastfeeding, nutrition in pregnancy, and symptoms of pregnancy.

During interviews, many midwives volunteered detailed information on the importance of health education and its content. Midwives recognize the importance of early reporting of problems where treatment facilities are less than optimum and thus put extra emphasis on education, particularly for women and girls in their first pregnancy. They provided health education about recognition of problems during pregnancy with the knowledge that a treatment system is in place to handle complications. In seeking clues to the strong motivation of nurse midwives toward their role as educators, it was felt that the presence of the functioning referral system may be a prerequisite that is closely linked to the ongoing health education effort.

Patient's prenatal record card, Grenada, 1990 (Side Two)

BIRTH AND PUERPERIUM

POST-NATAL EXAMINATION

ANTE-NATAL CARD

<u>BIRTH</u>	Date	Place
<u>PUERPERIUM</u>		
Date		
B.P.		
Hb		
Urine		
AB		
SGOT		
<u>MOTHER'S CONDITION ON DISCHARGE</u>		Date
T.P.R./B.P.		
Breasts		
Uterus		
Vagina		
Perineum		
Lochia		

<u>DAE</u>	<u>kg</u>
Weight	
B.P.	
Urine	
Hb	
Symptoms and duration	
Breasts and feeding	
Abdomen	
Public examination	
Baby checked	Yes <input type="checkbox"/> No <input type="checkbox"/> Retained <input type="checkbox"/>
Pap smear	
Result of Pap smear	
Family planning	

<u>NAME</u>	<u>Reg. No.</u>						
<u>Address</u>	<u>tel. No.</u>						
<u>Occupation</u>	<u>Child's father</u>						
<u>Age</u>	<u>Occupation</u>						
<u>Marital Status</u>	<u>Religion</u>						
<u>Religion</u>							
<u>Household Head</u>							
Adults	Children						
Male	Boys						
Female	Girls						
<u>Mobile Address</u>	<u>tel. No.</u>						
<u>Medical Station</u>	<u>tel. No.</u>						
<u>BOOKED FOR DELIVERY AT:</u>							
<u>RELEVANT FAMILY HISTORY</u>	TB						
High B.P.	Diabetes						
	Tuberc.						
<u>PAST ILLNESSES, ALLERGIES, BLOOD TRANSFUSIONS</u>							
Ever practiced family planning	No <input type="checkbox"/> Yes <input type="checkbox"/>						
<u>PREVIOUS GESTATION HISTORY</u>							
No	Year	Mac	Sex	Weight	Alive	Dead	Confinement
<u>Normal Menstrual Cycle</u>				<u>DLNMP</u>		<u>EDR</u>	

<u>BABY</u>	<u>Sex</u>	<u>Birth Weight</u>
Condition at Birth		
Date of Discharge		
Examination		
Weight		
Eyes		
Feeding		
<u>POST-NATAL APPROPRIATE</u>		
Date		
Place		

SPECIAL NOTES

Handwritten initials or mark.

D. Provision of laboratory services is a major challenge to the health care system and is given high priority by prenatal care providers.

Adequate laboratory services are essential to diagnosis and treatment of maternity complications. Establishment and maintenance of laboratory facilities has been an ongoing challenge to the Grenadian health care system. Because laboratory facilities are located only at the General Hospital in St. George's, considerable time and effort is devoted to transporting blood and other laboratory samples to the hospital and obtaining the results of testing. Each health station and health center has a refrigerator and a weekly pick-up of samples for delivery to the hospital. Commonly, this involves use of the ambulance one morning a week to drive to each health station in the parish and pick up samples, then to the hospital via the parish health center. The specific arrangements vary in different parishes but lost samples, broken tubes, and lost results are among frequently mentioned problems. When necessary, the laboratory samples are repeated. Unfortunately, in some areas it is difficult to complete the laboratory work before the patient delivers. However, these cases are few. The laboratory system usually works even if it requires repeated follow-up by the midwives, thus they have the knowledge that their efforts are not in vain.

E. Normal deliveries are attended by nurse midwives as are most other vaginal deliveries.

Maternity care in Grenada makes very sparing use of physician services, supplies and equipment. General physicians, those without obstetrical training, rarely attend deliveries. Normal deliveries are attended by nurse midwives and involve limited use of medications, interventions and diagnostic tests. On admission for hospital deliveries, blood is drawn for hemoglobin level and blood type and cross match, if not on the prenatal card. Vital signs are taken, urine is tested, and a vaginal examination is made if labor seems to have begun. Once labor has commenced, the patient is encouraged to ambulate during the first stage. According to hospital protocols, progress of labor is monitored every 4 hours by vaginal examination and vital signs and any other symptoms are monitored. In practice, there is an average of 19 patients on the maternity ward at a time and two midwives and an assistant are responsible for their care. Student midwives rotate on and off the ward on a sporadic schedule. Fetal condition is monitored using a fetoscope and by checking for meconium staining of the amniotic fluid.

During the second stage, the woman is transferred to the delivery room where she is attended by qualified midwives or student midwives on rotation. Most women receive no intravenous drip, no episiotomy and no routine analgesics or anesthesia. The only medication routinely given is oxytocin after the birth of the head. Episiotomies were carried out in 1.5% of births and the proportion with second degree lacerations was 5.6% in 1987-88. Third degree lacerations were experienced in 0.06% of General Hospital births (1987-88 data). Although normal deliveries are allowed to progress without intervention, midwives are trained to recognize early signs of intrapartum complications and to notify obstetrical consultants for guidance in such cases.

F. Grenadian nurse midwives take considerable responsibility while acting on the basis of clear protocols for the management of life-threatening complications.

The quality of care in Grenada is largely an outcome of the skills, experience, and training of nurse midwives who are graduates of a 3-year nursing school. Fully qualified staff nurses undertake an additional 10-month period of intensive midwifery training to serve prenatal and maternity patients. Most Grenadian nurses are trained at government expense at the nursing school attached to the General Hospital in St. George's. The quality of care can be attributed to this training program at the General Hospital and the qualifications of the midwives which permit them to apply their knowledge in individual cases and to make sophisticated judgements.

The quality of care also depends on the clinical protocols which are taught to the nurse midwives. In interviews with a sample of nurse midwives in the health centers and stations, the responses to questions on management of pre-eclampsia, antepartum hemorrhage, gestational diabetes, malpresentation and multiple births revealed consistent protocols that were known and understood by the great majority of midwives. For less severe conditions that do not represent a clear and present danger to maternal life, but that may predispose to poorer maternal or fetal outcome, there was less agreement among different midwives in the protocols for treatment. Such conditions were: anemia, previous low birthweight infant, previous premature labor, previous fetal loss, stillbirth or poor obstetrical history, fetal distress in labor, prolonged gestation, or prolonged labor.

A third element contributing to the quality of care is its accessibility. While prenatal clinics are only held once a week in the health centers, the district nurse-midwives are available round-the-clock to manage emergency situations through each health center and station.

G. The effectiveness of the referral system for pre-eclampsia, antepartum hemorrhage, gestational diabetes and malpresentation is essential to the attainment and maintenance of low maternal mortality in Grenada.

The chart review of pregnancy complications revealed that most cases were detected early enough to be treated successfully and avoid maternal deaths. It may be useful to consider the steps that are necessary for smooth linkages in this referral system:

- The patient attends the prenatal clinic before conditions become severe.
- The nurse midwife obtains clinical or laboratory evidence and properly and correctly interprets the need for a referral.
- The nurse midwife successfully communicates the importance of a referral to the pregnant woman and, in some cases, her family, by providing health education and motivation as needed.
- The nurse midwife uses a telephone to contact the referral center. She obtains a specific appointment at a clinic or notifies the hospital maternity unit of incoming emergencies. In emergency cases the telephone is also used to summon an ambulance from the hospital at St. George's or Grenville or from one of the two health centers that have ambulances.

- The patient attends her appointment as scheduled.
- The nurse midwife schedules a follow-up visit for the patient to return to the originating clinic to provide an opportunity to ensure that the patient has attended the second level clinic as prescribed and has been attended to or else to follow-up on recommended treatment as necessary.
- If she fails to return for the follow-up visit, the midwife telephones the patient or sends a message to the patient to ensure that the condition has been attended to.

The above represents an ideal scenario that may be executed with many variations but omission of a single step could result in a missed referral and, for the most serious pregnancy complications, the risk of death. Hence, the frequency of misses in this sequence of events must be rare as evidenced by the frequency of complications and the low mortality. In practice, midwives hold clinics primarily from 8 a.m. until 12 or 1 p.m., depending on the number of patients presenting; this allows several hours in the afternoon for follow up on laboratory results, referrals and appointments. As stated before, they are available for emergency situations round-the-clock.

As these steps show, communication between the primary care clinics and the referral centers is essential to the smooth functioning of the system and the telephone is an important part of that system of communication for appointments, follow-up and emergency transport. Telephones are an essential feature of every health center and visiting station and each department of the hospital. The telephone is used to follow-up on laboratory and blood work, to notify the hospital maternity unit of incoming emergency cases, to call for an ambulance, to make clinic appointments for patients referred to the obstetrical consultant, and to follow up cases sent to the hospital or sent home.

Upward communication to referring centers in St. George's is not only by way of the telephone, but also through the referral note given to the patient which may contain other clinical information. The patient also carries her prenatal card which includes information on all prenatal visits and laboratory and clinical findings. Downward communication from the referring center to the lower levels of care is through information recorded on the prenatal record card and given to her, through special notes that may be attached to the prenatal card, and through discharge notes sent with all hospitalized patients when they return to their home parish.

The prenatal record card obviously plays an important role also in the information flow between health center/station and hospital staff. The patient's prenatal record card summarizes all clinical and laboratory findings and is used to transfer such information from primary to secondary level clinics. In addition, formal referral notes are used and may include additional information beyond that given in the prenatal card. After care is given at the second level clinic, the clinical and laboratory findings are recorded on the prenatal card together with any treatment or conclusions. A note may also be attached for the referring clinic, for example if a return visit is scheduled. For patients who are hospitalized, a formal discharge summary is given to the patient with their prenatal card to be given to the local clinic that will be providing follow-up care.

A referral from the district nurse midwife or general practitioner is necessary in order to be seen by an obstetrical consultant, unless the patient is able to pay for a private visit. This process of referral to obstetricians seems to be an efficient one providing access to secondary services for women who need them; it also ensures the role of the nurse midwife as gate keeper

into the referral hierarchy. District nurse midwives seem to make appropriate referrals for most conditions without hesitation.

One of the key features of the referral system is that women who are referred for diagnosis of a suspected complication, for example, elevated blood pressure, do not continue to receive care at the higher level to which they are referred unless the severity of the condition or unresponsiveness to treatment require continuation of second level care. Whenever possible, the patient is sent back to the referring midwife with instructions for follow-up at the lower level as needed. When necessary, the district nurse midwife visits the home of the patient to provide follow-up care. The return of the patient to the lower level of care is necessary in order to ration consultant's services. It also permits access for those in need of urgent care rather than overloading the consultant's roster with routine follow-up appointments.

Facilitating the use of the referral systems are the close linkages among the staff in clinics and hospital even though staff of each report to separate administrations. The clinics are administered through the community health service of the Ministry of Health while the staff in the hospitals are responsible to a separate administration in charge of hospitals. Supervision of these two departments is separate with public health nurses in the larger health centers acting as supervisors to the district nurse midwives and reporting to the chief nursing officer in the Ministry of Health. The health stations are visited frequently by a supervising public health nurse. However, face-to-face meetings among practicing midwives from stations, centers and hospitals take place once monthly at the parish level but are mainly for the purpose of administrative coordination and supervision rather than for communication of clinical information. Parish supervisors who are public health nurses attend a monthly meeting at the Ministry of Health in St. George's which is used for similar purposes. Both face-to-face meetings and the frequent telephone calls tend to reinforce interpersonal links among midwives in health centers and in hospitals that begin as student nurses. These interpersonal links and the presence of a responsive referral system are likely factors motivating the nurse midwives to use the referral system effectively.

Among the major strengths of the maternity care system in Grenada is the integration of the various units of the system, the strong referral system, and the uniform access to care in all parts of the country with the exception of Carriacou and Petite Martinique. Prenatal care is available to all women at their local health station. All centers and stations offer basically the same level of care including abdominal examinations, blood work, and referral to obstetrical consultants in case of deviations from the routine.

VI. CLINICAL MANAGEMENT OF OBSTETRICAL COMPLICATIONS

The success of the maternity care system in Grenada rests in part on the early diagnosis of key conditions by nurse midwives at health stations or health centers -- diagnosis in time to treat successfully. The following paragraphs will address quality of care from a more clinical perspective.

Throughout the world there has been much interest in the use of social indicators to identify high risk pregnancy in order to focus prenatal care efforts toward those who meet specific risk criteria. However, the sensitivity and specificity of such indicators and groups of indicators are limited. Although the strategy outlined by the Pan American Health Organization for maternal and child health in the Caribbean suggests that the utilization of a risk-based approach may be advisable, no effort is made in Grenada to identify high risk pregnancies according to social characteristics. The following clinical findings are used to identify high risk women: severe edema, hypertension, albuminuria, glucose in urine, severe anemia, bleeding, small-for-dates abdomen, large-for-dates abdomen, malpresentation or suspected multiple pregnancy. When these or other signs of possible complications are detected by the nurse midwife in the prenatal clinic, the patient is referred to the obstetrical clinic for evaluation.

The major causes of maternal mortality in developing countries are eclampsia, obstructed labor, hemorrhage and sepsis. The goals of the Grenadian system of prenatal care are to identify complications leading to these causes of death early and to treat them successfully. Clinic log books revealed that many women do not initiate prenatal care until mid-pregnancy. Since these life threatening complications are likely to occur in the third trimester and since the coverage of prenatal care in the third trimester seems to be very good, complications that eventuate in fatal outcomes are rarely missed. Management of these potentially fatal conditions for the mother and of gestational diabetes, a frequent cause of infant death, will be discussed below.

A. Potential cases of obstructed labor are referred to hospital on an urgent basis.

There were no deaths due to obstructed labor in Grenada in the 2 year period. The actual prevalence of obstructed labor is hard to determine because cephalopelvic disproportion is rarely diagnosed in Grenada. X-ray pelvimetry is not used for diagnosis and every woman is given a trial of labor. The prevalence of prolonged labor can be taken as an indicator of the potential for obstructed labor. Based on the chart review, it was estimated that in 2.2% of General Hospital deliveries, labor is prolonged. Prolonged first stage of labor was the indication for caesarian in 5 of 29 caesareans in the chart review and malpresentations were responsible for 2 additional caesarian sections.

B. Considerable effort has been taken in Grenada to reduce delays in performance of caesarian section.

In Grenada all caesarian section operations are performed at the General Hospital by either of two obstetrical consultants. General physicians do not perform caesareans even on an emergency basis. Until recently, the time delay between the decision to perform a caesarian and the initiation of surgery was often 2-3 hours, especially at night. Operating room nurses, blood technicians, anesthesiologists and sometimes pharmacists have to be called in from home for surgeries from 4 p.m. to 8 a.m. and on weekends. The hospital driver frequently

spends hours picking up these staff members. Recently, coverage for emergency surgery was improved by requiring junior nurses who serve as prep nurse for the operating room to remain on the premises 24 hours a day. Blood technicians, senior surgical nurses and anesthesiologists still come from home but can scrub for surgery immediately because the operating theatre is prepared while they are en route. Anesthesiology service has improved due to additional staffing.

Post-operative care includes a period in the recovery room if surgery is performed during the day or at the maternity unit for evening and weekend surgeries. Analgesics are given routinely including intramuscular pethidine. In some cases prophylactic antibiotics are given. In the 2 year period there was one maternal death among women with caesarean sections. Women who are given caesarian sections are required to pay \$250 for the service but no attempt is made to collect the fee before service is provided.

In emergencies, women delivering at the district hospital in Grenville, in Carriacou or at the outpatient maternity units or at home must be transferred to the General Hospital for caesarian sections. In 1987-88 there were 75 women (6.5% of district hospital deliveries) transferred in all. An estimated 17% of these transfers were for prolonged labor. Women with malpresentation are not generally admitted to these facilities but will be transported immediately via ambulance.

C. Pre-eclampsia is detected in prenatal clinics and referrals are made for further treatment.

Blood pressure monitoring is a regular feature of prenatal care in Grenada and any patient who is found to have a blood pressure in excess of 130/90 or significant albuminuria, edema or sudden weight gain is immediately referred for obstetrical consultation as described above. Those with significant blood pressure elevation are admitted to the General Hospital and released only if they become normotensive and the fetal condition is good. If they are discharged, follow-up blood pressure measurements are made at the primary care clinic. For those who remain in the hospital, blood pressure and fetal heart rate and movements are monitored and hydralazine or aldomet are used if needed to control blood pressure. Labor is managed by the midwives according to hospital routine but with frequent blood pressure checks and urinalysis. The midwives are trained to recognize signs of impending eclampsia and to notify the obstetrician immediately. If eclampsia does occur, magnesium sulphate and valium are used. There were 4 cases of eclampsia during the 2-year study period and 2 maternal deaths resulted, including one case in a woman from Carriacou who had not attended prenatal clinic.

D. Postpartum women are observed carefully for excessive blood loss and most bleeding complications are managed without blood replacement. Postpartum infections are not well-documented.

Grenadian midwives are attentive to the seriousness of blood loss and the potential for postpartum hemorrhage. The relationship of anemia to hemorrhaging is well understood. Although there is an established policy to give iron and folate supplements to all pregnant women, in practice, treatment depends on the availability of iron tablets. Typically, the supply has not been sufficient to provide them to all pregnant women and nurse midwives have been forced to make personal judgements about whom to treat. Midwives also counsel all patients

to increase their dietary intake of iron and inform them about inexpensive locally available food sources.

At the time of delivery, the only routine medication used for midwife-attended births is 5 IUs of oxytocin given at the birth of the head of the baby to assist in clamping down uterine vessels and minimize blood loss. In all cases, blood loss is measured using graduated vessels; and antepartum blood loss, if any, is estimated. Hospital charts include an estimate of blood loss for each patient.

Any patient who loses 500 mls. of blood is considered to have postpartum hemorrhage and the obstetrician is notified and treatment is initiated immediately. The first stage of treatment is to insert an intravenous catheter and to administer an additional 5 IUs of oxytocin and to elevate the foot of the bed. The physician examines the patient to determine the cause of bleeding. If necessary, any retained placental fragments are removed. The second level of treatment, if bleeding continues, is to administer intravenous fluids and continue to monitor vital signs and blood loss. In some cases, ergometrine is also used at this point. The third level of treatment is to administer whole blood either from the blood bank or preferably from relatives. In 1987-88 there were 246 women at the General Hospital with postpartum hemorrhage in excess of 500 mls., a rate of 7.7%. Among postpartum hemorrhage cases in the chart review, nearly 60% resulted in bleeding in excess of 1,000 mls and 22% were greater than 1500 mls. Postpartum hemorrhage was frequently accompanied by other complications. Among those with blood loss in excess of 1000 mls., 13% had caesarians and 11% had infections. Prolonged first and second stage, lacerations and stillbirth were also frequent correlates.

In the outpatient maternity units blood loss is monitored in much the same manner as it is in the hospital. Each unit has an ambulance which is summoned if it is out on call when a woman presents for delivery. In cases of increased bleeding, the same type of treatment is used. However, if first stage treatment does not stop the bleeding, the second stage treatment with intravenous fluids is given and procedures are initiated for an immediate transfer of the patient to the General Hospital. The hospital is notified by telephone and a nurse is called in to ride in the ambulance with the patient. Interruptions in ambulance service were, until recently, a frequent problem but have improved due to the donation of several more ambulances and the establishment of a maintenance unit exclusively for Ministry of Health vehicles.

In home births, the midwife in attendance is equipped with oxytocin and proceeds in generally the same manner. Women with more than 5 previous births are encouraged to deliver in hospital to avoid an increased risk of complications.

Grenadian women with a normal recovery and healthy newborns are discharged from the hospital approximately 12 hours postpartum. Since any postpartum infections that occur are likely to begin after discharge, women are referred to their local health center or station for postpartum care and are instructed to report there in case of fever, foul discharge, pain, or problems with the neonate.

In addition, health center staff visit patients in the first few days postpartum to examine both mother and baby and to encourage them to seek care early if needed. Especially for first births, baby care and breastfeeding advice are given. At these visits, an assessment is made of the risk of problems occurring and if there are existing or potential problems, one or more home visits are made. Not all health centers and stations have sufficient staff to make these home visits on a regular basis and staff do not always find out when patients have delivered.

It was not possible to estimate the prevalence of postpartum infection in this study because of the number of different sources for care: the health centers, stations, and general practitioners. However, it seems reasonable to infer that treatment is effective since there were no deaths due to postpartum infection in the 2 year period.

E. Other pregnancy complications are monitored through prenatal care and obstetrical referral.

Urine is routinely tested for sugar using a dip stick at each prenatal visit and women with positive tests are referred to an obstetrician for blood glucose and other diagnostic tests. Confirmed diabetics are admitted to the hospital and urinalysis is performed every 4 hours. Fetal heart rate and movements are monitored. The patient may remain in hospital until delivery or, if blood glucose can be controlled, may possibly be discharged with follow-up at the local health station or center.

Women are asked to report any bleeding during pregnancy and such cases are promptly referred to an obstetrician. In cases of severe bleeding, the patient will be referred directly to the hospital on an emergency basis. In the hospital, bleeding cases may not be examined by midwives and the obstetrician is called in to determine the cause of bleeding and course of treatment. Bed rest is observed and blood is sent for type and cross-matching.

VII. PERINATAL OUTCOME

Infant survival in Grenada compares favorably with available information for other Caribbean nations. However, the rate of stillbirths in the General Hospital was 21.5 per 1,000 total births in 1987-88, somewhat higher than in neighboring countries. Among General Hospital cases, the rate of premature birth was 4.6% and the neonatal death rate was 15.6 per 1,000 live births. All healthy babies room-in with their mothers and are breastfed. Infant formula is available only with special orders and even premature babies are given expressed breastmilk. Neonatal care has been limited by lack of incubators and other equipment but recently a special care nursery has been established for low birthweight and sick babies.

- A. Routine postpartum care is given through home visits and women and babies with problems are urged to visit health centers.**

Although district nurse midwives are called on to visit newly delivered mothers and babies in their homes, actual coverage of these routine home visits seems to vary from district to district.

The general protocol for postpartum care in Grenada calls for a physical examination of the mother at 6 weeks postpartum at which time family planning is offered. Estimation of the coverage of these examinations is difficult since they may be obtained at any health center or station. Nurse midwives reported a reluctance on the part of Grenadian women to obtain such check-ups since they wish to avoid pelvic examinations, and particularly pap smears, which are considered to be painful. Family planning is also available through the Family Planning Association of Grenada and the Grenada Planned Parenthood Association and through retail outlets.

VIII. SUMMARY

The case study in Grenada provides an illustration of the operation of a primary care-based prenatal care system with virtually all births attended by qualified midwives with referral to obstetricians for those requiring forceps or caesarian section. A well-established and reliable referral system is maintained to provide obstetrical consultations to those with prenatal or intrapartum complications. Essential features of the referral system are:

- a woman's prenatal card that is kept by the patient;
- frequent communication, in this case by telephone, between the primary and secondary care levels; and
- an effective emergency transportation system.

Over-use of secondary care facilities for uncomplicated deliveries is a problem that has yet to be addressed. Some attention to staffing problems and promotion efforts in the community is needed.

In the Grenadian maternity care system, no effort is made to use social criteria to predict risk status and modify the prenatal care package accordingly. Women are generally referred to secondary level care only when specific clinical findings indicate the need for further diagnosis or treatment. An effort is made to provide as reasonable a level of primary care to as broad a segment of the population as possible. At the district hospital, midwives conduct about 575 low risk births a year and 94% are accomplished without referral for second level care.

Until recently, there were notable gaps in second level care, in availability of medications, x-ray, laboratory and operating theatre. Nevertheless, relatively good maternal survival was achieved prior to the recent improvements. Current government efforts seek to eliminate maternal mortality entirely and to reduce stillbirth and neonatal death rates.