

Obstetrics and gynecology

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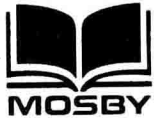
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Preface

This edition of *Obstetrics and Gynecology*, as were its predecessors, was prepared specifically for students rather than for practicing obstetric-gynecologic specialists. We discarded the alternatives—that of reducing the content to a point at which it supplies only skeletonized “core” information and that of expanding it in an attempt to make it an appropriate reference for obstetrician-gynecologists of all levels of skill—because the book has served a useful purpose as the only textbook of obstetrics-gynecology that bridges the gap between those which provide minimal information and those which are all inclusive.

The term “student” has a broad connotation. It encompasses medical students, house officers in various specialties including obstetrics-gynecology, and practicing physicians. Our concentration on normal reproductive physiology and on the anatomic, pathologic, and functional changes that most often disrupt reproductive processes makes *Obstetrics and Gynecology* an appropriate text for medical students and a basic reference for physicians in almost any specialty, particularly for family practitioners and internists. The diagnostic methods and therapeutic regimens can be carried out in either ambulatory or hospital settings by experienced physicians. We have deliberately omitted descriptions of almost all operative techniques and of complicated therapeutic regimens, for example, chemotherapy for ovarian cancer. These require much experience and great skill and are more appropriately presented in highly specialized texts. However, we have retained the concept of dividing the material into that which we consider to be basic information for every physician who treats women and that which is more advanced. The latter, set in small type, is readily available to medical students and others who wish to acquire more than a limited concept of female reproductive disorders.

Every chapter has been revised extensively in an attempt to include new information concerning the causes, pathophysiology, diagnosis, and management of a variety of obstetric and gynecologic disorders. We have been able to do this without changing the size of the book significantly.

A new chapter on the breast has been added because it is essential that physicians who see female patients regularly be familiar with breast evaluation. The 37,000 yearly deaths from breast cancer can be reduced only by employing all available methods for diagnosing malignancies while they are confined to the breast. The chapter on obstetric and gynecologic infections has been completely rewritten to incorporate the most recent information concerning the microbiology of infections of the reproductive organs and their response to antibiotic regimens. We deleted the chapter on surgical complications of pregnancy but retained and updated the material. It has been moved to other chapters where it is considered with nonsurgical conditions affecting the same organ systems.

The chapters concerning pregnancy and labor and delivery, both normal and abnormal, have been revised extensively to present the most recent concepts of reproduction and its failures. The material on contraception, particularly that concerning intrauterine devices and oral contraceptives, has been expanded and updated. The section on rhythm has been entirely rewritten, and the various techniques are described in detail. The chapters on menstruation and its disorders and on the diseases and dysfunctions of the reproductive organs have been revised extensively; several have been almost completely rewritten. In each instance, we have attempted to replace outmoded concepts with the most recent information available to us.

The chapters on psychology and life periods of women, sexuality and sexual function, dysmenor-

rhea, and premenstrual tension, originally provided by Dr. Michael Joseph Daly, Professor and Chairman, Department of Obstetrics and Gynecology, Temple University School of Medicine, and Dr. Harold Winn, Clinical Professor of Psychiatry and Clinical Professor of Obstetrics and Gynecology in Psychiatry, Temple University School of Medicine, have also been revised to include new concepts in these areas.

We trust that this edition of *Obstetrics and Gynecology* will continue to serve as a useful textbook for medical students and as a reference for physicians who are responsible for providing obstetric and gynecologic care.

**J. Robert Willson
Elsie Reid Carrington
William J. Ledger**

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CHAPTER 1 Introduction

J. Robert Willson

It might appear that physicians who confine their professional activities to the treatment of pregnant women (obstetrics) and patients with dysfunctioning genital organs (gynecology) are limiting their practice rather severely. On the contrary, obstetricians and gynecologists must be familiar with many fields of medicine because their patients vary in age from those newly born to senescent women. It is possible for women with medical conditions such as hypertension, tuberculosis, rheumatic heart disease, diabetes, multiple sclerosis, and a host of others to conceive, and all manner of acute medical and surgical conditions may develop during pregnancy.

Gynecologists must be pediatricians, internists, endocrinologists, and surgeons, since they treat females of all ages and often are the first persons consulted because of symptoms that arise in structures other than the genital organs. They must also be familiar with the basic principles of psychiatry and be able to recognize the emotional problems that so frequently manifest themselves in sexual disorders.

The specialist who has little knowledge of general physiologic function and of disease processes in other parts of the body and who thinks only in terms of the pelvis tends to attribute most symptoms, whatever their nature, to some presumed dysfunction of a pelvic structure. A comprehensive approach, by which the emotional and physical functions of the patient as a whole are considered, is more important when dealing with pregnant women and those with gynecologic disorders than in almost any other branch of medicine.

In most countries throughout the world the management of normal pregnancy, labor, and delivery

is the responsibility of midwives. The traditional midwife in more primitive societies rarely has training other than that as an apprentice to an untrained mentor, and her practice is uncontrolled. In more advanced countries, midwives must meet stringent educational requirements, and the limitations of their practice are established in specific government regulations.

The outcome of obstetric care provided by midwives is determined by their training and skill, by the availability of physician consultants and of facilities to which women with complications can be referred, and by the regulations governing practice and consultation. Both maternal and perinatal mortalities are high in underdeveloped countries where untrained midwives have no supporting facilities and the general level of health is low. In contrast, maternal and perinatal mortalities are among the lowest in the world in countries such as the Netherlands and the United Kingdom where midwives, who are responsible for much of the obstetric care in normal cases, are well trained and work closely with obstetrician-gynecologist consultants.

The American Board of Obstetrics and Gynecology was organized in 1930, training facilities for obstetrician-gynecologists were expanded, and women began to consult specialists rather than family physicians who had previously provided most obstetric care. At present the majority of deliveries in the United States are performed by obstetrician-gynecologists in practice or in training.

In the past, family physicians treated women with gynecologic problems, and general surgeons performed most gynecologic operations. The obstetrician-gynecologist has gradually assumed responsibility for much gynecologic care. Obstetri-

cian-gynecologists introduced the concept of periodic health examinations on a large scale. These examinations were directed toward the discovery of asymptomatic pelvic disease, particularly carcinoma of the cervix, which can be diagnosed in its incipency by identifying the characteristic cellular changes in cervical epithelial cells (Papanicolaou's test). More and more women are coming to obstetrician-gynecologists at regular intervals for such examinations.

Obstetrician-gynecologists often provide considerable amounts of general medical care for their own patients. In many instances they serve as primary physicians, treating minor medical and surgical conditions and referring those which are more complicated. This is not surprising, since an obstetrician-gynecologist often has provided care for an individual patient before her marriage, during pregnancies, and at regular periodic examinations after childbearing is completed.

Unfortunately, physicians cannot respond adequately to the steadily increasing demands for obstetric-gynecologic care. In fact, we cannot even cope with all serious problems. For example, in 1980 about 7400 women died with cancer of the cervix, a disease that can be diagnosed so early that it can be eradicated almost without exception. The deaths occurred because these women were not screened for early cellular changes. An additional 3200 died of other malignant uterine tumors; most of them might have been treated successfully had they consulted their doctors early. In the same year, 35,800 women died of breast cancer, another malignancy that can be diagnosed in its earliest stages by effective techniques that are not yet readily available to all women. In 1976 there were 390 maternal deaths, most of them preventable; 34,587 neonatal deaths; and 33,111 fetal deaths, many of these also preventable. There are vast unmet needs in general nutrition and health care and in health education, notably in sex and family living.

Obstetric-gynecologic care can be improved and made more acceptable to women of any economic or social class through the development of *health care teams* composed of obstetrician-gynecologists, nurse midwives, obstetric-gynecologic nurse

practitioners, and specially trained aides. Each can be made responsible for the area of care that is appropriate on the basis of training and ability. For example, the nurse midwife can provide much of the prenatal care and education for *all* pregnant women and delivery and postpartum care for those in whom normal deliveries are anticipated. Nurse midwives or trained obstetric-gynecologic nurses can provide contraceptive counseling, perform periodic health examinations on well women, diagnose and treat minor gynecologic conditions such as vaginitis, and be responsible for a comprehensive health education program. With such capable associates, physicians could concentrate on women with high-risk pregnancies and with gynecologic problems that require their special skills; they would serve as immediately available consultants to associates working in their offices and be responsible for women who require special care during labor and delivery and for gynecologic operations.

Such teams can extend care into areas where there are no physicians, with nonphysician workers serving as screening and triage agents who refer women needing special care to an appropriate physician. It is essential that such a system be organized to deliver medical care to women of all socioeconomic classes. The model is not one that is appropriate only for poor women.

The physician alone is not responsible for all poor results of obstetric care. A national survey of maternity care by the American College of Obstetricians and Gynecologists pointed out several important inadequacies in hospitals in which women are delivered. As a general rule the facilities provided by hospitals in which fewer than 2000 women are delivered yearly are less adequate than those with larger services. Constant 24-hour coverage of the labor-delivery area was provided by registered nurses in almost all large services but in only 40% of hospitals with less than 250 deliveries each year. In 93% of hospitals with large services, emergency cesarean section could be performed in less than 40 minutes; this was possible in only 63% of hospitals with small services. In addition, intensive newborn care by experienced pediatricians was more readily available in larger hospitals.

Hospital-related maternal deaths in Michigan indicate the importance of these findings.* From 1966 to 1971 there were 973,252 live births of 20 or more completed weeks of gestation in hospitals and 154 maternal deaths, a rate of 1.58/10,000 live births. The maternal death rate varied according to the size of the hospital obstetric service as follows:

Annual live births in hospital	Maternal mortality
1-100	4.24
101-500	1.86
501-1000	1.52
1001-2000	1.70
2001 plus	1.35

Each maternal death was studied, responsibility was assigned, and avoidable factors were indicated by the members of the Michigan Maternal Mortality Subcommittee of the Committee on Maternal and Perinatal Health. The maternal death rates associated with avoidable factors were higher in small hospitals than in larger ones as follows:

Annual live births in hospital	Maternal mortality with avoidable factors
1-100	2.83
101-500	1.72
501-1000	1.14
1001-2000	1.29
2001 plus	0.96

In recent years these figures have changed. Perinatal centers, which have the facilities and personnel to manage the most complicated pregnancies, have been developed. Many women who need special care are being referred for consultation or treatment during pregnancy and for delivery. More and more physicians, both family practitioners and obstetrician-gynecologists, are using such centers, and the end result is an improved outcome for both mothers and their infants.

ALTERNATIVE BIRTH CENTERS

The increasing use of technologic innovations during normal labor has led many women to seek less complicated alternative methods of obstetric

care. They reason that a completely normal pregnancy and delivery can be managed successfully by a qualified nurse-midwife, without interference and without mechanical monitoring equipment. Some even contend that delivery at home is safer than is delivery in a hospital. The former concept is correct; the latter is not.

The sharp decline in maternal mortality since the 1930s coincided with increases in both number of hospital deliveries and the provision of obstetric care by trained obstetrician-gynecologists and with improvements in anesthesia and in general medical and surgical care. Electronic and biochemical monitoring techniques and intensive neonatal care, which is only available in perinatal centers, has improved the outcome for the infant when pregnancy is complicated. They are far less important for the mother, especially when pregnancy and labor are normal.

Alternative birth centers have been developed in an attempt to avoid the use of scientifically oriented hospital labor delivery areas, while providing many safeguards that cannot be made available during delivery at home. Such centers are specifically designed for women whose pregnancies have been uncomplicated and for whom normal labor and delivery is anticipated. Most centers are located in or near hospital labor-delivery areas, but some have no direct physical connection with a hospital. The centers are alike in that the atmosphere is more like that of a home than a hospital. The patients labor and deliver in a comfortable bed where they remain with the newborn infant until they are discharged, usually within a few hours. Their families can be with them. The centers are staffed by personnel who are both well trained and experienced in providing care during labor and who support the concept of helping the perfectly normal pregnant woman have her baby as naturally as possible. The labor can be managed by nurse-midwives or physicians, and either can conduct the delivery.

Hospital-based centers are usually located near or within the regular labor-delivery area, which permits prompt consultation with a physician whenever it is necessary and transfer of the patient when a complication arises. Free-standing centers

*From Rice, Gerald, Chief Bureau of Maternal and Child Health, Michigan Health Department: Personal communication.

should have agreements with nearby hospitals that permit the immediate transfer of patients when a complication develops. They also should be prepared to provide emergency care during transfer. Such precautions are essential because from 15% to 25% of carefully screened patients develop complications during labor or after delivery that require more sophisticated care than can be provided in an alternative birth center.

Many of the problems that arise during labor can be anticipated and prevented by careful patient selection. Only women in whom a completely normal pregnancy, labor, and delivery is anticipated should be selected for care at a center. Some of these will be transferred during pregnancy, for example, when the membranes rupture prematurely, if an abnormal position is diagnosed, if hypertension is recognized, if bleeding occurs, or if labor begins prematurely. The most common reasons for transfer during labor are failure to progress, abnormal fetal position, and fetal distress.

The progress of labor is followed by physical assessment of the quality of the contractions, cervical dilatation, and descent of the presenting part. The fetal heart is monitored by frequent auscultation. A qualified attendant is present almost constantly. In addition to following the progress of labor and its effect on the fetus, the attendant supports the mother and father and aids them in using the techniques they learned during their childbirth education class. Minimal amounts of analgesia are used.

Spontaneous delivery is supervised by the nurse-midwife or physician. Local infiltration or pudendal block anesthesia is often used for delivery, but major anesthetic techniques are not. Episiotomies are performed when necessary; they, as well as perineal lacerations, are repaired in the center.

The results of delivery in alternative birth centers in which patients are properly screened, in which meticulous care is provided during labor and delivery, and from which patients with complications are transferred to hospitals promptly are excellent. Understandably, more and more such centers will be developed both within and outside hospitals.

Conversely, home delivery is far from safe. Neither the necessary safety support nor an adequate number of competent attendants is available, and transfer to a hospital when a complication arises is usually delayed. Few trained midwives or physicians will agree to perform deliveries in the home. This has led to the appearance of untrained birth attendants who are willing to do so. In many instances their only qualifications are that they have had children themselves or that they have assisted others in having babies. As might be anticipated, the results are disastrous. In the states that maintain statistics concerning outcome of delivery, perinatal mortality is from two to five times higher in home than in hospital delivery.

The outcome, however, is influenced by prenatal selection of patients and by the experience of the attendant. Burnett and associates reported the following perinatal mortalities for home deliveries in North Carolina: (1) planned home delivery, patients screened in a health department clinic and delivered by a physician or an approved lay-midwife: 4/1000 live births; (2) planned home deliveries if the attendant was neither a physician nor an approved lay-midwife: 30/1000 live births, and (3) unplanned home delivery (usually precipitous): 120/1000 live births.

If one compares the result of delivery at home and in an alternative birth center, the only logical conclusion is that the risks of home delivery are usually too great to assume.

Many gynecologic conditions can be managed by family physicians who take time to examine their patients and make accurate diagnoses. In gynecology, as in obstetrics, consultation is necessary for complicated diagnostic problems and before performing an operation. Accurate diagnoses can usually be made with a minimum of laboratory study, but many helpful diagnostic tests can be performed by the physician. Unfortunately, the busy practitioner sometimes treats symptoms without adequate examination and may therefore overlook cancer, abnormal pregnancy, and other serious conditions, all of which can usually be diagnosed without difficulty.

BIRTHRATES

The *birthrate*, the number of live births per 1000 population, varies from year to year, depending on a multitude of factors. The rate fell progressively from 30 in 1910 to 18.4 in 1933. It is interesting that this low rate was attained before the present sophisticated contraceptive methods were available and undoubtedly represents a calculated mass decision to prevent pregnancy because of the severe financial depression.

Most couples were forced to delay starting their families because of World War II, but the birthrate started upward in 1940 and rose steeply after 1945, reaching a peak of 26.6 in 1947. It was 25 with 4,254,784 births in 1957 and 23.3 with 4,268,326 births in 1961. The birthrate continued to fall, reaching 17.8 with 3,520,959 births in 1967.

An increase in the number of births was anticipated in 1969 because of the large number of young people who were born during the "baby boom" of the 1940s. The number of women between the ages of 15 and 45 years has been increasing as these women grow older: from 42,336,000 in 1970 to a projected 56,000,000 in 1985. However, the anticipated increase in births did not occur. By 1975 the birthrate had decreased to 14.8 with 3,144,198 births.

The predicted vast increase in the number of births was based on continuing high birthrates rather than on the present low ones, which were not expected. Once again the young people of the country have made considered decisions to limit family size. In contrast to the 1930s, however, reliable methods for preventing pregnancy are readily available, and abortions can be obtained legally if contraception fails. There is no certain way of predicting the reproductive rates for the future, but some increase in the *number* of births is inevitable. Even though birthrates remain low, an increasing number of women will enter the childbearing years. In addition, the birthrate may rise because women who have postponed pregnancy and are now in their late twenties and early thirties will become pregnant and because a slight increase in family size may again become popular.

There is a suggestion that birthrates as well as number of births are increasing. In 1977 the birthrate rose to 15.3. In 1979 the birthrate was 15.9; 3,494,398 live births were registered.

The *fertility rate*, the births per 1000 women between the ages of 15 and 45 years, is a better indication of reproductive patterns than the birthrate. The fertility rate in the United States rose from 75.8 in 1936 to 122.9 in 1957. It fell to 87.2 in 1967 and to 67.8 in 1977.

Even the fertility rate does not provide complete information concerning pregnancy because it does not include spontaneous and induced abortions. In 1979, 1,238,987 legal abortions, 358/1000 live births, were reported in the United States.

ILLEGITIMACY AND TEENAGE PREGNANCY

Both the number and ratio (number of births per 1000 unmarried women) of illegitimate births are increasing. In 1950 there were 141,600 (ratio 39.8); in 1960, 224,300 (ratio 52.7); and in 1970, 398,700 (ratio 106.9). In 1977, 515,700 children were born to unmarried mothers, a ratio of 155. The ratio for white women was 81.8, and for black women, 517.4. Following are the number and ratios of illegitimate births in 1977 by age of the mother:

Age	Number	Ratio	
		White	Black
<15	10,100	727.9	987.5
15-19	239,700	273.1	819.6
20-24	168,600	74.6	494.8
25-29	62,400	29.0	297.4
30-34	23,700	26.9	249.7
35-39	8800	39.1	254.5
40+	2300	55.8	258.1

The reported illegitimate births represent only a small fraction of total out-of-wedlock conceptions. Estimates based on correlating the wedding date with the date the first child is born indicate that more than 50% of women of all ages are already pregnant at the time of their marriage. In addition, many illegitimate births are not reported as such.

An illegitimate pregnancy is a problem at any age, but it may be disastrous to a teenager. Before legal abortion became available, the alternative:

were to marry or to remain pregnant, usually giving the baby up for adoption. Neither alternative was a satisfactory solution in most instances. Teenage marriages, particularly those forced by pregnancies, are notoriously unsuccessful, and the alternative of remaining pregnant is inadequate for most girls. Whatever the choice, the result was disrupted education, which too often was not resumed; broken marriages; and often repeated illegitimate pregnancies.

Unfortunately, the availability of effective contraceptive methods has made no remarkable change in the number of teenagers who conceive. The principal difference has been in the number of births. The conception rate of women ages 12 to 19 was 53.8 in 1976; in 1978 it increased to 56.9. In 1976, 570,672 teenagers were delivered, whereas the pregnancies of 314,217 were terminated by abortion. Comparable figures for 1978 were 554,179 deliveries and 357,028 abortions.

Fetal, neonatal, and postneonatal death rates are higher in teenage pregnancies than in those of mature married women. The fetal death ratios for various age groups of legitimate and illegitimate pregnancies are listed in Table 1-1. The effects of illegitimacy are obvious. The curves for neonatal and postneonatal deaths demonstrate a similar disadvantage for young girls. The highest mortalities occur in girls of the lowest socioeconomic groups, those who have had the least education, and those who have had more than one baby before they reach the age of 20 years.

The solution is far more complex than a simplistic approach of making contraceptives available to all girls entering their teens. Most young girls have little accurate and useful information concerning reproduction and, in many communities, no way of learning more. Parents are likely to avoid sexual discussions, and either there are no effective sex education courses in schools, or they do not include instruction in contraception. Some girls may be forced into premature sexual activity by the pressure of their peers; others are seeking love and attention, which they think they can get in no other way. These girls may have unprotected coitus because they know little about contraception and counseling

TABLE 1-1. Fetal death ratios, 1976

Age	Total deaths	Ratio	
		Legitimate	Illegitimate
<15	151	19.2	17.5
15-19	4540	10.3	13.8
20-24	7163	8.9	14.9
25-29	5815	8.7	17.0
30-34	2872	11.0	22.6
35-39	1523	19.8	34.2
40+	521	30.4	38.8

is not available to them. Others fail to use contraceptives because of an unconscious wish to become pregnant to fill an emotional need. Illegitimate pregnancy in more mature women often is a result of carelessness in the use of contraception.

The obvious solution, and it will not come soon, is basic and effective sex education at home and in schools, opportunities to discuss personal problems of sex and reproduction with understanding parents and counselors, and readily available contraception for those who are sexually active.

Counseling also is important for teenage girls who already have conceived. The initial decision is between abortion and remaining pregnant. Those who choose the latter must be permitted to continue their education. They, as well as those who select abortion, need continuing counseling and the best medical care. An important objective in counseling is to provide the patient with an understanding of why she became pregnant and to help her develop the motivation to prevent a recurrence. Without such motivation, as many as 50% of teenagers will be pregnant within a year after delivery.

MATERNAL MORTALITY

A *maternal death* is the death of any woman from any cause during pregnancy or within 42 days of the termination of pregnancy, irrespective of the duration of pregnancy or its site. A *direct obstetric death* is one resulting from a complication of pregnancy itself—from intervention, from omissions of or incorrect treatment, or from a chain of events resulting from any of the preceding. An example

is a death from postpartum hemorrhage. An *indirect obstetric death* is one resulting from a disease that had existed previously or that developed during pregnancy, but the course of which was aggravated by the physiologic effects of pregnancy. An example is serious rheumatic heart disease with decompensation during the period of maximum cardiac stress. A *nonobstetric death* is one resulting from an incidental cause unrelated to pregnancy. An example of a nonobstetric death is one resulting from injuries sustained in an automobile accident or death from a brain tumor.

The *maternal mortality* is the number of maternal deaths from direct causes per 100,000 live births as indicated in the following equation:

$$\frac{\text{Number of direct maternal deaths}}{\text{Total live births}} \times 100,000 = \text{Maternal mortality}$$

Maternal death rates vary considerably in different parts of the country and with different classes of patients. The mortality is higher in nonwhite patients than in either white nonprivate or white private patients. This undoubtedly occurs because the nonwhite patients include the most impoverished and least well-educated people in the United States. There is a higher incidence of medical complications such as essential hypertension, anemia, malnutrition, and preeclampsia-eclampsia among this group of patients, and these conditions often remain untreated. The patients frequently do not seek prenatal care, entering the hospital only after labor has begun; if they do register in clinics, they often appear late in pregnancy, attend irregularly, and cannot afford adequate diets and medications.

The death rate is highest in urban communities and in the southeastern states, where the concentration of nonwhite patients and those of low economic status is greatest. Maternal mortality is lowest in the Northwest, parts of New England, and the upper Midwest, where the population is more homogeneous with fewer blacks and less poverty and malnutrition. Reduction in maternal mortality therefore must be a concern of educators, sociologists, and economists as well as of physicians.

The maternal mortality in 1930 was more than 600/100,000 live births. The rate has fallen steadily

TABLE 1-2. Causes of direct maternal deaths

Cause	Total
Toxemia	83
Infection	71
Hemorrhage	55
Ectopic pregnancy	39
Abortion	16
Other causes	126
TOTAL	390

to a level of 12.3 in 1976. The causes of the 390 direct maternal deaths in 1976 are listed in Table 1-2.

Tabulations of causes of maternal mortality do not reflect the overlap of all responsible contributing factors, since they include only the primary cause listed on the death certificate. For example, most deaths listed as "abortion" are caused by infection, and many women who die of puerperal sepsis also had postpartum hemorrhage, which may represent a major factor in their deaths. In addition, indirect and nonobstetric deaths may be listed under specific causes, such as heart disease, and do not appear as maternal deaths.

The reduced maternal death rate is a result of many factors, which include an increase in hospital deliveries, the development of perinatal centers, the availability of blood, and the ability to treat infection effectively. In addition, there are many more highly trained and skillful obstetricians in all parts of the United States with whom general practitioners can consult when a complication develops. Most hospital staffs are organized and have established rules by which obstetric practice in the institution is governed. Those without special training and experience are required to seek consultation for serious complications and for abnormalities of labor. This is in contrast to the previous situation, when any staff member, regardless of ability, was permitted to perform any type of operative procedure or manage any complication without seeking help.

An important factor in the reduction of maternal mortality was the development of state and local Maternal Mortality Review Committees in the early

1930s. The complete care of each pregnant woman who dies is reviewed by a committee of obstetrician-gynecologists who determine the cause and assign responsibility for the death to the primary physician, the consultant, the patient, or the institution. The principal reason for these committees is physician education, and the result has been a dramatic reduction in maternal mortality. Maternal Mortality Review Committees represent the first organized peer review system to be developed in the United States.

Maternal mortality can be reduced even further. It should be possible at least to eliminate deaths from hemorrhage and infection, both of which can be prevented or treated if they occur. Deaths from abortion can be eliminated or reduced to a minimum by making reliable contraceptive methods and legal abortion available to everyone who wants them. There may be an irreducible minimum of obstetric deaths, but it can only be reached if every physician concentrates on preventing or detecting and correcting potentially lethal abnormalities and if the facilities in which pregnant women are treated are optimal.

PERINATAL MORTALITY (Fig. 1-1)

A *fetal death* is the death before or during birth of a fetus weighing 500 g or more. No heartbeat, cord pulsation, respiratory activity, or movement of voluntary muscle can be detected after birth. If the weight is unknown, fetal death is diagnosed if

the pregnancy duration is of 20 completed weeks or more as measured from the first day of the last normal menstrual period.

A *liveborn infant* is one in which signs of life, including breathing, cord pulsation, heartbeat, or voluntary muscle movement, can be detected after its complete expulsion from the vagina. A *neonatal death* is the death within the first 28 days of life of a liveborn infant weighing at least 500 g or after 20 completed weeks of pregnancy. A *hebdomadāl death* is the death within the first 7 days of life of a liveborn infant weighing 500 g or more.

The term *perinatal death* is an inclusive one, indicating the death of a fetus weighing 500 g or more before or during birth and of a liveborn infant within the first 28 days of life.

The *fetal mortality* is the number of fetal deaths per 1000 births of liveborn and dead-born infants. The *neonatal mortality* is the number of deaths per 1000 births of liveborn infants. The *perinatal mortality* is the number of fetal plus the number of neonatal deaths per 1000 births of live and dead infants. *Infant mortality* includes deaths that occur between the twenty-eighth day and the end of the first year of life.

Most states require that the deaths of all infants born after 20 or more weeks of pregnancy be reported; in some states it is necessary to report deaths from pregnancies of less than 20 weeks' duration.

Perinatal mortalities based on births of all infants

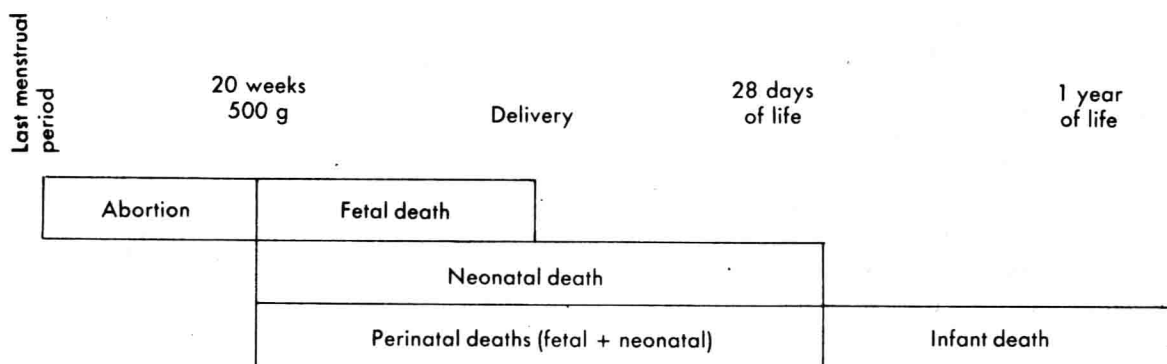


Fig. 1-1. Abortion, perinatal, and infant mortality.

weighing more than 500 g include many who are too immature to survive, even under the most advantageous conditions. A more realistic method is to base the calculation on births of infants who are likely to live if they are born in good condition and if facilities for intensive neonatal care are available. These are infants who weigh more than 800 g or those with gestation periods of at least 27 weeks. This does not mean, of course, that the large number of deaths of smaller infants can be ignored because spontaneous abortions and immature births constitute one of the most important causes of infant loss.

There are many reasons for perinatal deaths; some deaths, such as those associated with hypertension and other acute and chronic diseases in the mother, complications of labor, infections, and birth injuries, can often be prevented. Those caused by congenital malformation, cord entanglement, and certain disorders of placental function cannot yet be controlled. The latter, however, are in the minority.

If a postmortem examination is performed on every infant who dies, and if attending obstetricians will review the management of the pregnancy and delivery, they may find an obvious cause for the death of the baby. The application of this information to similar situations in the future may help prevent other deaths. Most hospitals hold regular mortality conferences in which obstetricians, pediatricians, and pathologists participate; interested individual physicians can accomplish the same things by reviewing the deaths of their own patients.

Fetal deaths. The World Health Organization has recommended the term *fetal death* to replace the older terms, *stillbirth* and *abortion*. Fetal deaths are classified as follows:

- Group I: Early fetal deaths—less than 20 completed weeks of pregnancy
- Group II: Intermediate fetal deaths—20 through 27 completed weeks of pregnancy
- Group III: Late fetal deaths—28 or more completed weeks of pregnancy
- Group IV: Unclassified

In 1976 there were 33,111 fetal deaths of 20 weeks or more. The *fetal mortality ratio* was 10.5/1000 births.

The total number of fetal deaths cannot be determined accurately because most states do not require the reporting of deaths from pregnancies of less than 20 weeks' duration; 10% to 15% or more of all pregnancies terminate in spontaneous abortion. At least half of these occur because of unpreventable factors such as chromosomal abnormalities, but some of the rest might have been prevented.

The most common causes of fetal deaths are *anoxia* (many of these deaths are associated with abruptio placentae, placenta previa, hypertension, maternal diabetes, prolapsed cord, and abnormal labor), *congenital anomalies*, and *infection*. Many of the latter can be prevented. In one third to one half of fetal deaths no cause can be determined, even though an autopsy is performed.

Neonatal deaths. In 1976, 34,587 liveborn infants died during the first 28 days after birth. Of these, 29,497 were less than 7 days old when they died. The *neonatal mortalities* were 10.9 total, 9.7 white, and 16.3 nonwhite.

The reduction in the number of neonatal deaths has been less spectacular than that of maternal deaths. The neonatal mortality fell from 39.7 between 1920 and 1924 to 28.8 in 1940 and to 20 in 1951. In 1976 the rate was still lower: 10.9 (9.7 for white and 16.3 for black women).

Since most perinatal deaths occur in low-birth-weight infants, there are two possible causes for the relatively rapid improvement in recent years: a lower incidence of prematurity and improved care for small infants. The latter is the more likely cause. The delivery of infants weighing between 1000 and 1500 g decreased at a rate of about 1.7%/yr in white women and about 0.9%/yr in black women during the 1970s. Births of infants weighing less than 1000 g changed even less: a decrease of about 0.6%/yr occurred in white women, but the number delivered in black women actually increased at a rate of about 0.4%/yr.

Clearly, the principal reason for the improvement is that more women with pregnancy compli-

cations are now being treated in perinatal centers where specially trained teams provide intensive care both for mothers during pregnancy and labor and for their newborn infants.

Neonatal deaths in 1976 resulted primarily from the following causes:

Cause	Neonatal deaths
Impaired oxygenation	12,733
Asphyxia	3575
Conditions of placenta	937
Hyaline membrane disease	3185
Respiratory distress syndrome	3651
Pneumonia	677
Other	708
Immaturity alone	3960
Congenital abnormalities	5871
Birth injury	1805
TOTAL	24,369

Prevention of neonatal mortality. Approximately half of all neonatal deaths occur in premature infants who are unable to cope with the hazards of an independent existence. The most obvious way to reduce neonatal mortality therefore is to reduce the premature delivery rate. Although it is possible to accomplish this in certain patients, our understanding of many of the causes of premature labor is as yet incomplete, and we cannot always prevent it.

Most neonatal deaths occur with *high-risk pregnancies*; therefore it is essential that women with conditions associated with increased perinatal mortality be given special attention during pregnancy and labor. Examples of high-risk pregnancies are those complicated by diabetes mellitus, hypertensive disorders, hydramnios, multiple fetuses, and antepartum bleeding. The principal problems of delivery are breech and other malpresentations, prolapsed cord, placenta previa, and abruptio placentae. *High-risk pregnancies are best managed in perinatal centers.*

Illegitimate pregnancies and pregnancies at the extremes of the reproductive years are accompanied by increased prematurity and fetal and neonatal death rates. It is essential therefore that sexually active teenagers and women who want no more children be provided with reliable contraceptive methods.

Socioeconomic factors in perinatal mortality.

Perinatal mortality from all causes is higher in poor women than in middle- and upper-class women. The general health of more affluent women is better, they are better nourished, they have relatively easy access to physicians, and they know how to use medical care facilities. Poor women are likely to be congenitally malnourished and anemic, and they live in unfavorable environments. They are more likely to have more pregnancies at short intervals than are upper-class women. Medical care facilities available to poor women may be limited and inappropriate, and access to these facilities may be difficult. As a consequence, they use the facilities principally for serious acute illnesses rather than for health maintenance.

Adequate prenatal care alone, although obviously important in determining the outcome of high-risk pregnancies, is only a partial solution for the reproductive problems associated with poverty. Poor women must first be adequately fed and housed so they will no longer need to think only in terms of day-to-day existence. Physicians have little control over these aspects of the total problem, but they do have the responsibility of making certain that appropriate medical care facilities are made available and that acceptable educational programs designed to help women learn to use these facilities are instituted. Better general health alone will improve the outcome of pregnancy, but even this cannot be accomplished without concomitant social and economic advances.

NONLETHAL EFFECTS OF THE BIRTH PROCESS

Not all infants who are born alive are normal. Approximately 7% of all liveborn infants have structural or functional defects. Less than half these defects are diagnosed during the early postnatal period; the rest appear weeks or even years later.

It is difficult to determine how many of these conditions could have been prevented by better obstetric care because many are caused by unrecognized chromosomal conditions or teratogenic stimuli during pregnancy. Many individuals, however, particularly those who are mentally defective,