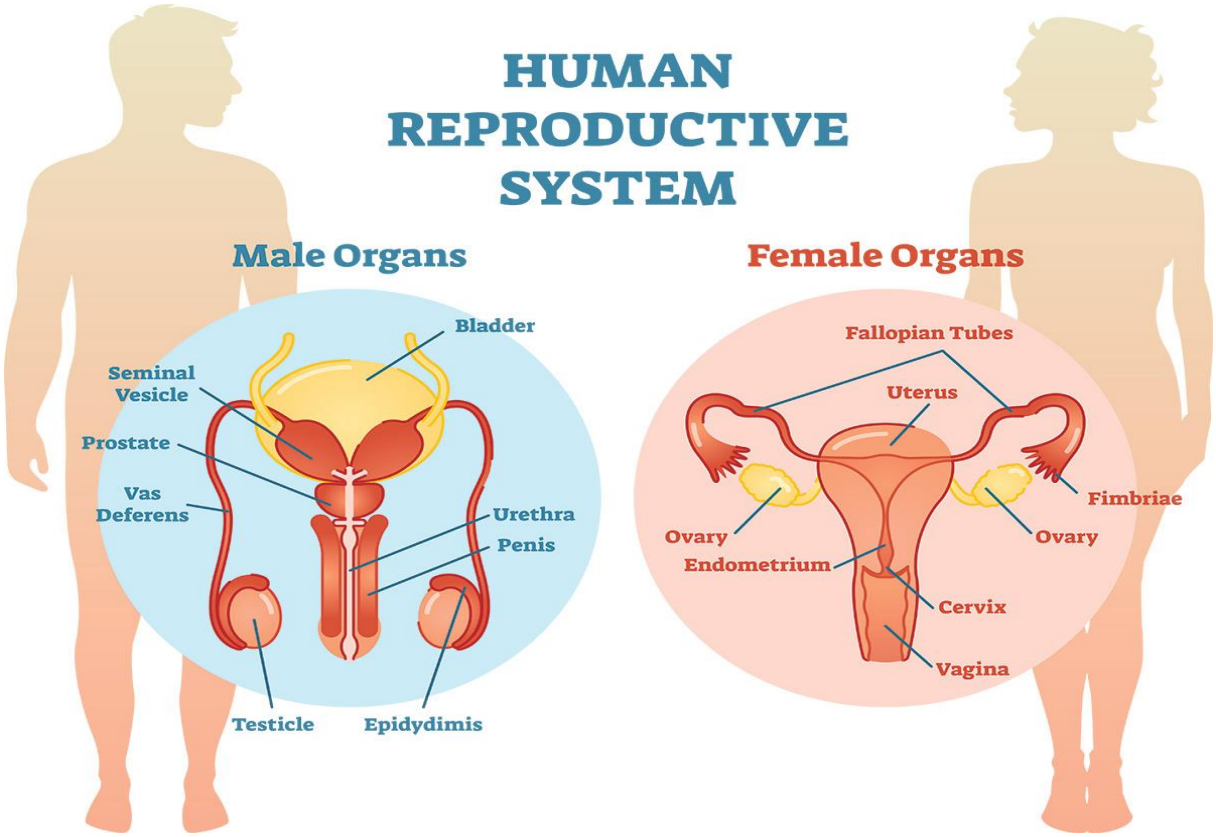
Ministry of Higher Education & Scientific Research
University of Mosul College of Nursing
Maternity and neonatal health nursing

Maternity and neonatal health nursing

Third stage
2024-2025

Maternity and Neonate Health Nursing

ANATOMY & PHYSIOLOGY OF THE REPRODUCTIVE SYSTEM



University of Mosul/College of Nursing
Lecturer: Jwan Mohammed Hassan
2024-2025

LEARNING OBJECTIVES

Upon completion of the lecture, you will be able to:

1-The key terms used in this lecture.

2-Describe changes of puberty in males and females.

3-Define Contrast the structure and function of the major external and internal female genital organs.

4-Outline the phases of the menstrual cycle, the dominant hormones involved, and the changes taking place in each phase.

5-Classify external and internal male reproductive structures and the function of each in hormonal regulation

KEY TERMS

Breasts, cervix, endometrium, estrogen, fallopian tubes, follicle- stimulating hormone (FSH), luteinizing hormone (LH), menarche, menstruation, ovaries, ovulation, penis, progesterone, testes, uterus, vagina, and vulva.

The reproductive system consists of organs that function in the production of offspring. Thefemale reproductive system produces the female reproductive cells (the eggs, or ova) and contains an organ (uterus) in which development of the fetus takes place; the male reproductive system produces the male reproductive cells (the sperm) and contains an organ (penis) that deposits the sperm within the female. Nurses need to have a thorough understanding of the anatomy and physiology of the male and female reproductive systems to be able to assess the health of these systems, to promote reproductive system health, to care for conditions that might affect the reproductive organs, and to provide client teaching concerning the reproductive system.

This chapter reviews the female and male reproductive systems and the menstrual cycle as it relates to reproduction.

PUBERTY

Puberty is a period of rapid change in the lives of boys and girls during which the reproductive systems mature and become capable of reproduction. Puberty ends when mature sperm are formed or when regular menstrual cycles occur.

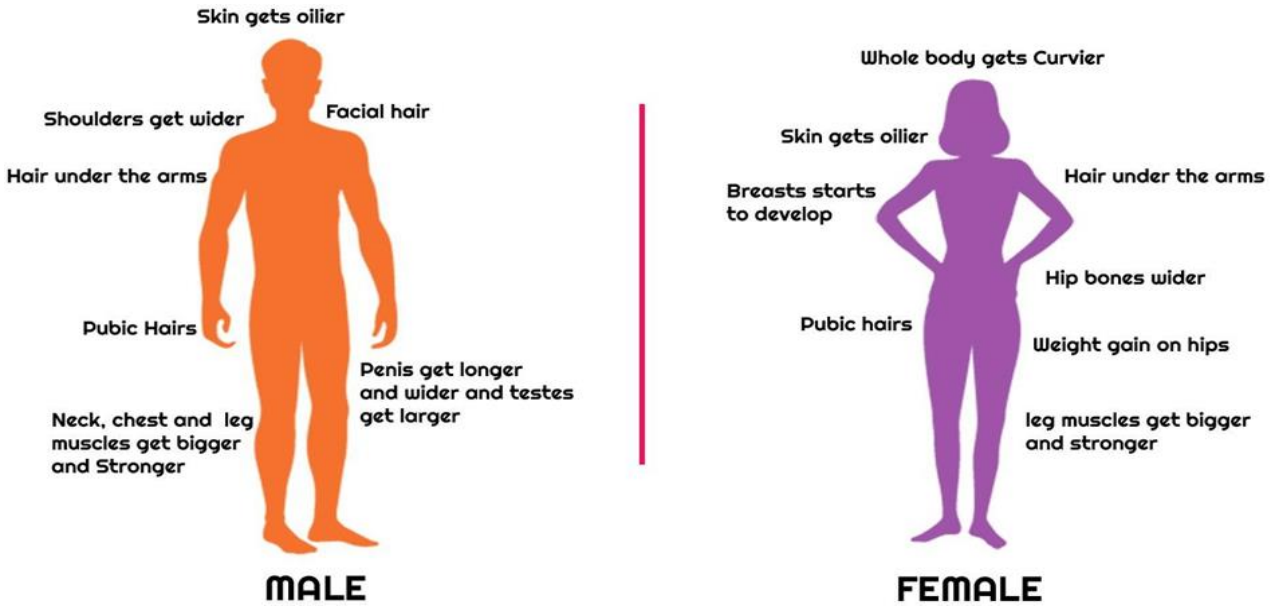
In girls, the first menstrual period (menarche) (age 11 to 15 years), The first outward change of puberty in girls is development of the breasts.

pubertal changes typically occur as:

1. Growth spurt
2. Increase in the transverse diameter of the pelvis
3. Breast development
4. Growth of pubic hair
5. Onset of menstruation
6. Growth of axillary hair
7. Vaginal secretions

In boys, Testosterone, the primary male sex hormone. Male hormonal changes normally begin between 10 and 16 years of age, and pubertal changes typically occur as:

1. Increase in weight
2. Growth of testes
3. Growth of face, axillary, and pubic hair
4. Voice changes
5. Penile growth
6. Increase in height
7. Spermatogenesis (production of sperm)
8. Nocturnal emissions ("wet dreams") may occur without sexual stimulation

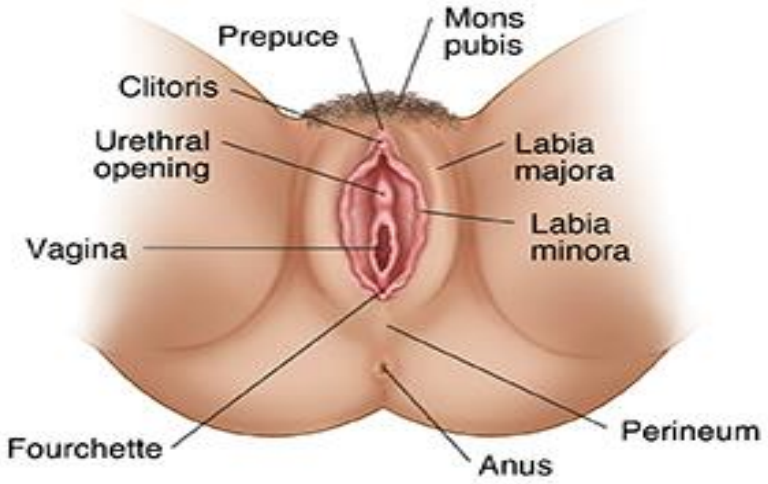


Female Reproductive System

The female reproductive system consists of external genitalia, internal genitalia, and accessory structures such as the mammary glands (breasts).

External Genitalia

The female external genitalia are collectively called the vulva (which means “covering” in Latin). They include the mons pubis, labia majora, labia minora, fourchette, clitoris, vaginal vestibule, and perineum.



Mons Pubis

The mons pubis (mons veneris) is a pad of fatty tissue covered by coarse skin and hair. It protects the symphysis pubis during sexual intercourse and contributes to the rounded contour of the female body.

Labia Majora

The labia majora are two folds of fatty tissue on each side of the vaginal vestibule. Many small glands are located on the moist interior surface. Their function is to protect the vaginal opening.

Labia Minora

The labia minora are two thin, soft folds of tissue that are seen when the labia majora are separated. Secretions from sebaceous glands in the labia are bactericidal to reduce infection and lubricate and protect the skin of the vulva.

Fourchette

The fourchette is a fold of tissue just below the vagina, where the labia majora and the labia minora meet , designed to stretch during vaginal intercourse and childbirth. This is the structure that is sometimes cut (episiotomy) during childbirth to enlarge the vaginal opening

Clitoris

The clitoris is a small, erectile body in the most anterior portion of the labia minora. It is similar in structure to the penis. Functionally, it is the most erotic, sensitive part of the female genitalia There are folds above and below the clitoris. The joining of the folds above the clitoris forms the prepuce, a hood-like covering over the clitoris.

Vaginal vestibule

The vaginal vestibule is the area seen when the labia minora are separated and includes five structures:

1. **The urethral meatus** lies approximately 2 cm below the clitoris. It has a fold like appearance with a slit type of opening, and it serves as the exit for urine.
2. **Skene ducts (paraurethral ducts)** are located on each side of the urethra and provide lubrication for the urethra and the vaginal orifice.
3. **The vaginal introitus** is the division between the external and internal female genitalia.
4. **The hymen** is a tough but elastic membrane that covers the vagina opening.
5. **The ducts of the Bartholin glands (vulvovaginal glands)** provide lubrication for the vaginal introitus during sexual arousal and are normally not visible.

Perineum

The perineum is a strong, muscular area between the vaginal opening and the anus. The elastic fibers and connective tissue of the perineum allow stretching to permit the birth of the fetus.

Internal Genitalia

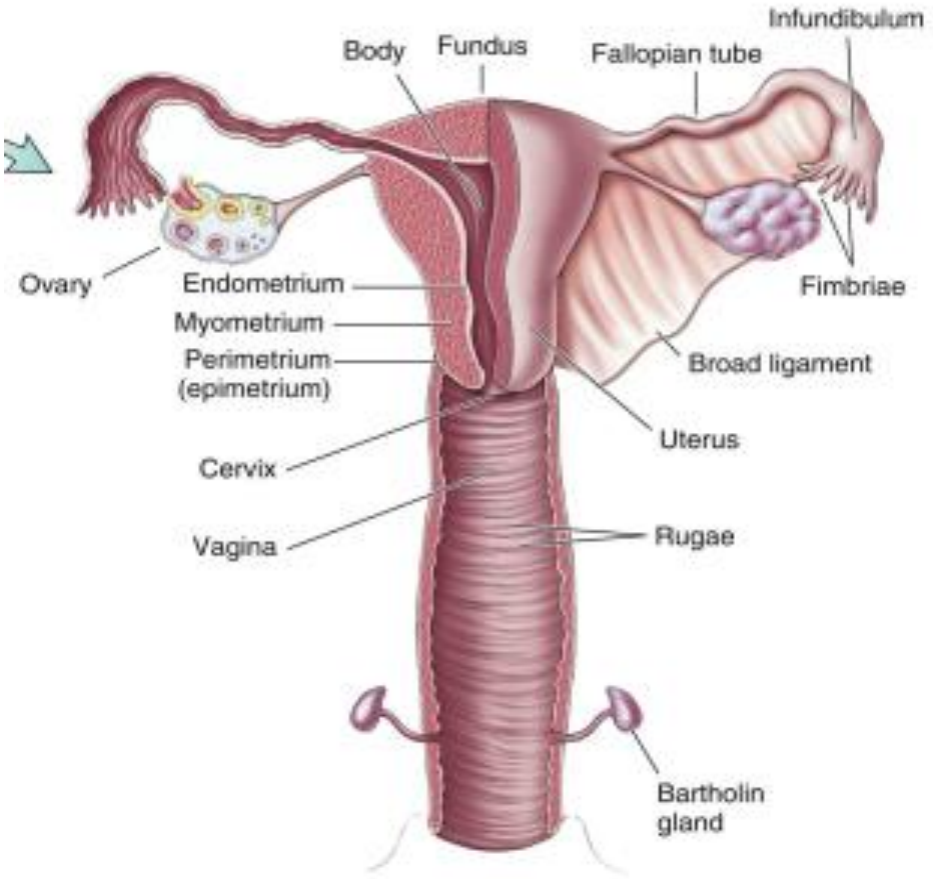
The internal genitalia are the vagina, uterus, fallopian tubes, and ovaries.

Vagina

It is a tubular, a canal that connects the external genitals to the uterus. It is fibromuscular organ lined with mucous membrane that lies in a series of transverse folds called rugae. **The rugae** allow for extreme dilation of the canal during labor and birth. It can range between 7 to 12 cm in length, but everybody is different. The vagina is self-cleansing and during the reproductive years maintains a normal acidic pH of 4 to 5.The vagina is

The vagina has three functions:

1. Provides a passageway for sperm to enter the uterus.
2. Allows drainage of menstrual fluids and other secretions.
3. Provides a passageway for the infant's birth



Uterus

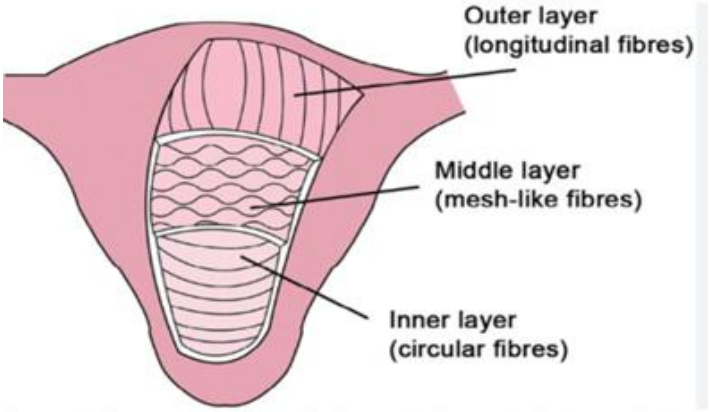
The uterus (womb) is a hollow muscular organ in which a fertilized ovum is implanted, an embryo forms, and a fetus develops. It is shaped like an upside-down pear or light bulb. In a mature, nonpregnant woman, it weighs approximately 60 g and is 7.5 cm long, 5 cm wide, and 1 to 2.5 cm thick. The uterus lies between the bladder and the rectum above the vagina.

The uterus is separated into three parts: fundus, corpus, and cervix.

- The fundus (upper part) is broad and flat.
- The fallopian tubes enter the uterus on each side of the fundus.
- The corpus (body) is the middle portion, and it plays an active role in menstruation and pregnancy.

The fundus and the corpus have three distinct layers:

1. ***The perimetrium*** is the outermost or serosal layer that envelops the uterus.
2. ***The myometrium*** is the middle muscular layer that functions during pregnancy and birth.
3. ***The endometrium*** is the inner or mucosal layer that is functional during menstruation and implantation of the fertilized ovum.



- The cervix (lower part) is narrow and tubular and opens into the upper vagina. The cervix consists of a cervical canal with an internal opening near the uterine corpus (internal os) and an opening into the vagina (the external os).

The mucosal lining of the cervix has four functions:

1. Lubricates the vagina
2. Acts as a bacteriostatic agent
3. Provides an alkaline environment to shelter deposited sperm from the acidic pH of the vagina
4. Produces a mucous plug in the cervical canal during pregnancy

Fallopian tubes

The fallopian tubes, also called uterine tubes or oviducts, extend laterally from the uterus, one to each ovary. They vary in length from 8 to 13.5 cm.

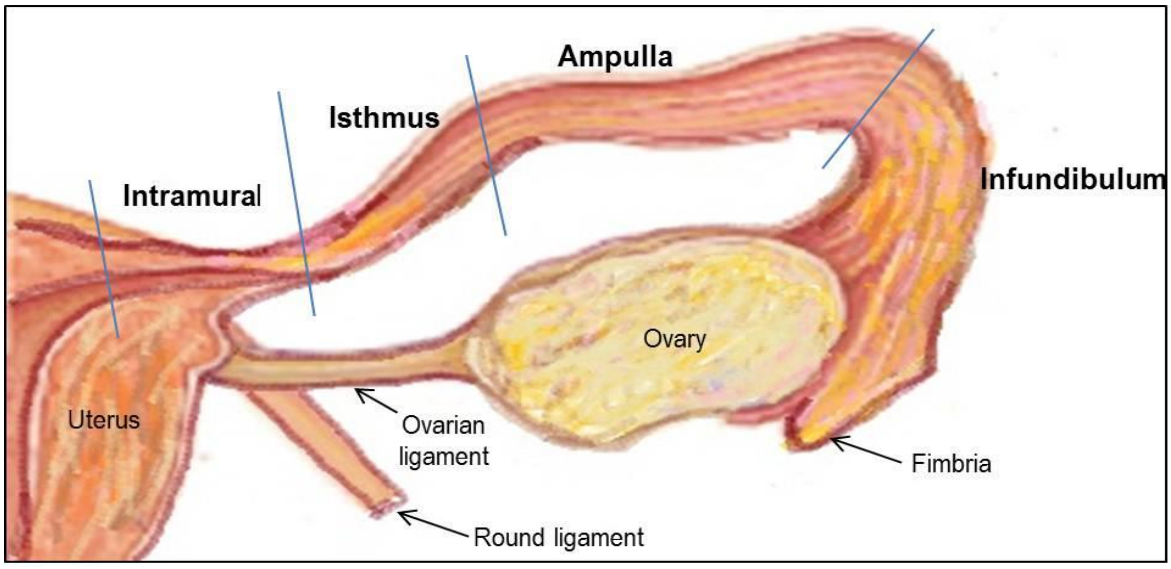
Each tube has four sections:

1. **The interstitial portion** extends into the uterine cavity and lies within the wall of the uterus.
2. **The isthmus** is a narrow area near the uterus.
3. **The ampulla** is the wider area of the tube and is the usual site of fertilization.
4. **The infundibulum** is the funnel-like enlarged distal end of the tube.

Fingerlike projections from the infundibulum, called **fimbriae**, hover over each ovary and "capture" the ovum (egg) as it is released by the ovary at ovulation.

The four functions of the fallopian tubes are to provide the following:

1. A passageway in which sperm meet the ovum.
2. The site of fertilization (usually the outer one-third of the tube).
3. A safe, nourishing environment for the ovum or zygote (fertilized ovum).
4. The means of transporting the ovum or zygote to the corpus of the uterus



Ovaries

The ovaries are two almond-shaped glands, each about the size of a walnut. They are located in the lower abdominal cavity, one on each side of the uterus, and are held in place by ovarian and uterine ligaments. They are homologous to the testes. Each ovary weighs from 2 to 5 g and is about 4 cm long, 2 cm wide, and 1 cm thick.

The ovaries have two functions:

1. Production of hormones, chiefly estrogen and progesterone.
2. Stimulation of an ovum's maturation during each menstrual cycle

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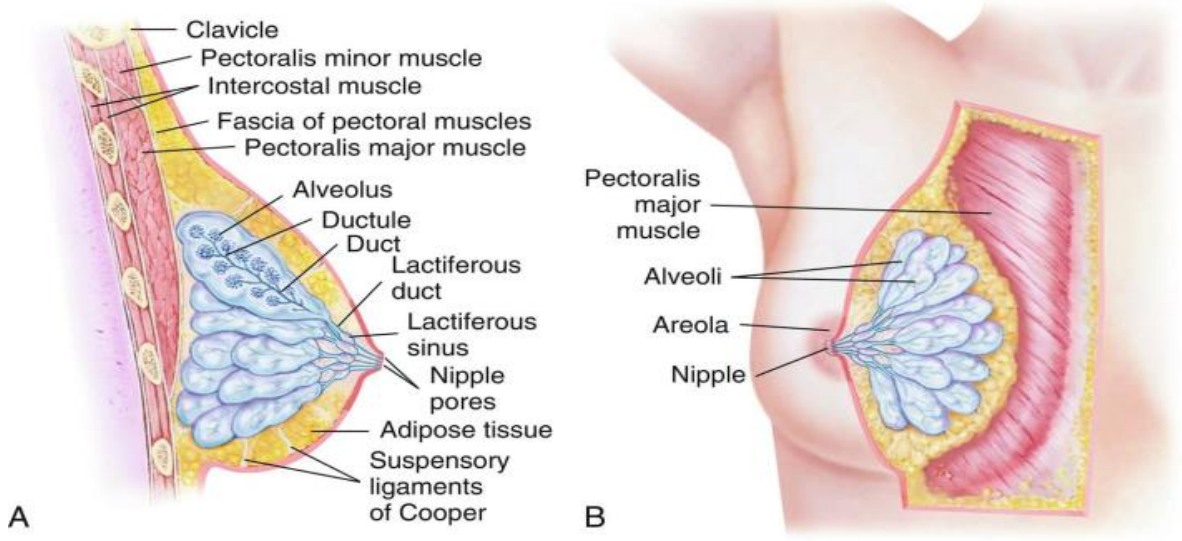
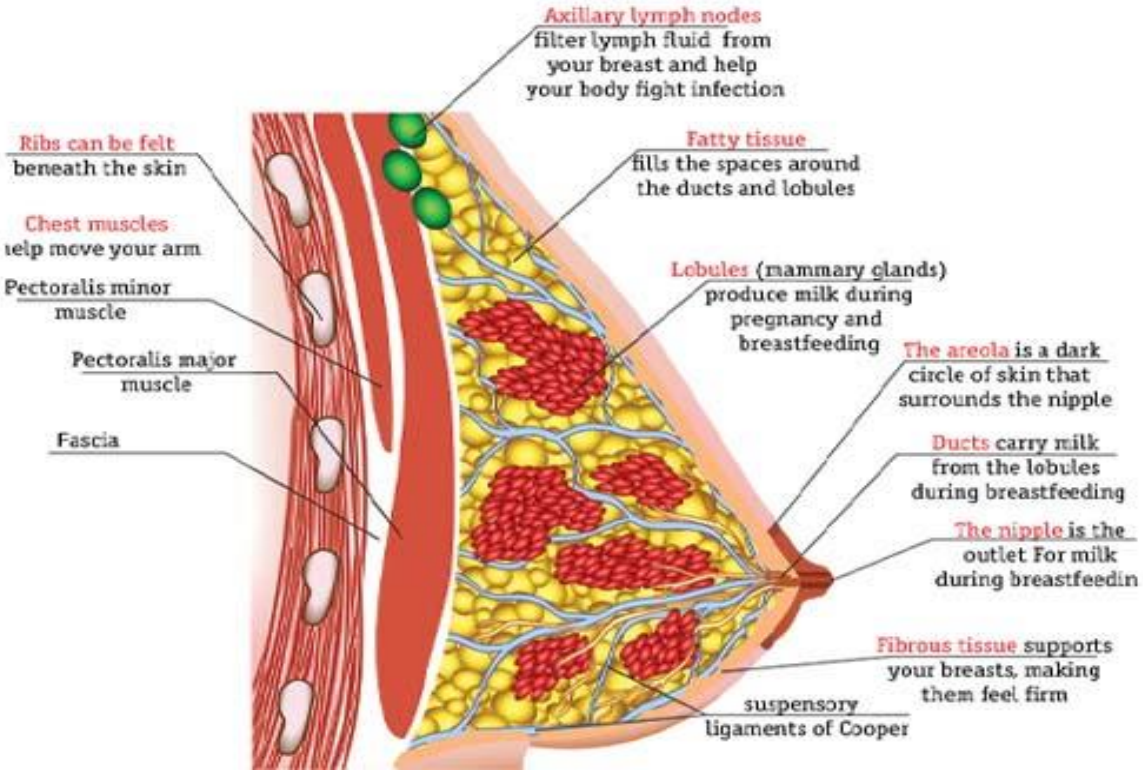
Breasts

- The two mammary glands, or **breasts,** are accessory organs of the female reproductive system that are specialized to secrete milk following pregnancy.
- Each breast has a nipple located near the tip, which is surrounded by a circular area of pigmented skin called the **areola**. Each breast has 15 to 20 sections, called **lobes**.
- Each lobe has many smaller structures called **lobules (Alveoli**) . These end in dozens of tiny **bulbs** that can produce milk.
- The lobes are separated by dense connective and adipose tissues, which also help support the weight of the breasts.
- They empty into approximately 20 separate lactiferous (milk-carrying) ducts.
- Milk is stored briefly in widened areas of the ducts, called ampullae or lactiferous sinuses.
- **Montgomery glands** (Montgomery tubercles) are small sebaceous glands in the areola that secrete a substance to lubricate and protect the breasts during lactation.



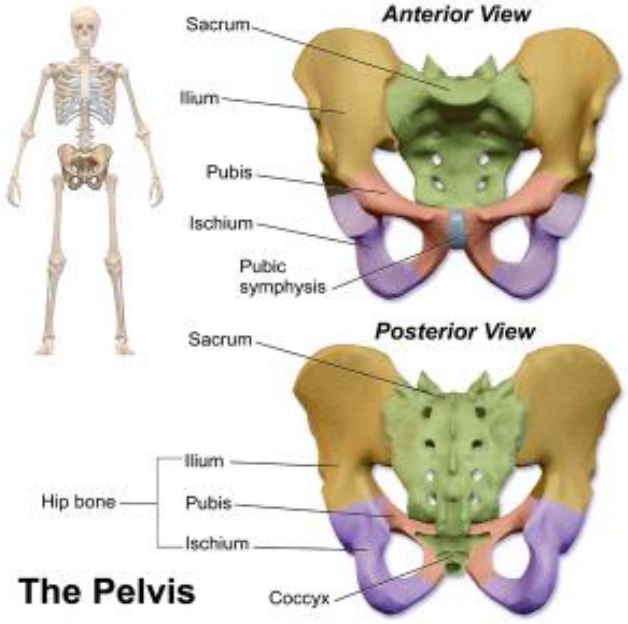
MEDICAL STRUCTURE OF THE FEMALE BREAST



Pelvis

The bony pelvis occupies the lower portion of the trunk of the body, made up of an ilium , pubic and ischium.

- The ilium is the lateral, flaring portion of the hip bone
- The pubis is the anterior hip bone. These two bones join to form the symphysis pubis.
- The ischium is below the ilium and supports the seated body.
- The posterior pelvis consists of the sacrum and the coccyx



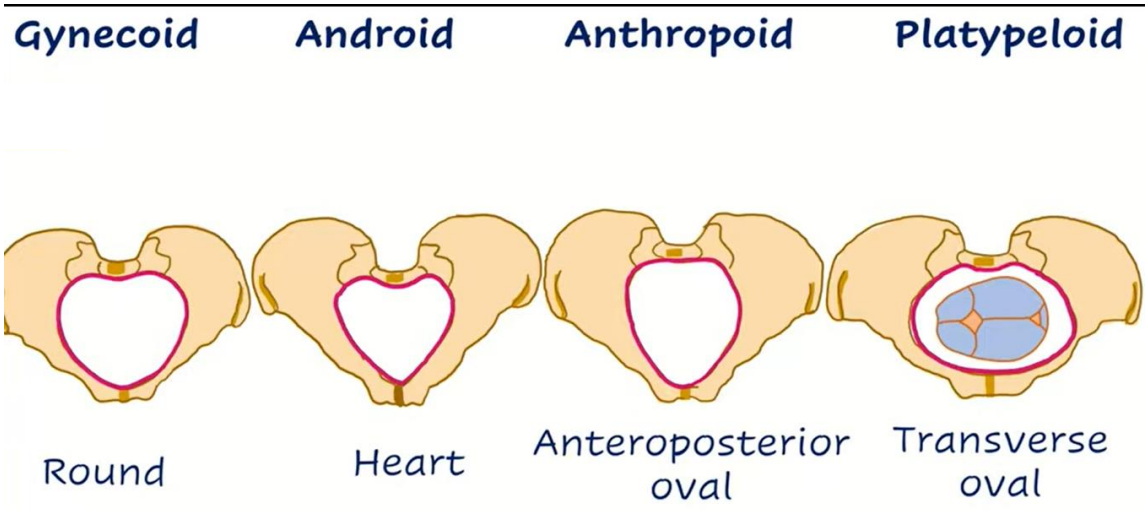
The bony pelvis has three functions:

1. Supports and distributes body weight
2. Supports and protects pelvic organs
3. Forms the birth passageway

Types of pelves

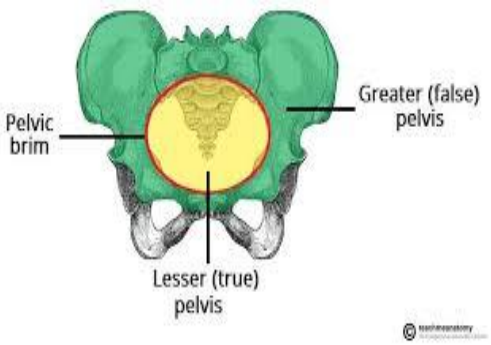
There are four basic types of pelvis. Each type of pelvis has implications for labor :

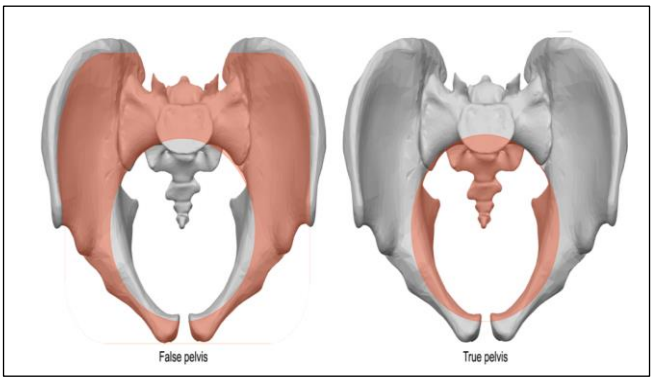
1. **The gynecoid** pelvis is the classic female pelvis, with rounded anterior and posterior segments. This type is most favorable for vaginal birth.
2. **The android** pelvis has a wedge or heart shape; may appear wider at the top and narrower at the bottom. it is typical of the male anatomy.
3. **The anthropoid** pelvis has an anteroposterior diameter that equals or exceeds its transverse diameter. The shape is a long, narrow oval.
4. **The platypelloid** pelvis has a shortened anteroposterior diameter and a flat, transverse oval shape. This type is unfavorable for vaginal birth.



The female bony pelvis is divided into:

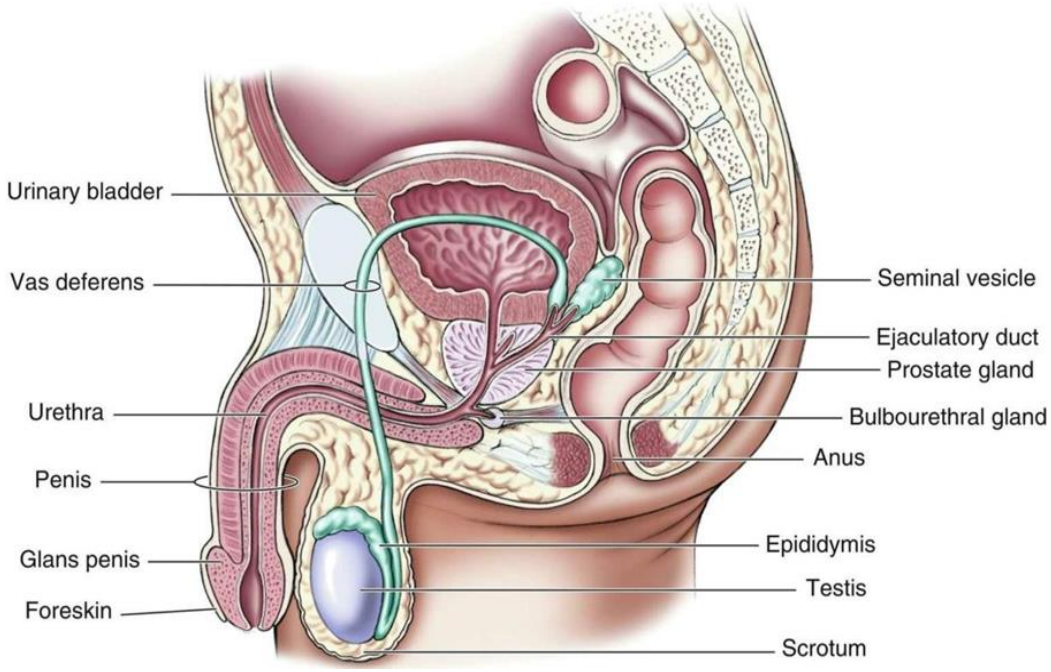
- False pelvis or upper pelvis : above the pelvic brim and supports the enlarging uterus and guides the fetus into the true pelvis
- True pelvis or lower pelvis : below the pelvic brim and related to the child -birth.





Male Reproductive System

The male reproductive system consists of external and internal organs



External Genitalia

The penis and the scrotum, which contains the testes, are the male external genitalia.

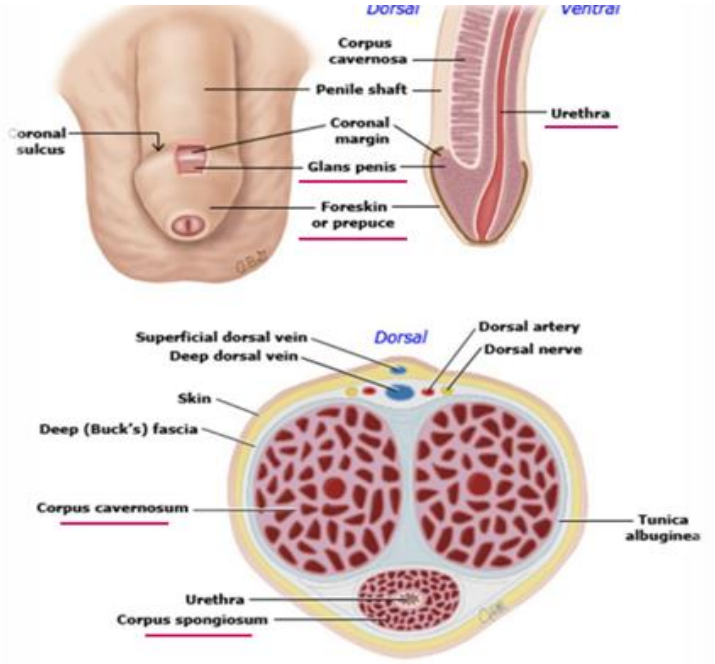
Penis

The penis consists of the glans and the body. The glans is the rounded, distal end of the penis. It is visible on a **circumcised penis** but is hidden by the foreskin on an uncircumcised penis.

At the tip of the glans is an opening called the **urethral meatus**. The body of the penis contains the urethra (the passageway for sperm and urine) and erectile tissue (the corpus spongiosum and two corpora cavernosa).

The penis has two functions:

1. Provides a duct to expel urine from the bladder.
2.Deposits sperm in a woman's vagina to fertilize an ovum.



Scrotum

The scrotum is the thin-skinned sac that surrounds and protects the testes. The scrotum also acts as a climate- control system for the testes, because they need to be slightly cooler than body temperature to allow normal sperm development.

Internal Genitalia

The internal genitalia include the testes, vas deferens, prostate, seminal vesicles, ejaculatory ducts, urethra, and accessory glands.

Testes

The testes (testicles) are a pair of oval glands housed in the scrotum. Leydig's cells are responsible for the production of testosterone

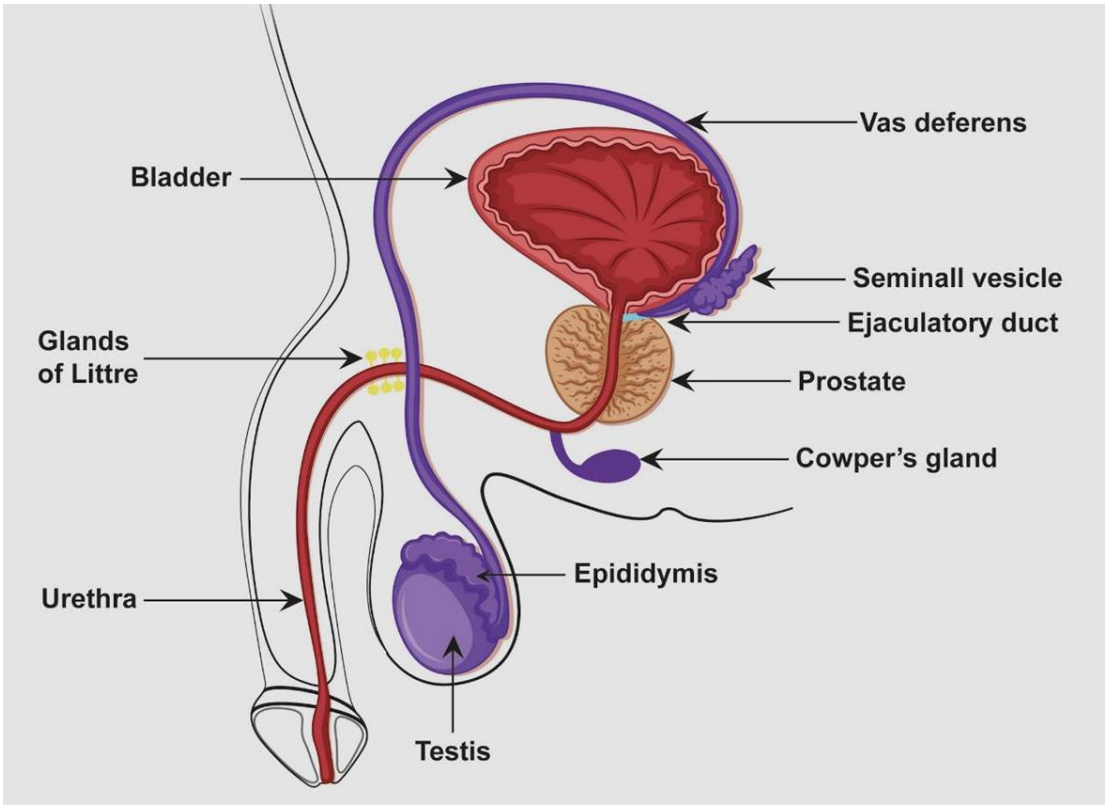
They have two functions:

1. Manufacture male germ cells (spermatozoa or sperm).
2. synthesizing testosterone (the primary male sex hormone).

Ducts

Sperm cells pass through a series of ducts to reach the outside of the body. After they leave the testes, the sperm passes through the **epididymis, ductus deferens, ejaculatory duct, and urethra**

- Each epididymis is a long (about 6 meters) tube, one from each testicle, stores the sperm. The sperm may remain in the epididymis for 2 to 10 days, during which time they mature and then move on to the vas deferens.
- Each vas deferens passes upward into the body, goes around the symphysis pubis, circles the bladder, and passes downward to form (with the ducts from the seminal vesicles) the ejaculatory ducts.
- The ejaculatory ducts then enter the back of the **prostate gland** (which produce a fluid that becomes part of semen (seminal fluid)) and connect to the upper part of the urethra, which is in the penis. The urethra transports both urine from the bladder and semen from the prostate gland to the outside of the body, although not at the same time.



Accessory glands

1. **Seminal** vesicles
2. The prostate gland
3. The bulbourethal **glands (Coper's glands)**

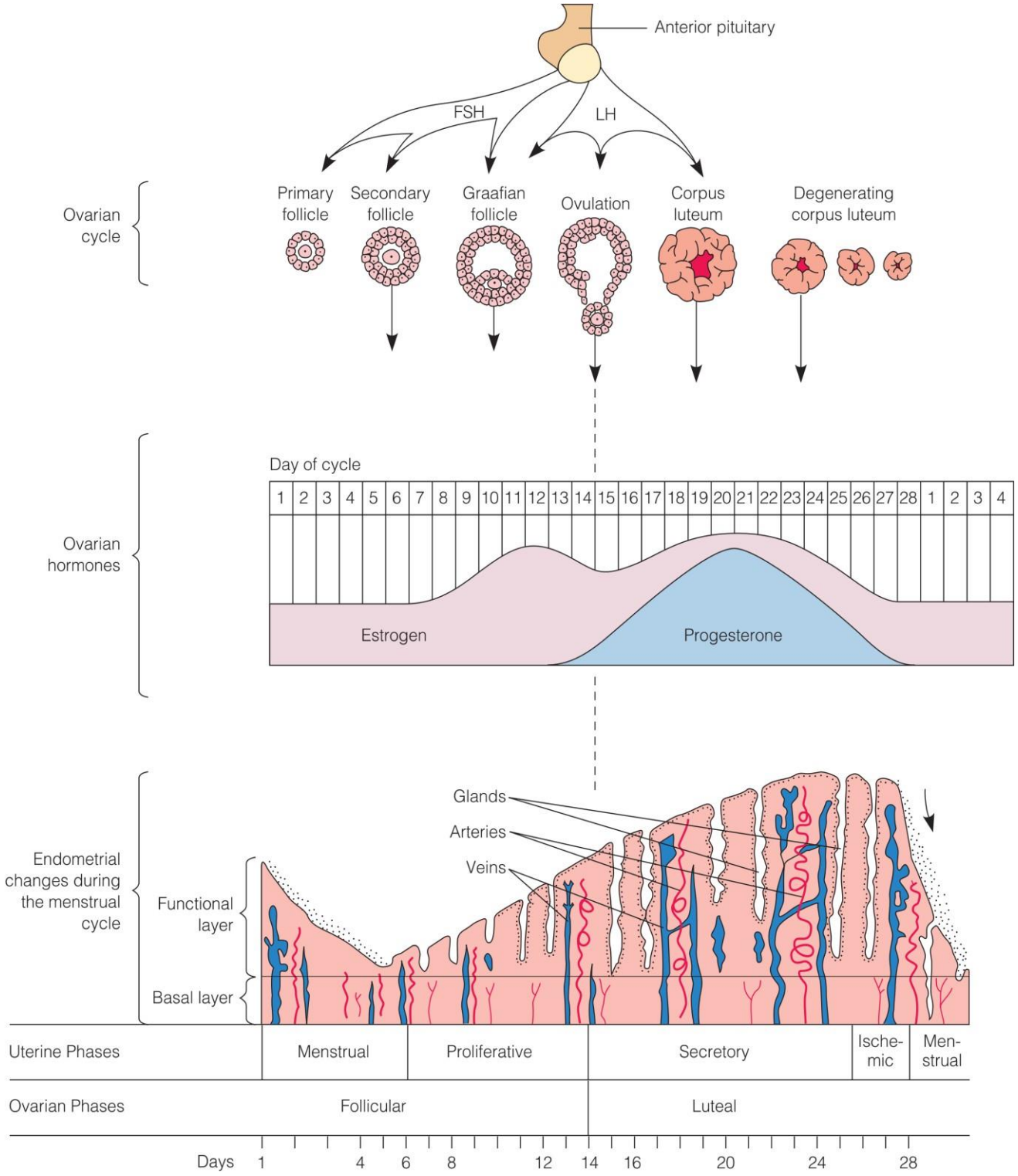
The accessory glands produce secretions (seminal plasma)that have three functions:

1. Nourish the sperm
2. Protect the sperm from the acidic environment of the woman's vagina
3. Enhance the motility (movement) of the sperm

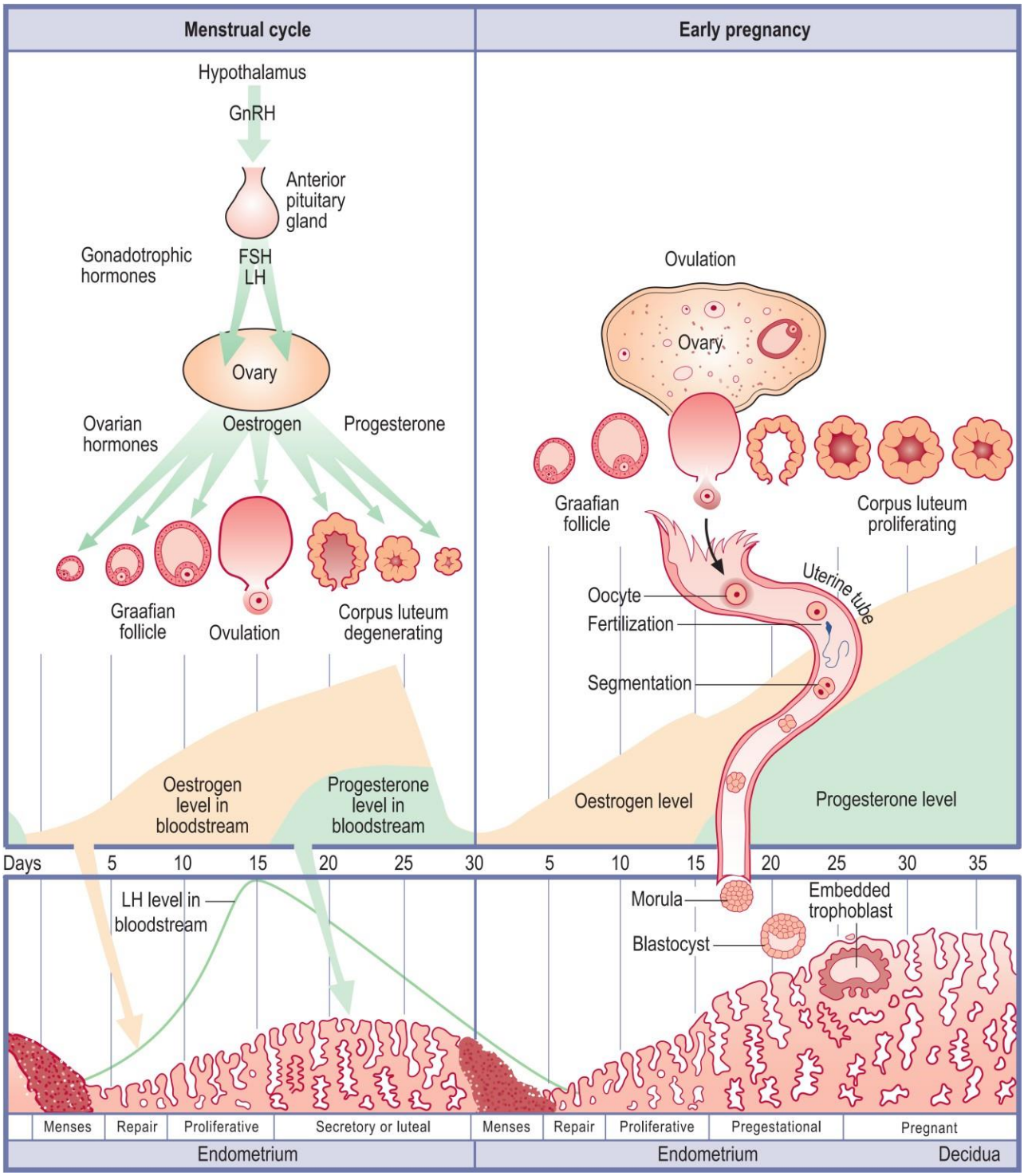
The seminal vesicles are two convoluted pouches , These glands secrete a viscous alkaline liquid that has a high sugar, protein, and prostaglandin content for supplies energy to the sperm to meet the ovum, and the prostaglandins assist in sperm mobility.

Prostate Gland is a chestnut-sized gland that lies just below the bladder which produces secretes a thin, alkaline fluid prostatic fluid that nourishes and transport sperm.

The bulbourethral glands (Cowper's glands) are two small structures about the size of peas located inferior to the prostate gland , secrete an alkaline mucus-like fluid to neutralizes the acidity of the urine residue in the urethra . Lubricates the head of the penis in preparation for sexual intercourse.



Female reproductive cycle: interrelationships of hormones with the four phases of the uterine cycle and the two phases of the ovarian cycle in an ideal 28-day cycle.


Menstrual cycle
Early pregnancy
Hypothalamus
GnRH
Anterior pituitary gland
Gonadotrophic hormones
FSH
LH
Ovary
Ovarian hormones
Oestrogen
Progesterone
Graafian follicle
Ovulation
Corpus luteum degenerating
Oestrogen level in bloodstream
Progesterone level in bloodstream
Ovulation
Ovary
Graafian follicle
Corpus luteum proliferating
Uterine tube
Oocyte
Fertilization
Segmentation
Oestrogen level
Progesterone level
Days
5
10
15
20
25
30
5
10
15
20
25
30
35
LH level in bloodstream
Morula
Embedded trophoblast
Blastocyst
Menses
Repair
Proliferative
Secretory or luteal
Menses
Repair
Proliferative
Pregestational
Pregnant
Endometrium
Endometrium
Decidua

Lecture 2
Fertilizationnn
Fetal development

Learning Objectives

Upon completion of the chapter, you will be able to:

1-Define the key terms used in this lecture.
2-Describe the process of gametogenesis in human reproduction.
3-Explain the process of fertilization, implantation, and cell differentiation.
4-Describe the development and functions of the amniotic fluid, placenta, and umbilical cord.
5-Compare fetal circulation with circulation after birth.

KEY TERMS

Blastocyst, embryonic stage, fertilization, fetal stage, genes, heterozygous, homozygous, morula, mutation, placenta, preembryonic stage, teratogen, trisomies, trophoblast, umbilical cord, zona pellucida, zygote.

OVERVIEW

Human reproduction is one of the most intimate spheres of an individual's life. For conception to occur, a healthy ovum from the woman is released from the ovary, passes into an open fallopian tube, and starts its journey downward. All this activity takes place within a 5-hour time span.

Nurses caring for the childbearing family need to have a basic understanding of conception and prenatal development so they can identify problems or variations and can initiate appropriate interventions should any problems occur.

This lecture presents an overview of fetal development, beginning with conception.

Cell division and gametogenesis

The division of a cell begins in its nucleus, which contains the gene-bearing chromosomes.

The two types of cell division are mitosis and meiosis.

Mitosis is a continuous process by which the body grows and develops, and dead body cells are replaced. In this type of cell division, each daughter cell contains the same number of chromosomes as the parent cell. The 46 chromosomes in a body cell are called the diploid number of chromosomes.

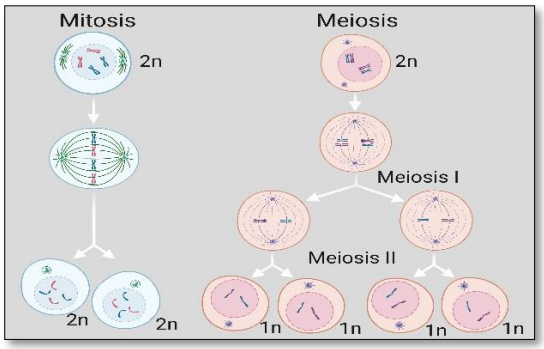
Meiosis is a different type of cell division in which the reproductive cells undergo two sequential divisions.

The process of mitosis in the sperm is called spermatogenesis, and in the ovum, it is called oogenesis.

During meiosis, the number of chromosomes in each cell is reduced by half, to 23 chromosomes per cell, each including only one sex chromosome.

This is called the haploid number of chromosomes.

At the moment of fertilization (when the sperm and the ovum unite), the new cell contains 23 chromosomes from the sperm and 23 chromosomes from the ovum, thus returning to the diploid number of chromosomes (46); traits are therefore inherited from both the mother and the father. The formation of gametes by this type of cell division is called gametogenesis.



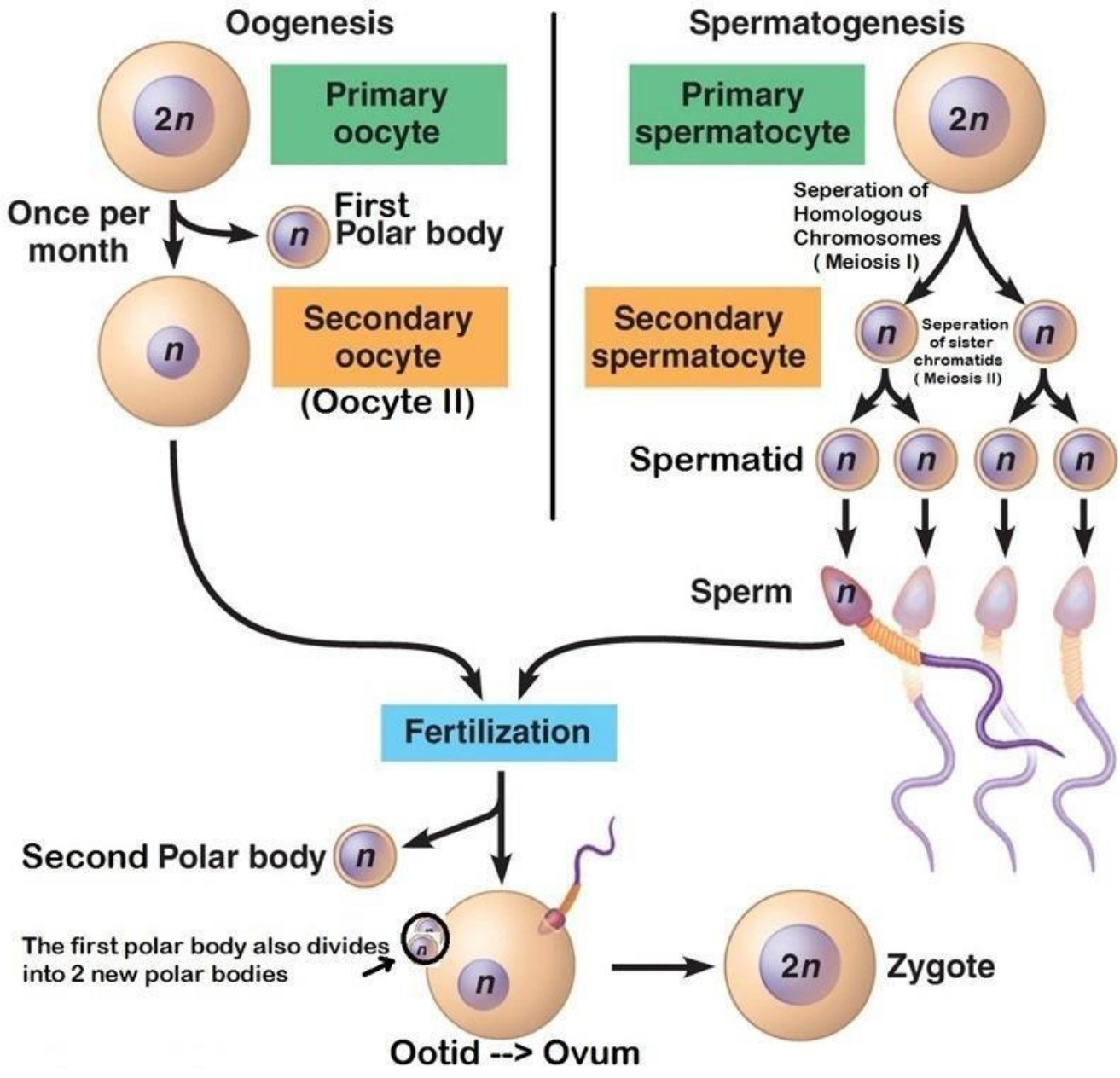
Fetal development

Fetal development during pregnancy is measured in the number of weeks after fertilization. The duration of pregnancy is about 40 weeks from the time of fertilization.

The three stages of fetal development during pregnancy are:

1. Preembryonic stage: fertilization through the second week

2. Embryonic stage: end of the second week through the eighth week
3. Fetal stage: end of the eighth week until birth Fetal circulation is a significant aspect of fetal development that spans all three stages.



Difference between Spermatogenesis and Oogenesis

Fertilization

Fertilization occurs when a sperm penetrates an ovum and unites with it, restoring the total number of chromosomes to 46. It normally occurs in the outer third of the fallopian tube, near the ovary. The sperm pass through the cervix and the uterus and into the fallopian tubes by means of the flagellar (whiplike) activity of their tails and can reach the fallopian tubes within 5 minutes after coitus.

The time during which fertilization can occur is brief because of the short life span of mature gametes. The ovum is estimated to survive for up to 24 hours after ovulation.
The sperm remains capable of fertilizing the ovum for up to 5 days after being ejaculated into the area of the cervix.

Sex determination

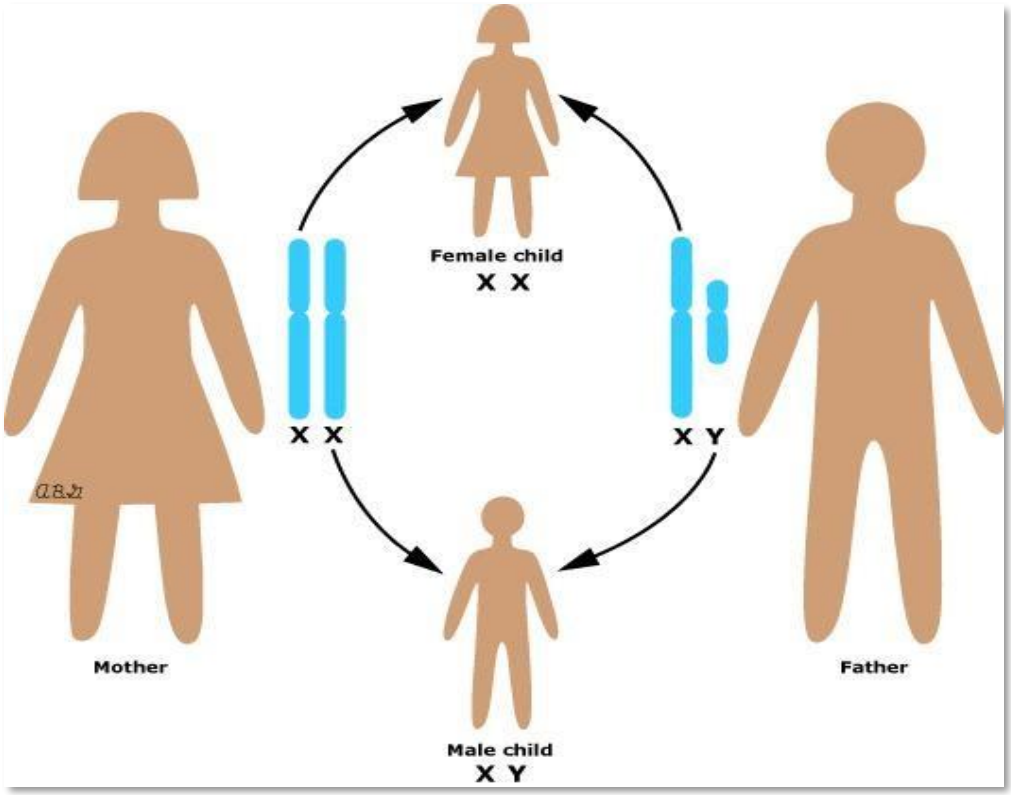
The sex of human offspring is determined at fertilization. The ovum always contributes an X chromosome (gamete), whereas the sperm can carry an X or a Y chromosome (gamete). When a sperm carrying the X chromosome fertilizes the X-bearing ovum, a female offspring (XX) result.

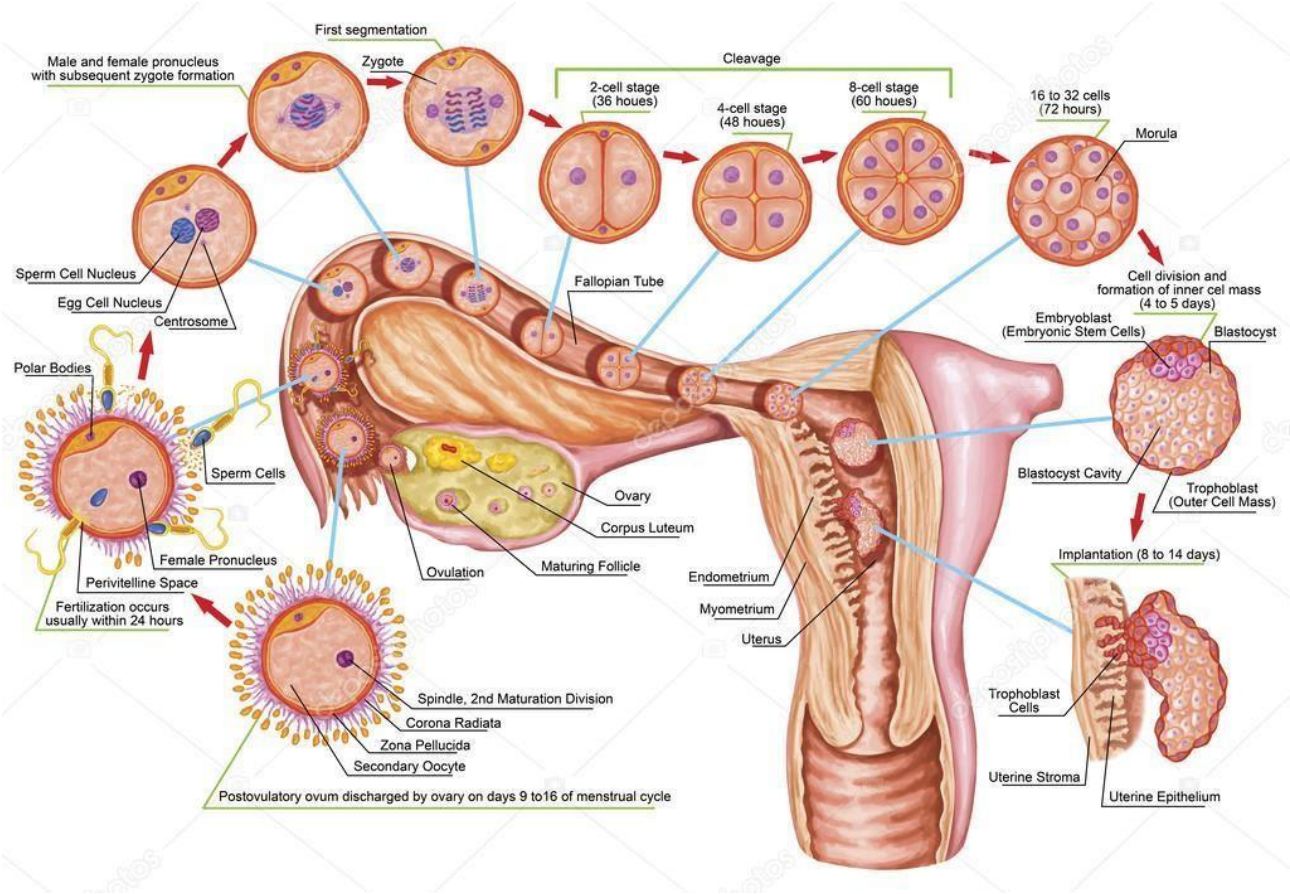
Tubal transport of the zygote

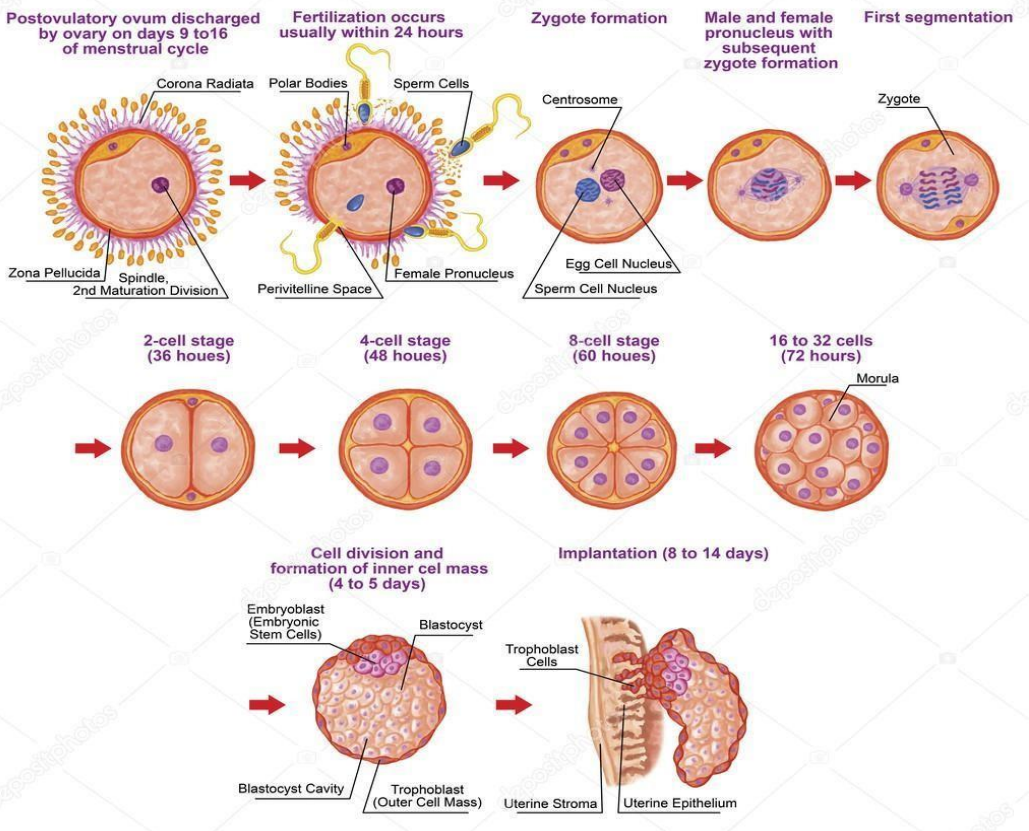
The zygote is the cell formed by the union of the sperm and the ovum, and it is transported through the fallopian tube and into the uterus. Fertilization normally occurs in the outer third of the fallopian tube. During transport through the fallopian tube, the zygote undergoes rapid mitotic division, or cleavage. Cleavage begins with two cells, which subdivide into four and then eight cells to form the blastomere. The size of the zygote does not increase; rather, the individual cells become smaller as they divide and eventually form a solid ball called the morula. The morula enters the uterus on the third day and floats there for another 2 to 4 days. The cells form a cavity, and two distinct layers evolve. The inner layer is a solid mass of cells called the blastocyst, which develops into the embryo and the embryonic membranes. The outer layer of cells, called the trophoblast, develops into an embryonic membrane, the chorion.

Implantation of the zygote

The zygote usually implants in the upper section of the posterior uterine wall. The cells burrow into the prepared lining of the uterus, called the endometrium. The endometrium is now called the decidua; the area under the blastocyst is called the decidua basalis and gives rise to the maternal part of the placenta.


Female child
X X
X X
X Y
Mother
Father
Male child
X Y


First segmentation
Male and female pronucleus with subsequent zygote formation
Zygote
Cleavage
2-cell stage (36 houes)
4-cell stage (48 houes)
8-cell stage (60 houes)
16 to 32 cells (72 hours)
Morula
Sperm Cell Nucleus
Egg Cell Nucleus
Centrosome
Fallopian Tube
Cell division and formation of inner cel mass (4 to 5 days)
Embryoblast (Embryonic Stem Cells)
Blastocyst
Polar Bodies
Sperm Cells
Ovary
Corpus Luteum
Blastocyst Cavity
Trophoblast (Outer Cell Mass)
Female Pronucleus
Perivitelline Space
Fertilization occurs usually within 24 hours
Ovulation
Maturing Follicle
Endometrium
Myometrium
Uterus
Implantation (8 to 14 days)
Spindle, 2nd Maturation Division
Corona Radiata
Zona Pellucida
Secondary Oocyte
Trophoblast Cells
Uterine Stroma
Uterine Epithelium
Postovulatory ovum discharged by ovary on days 9 to16 of menstrual cycle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Cell division and formation of inner cel mass (4 to 5 days)
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Blastocyst
Trophoblast Cells
Blastocyst Cavity
Trophoblast (Outer Cell Mass)
Uterine Stroma
Uterine Epithelium

Development and Cell differentiation

After implantation the cells begin to differentiate and develop special functions. The chorion, amnion, yolk sac, and primary germ layers appear.

Chorion

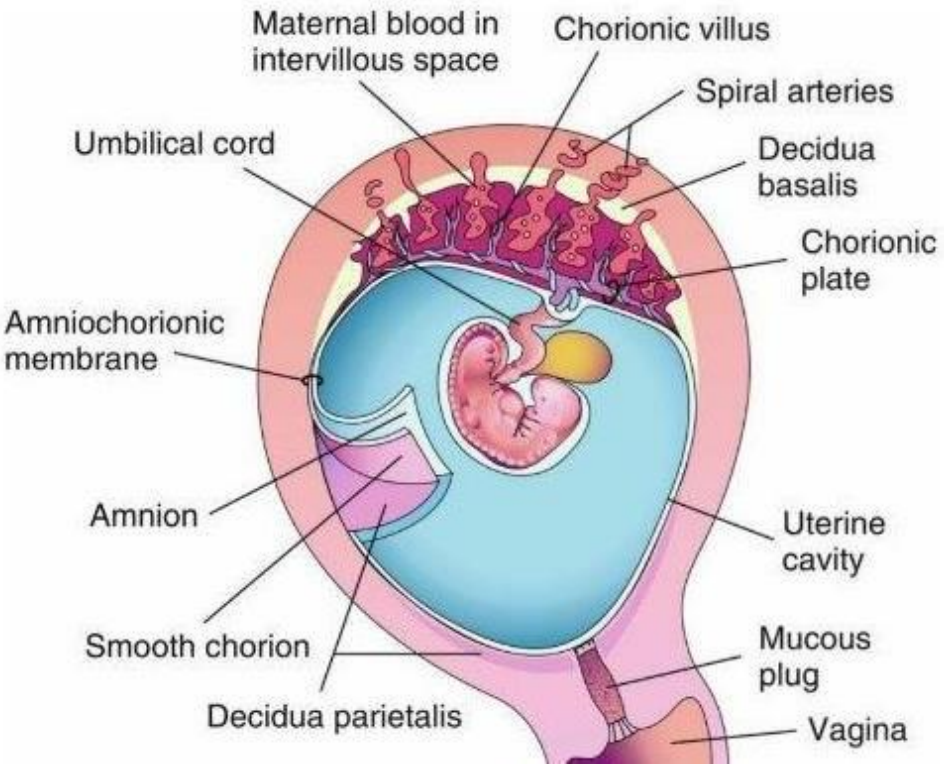
The chorion develops from the trophoblast (outer layer of embryonic cells) and envelops the amnion, embryo, and yolk sac. It is a thick membrane with fingerlike projections called villi on its outermost surface.

Amnion

The amnion is the second membrane; it is a thin structure that envelops and protects the embryo. The chorion and the amnion together form an amniotic sac filled with fluid (bag of waters) that permits the embryo to float freely. Amniotic fluid is clear, has a mild odor. The volume of fluid is about 1000 mL at 37 weeks.

The following are functions of amniotic fluid:

1. Maintains an even temperature
2. Prevents the amniotic sac from adhering to the fetal skin
3. Allows symmetrical growth
4. Allows buoyancy and fetal movement
5. Acts as a cushion to protect the fetus and the umbilical cord from injury



Yolk Sac

On the ninth day after fertilization, a cavity called the yolk sac forms in the blastocyst. It functions only during embryonic life and initiates the production of red blood cells. This function continues for about 6 weeks until the embryonic liver takes over.

Germ Layers

After implantation, the zygote in the blastocyst stage transforms its embryonic disc into three primary germ layers known as ectoderm, mesoderm, and endoderm. Each germ layer develops into a different part of the growing embryo.

Accessory structures of pregnancy

The placenta, umbilical cord, and fetal circulation support the fetus as it completes prenatal life and prepares for birth.

The placenta is a temporary organ for fetal respiration, nutrition, and excretion. It also functions as an endocrine gland.

Umbilical cord

The umbilical cord develops with the placenta and fetal blood vessels and is the lifeline between the mother and fetus. Two arteries carry blood away from the fetus, and one vein returns blood to the fetus. Wharton jelly covers and cushions the cord vessels and keeps the three vessels separated.

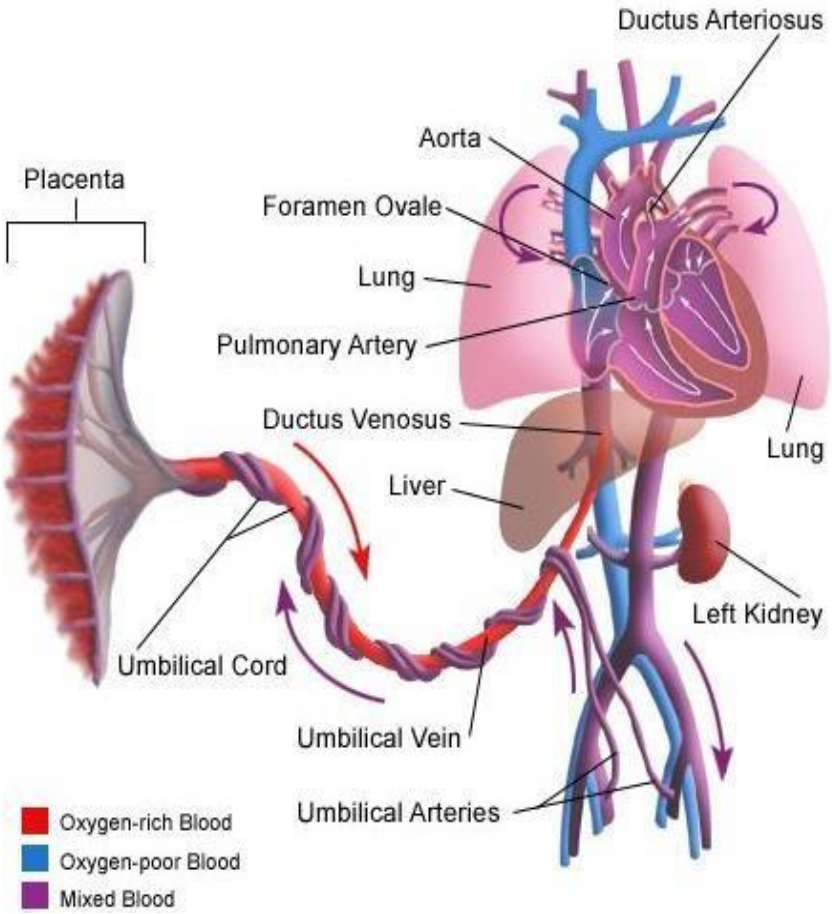
The vessels are coiled within the cord to allow movement and stretching without restricting circulation. The normal length of the cord is about 55 cm (22 inches). The umbilical cord usually protrudes from the center of the placenta.

Fetal circulation

After the fourth week of gestation, circulation of blood through the placenta to the fetus is well established. Because the fetus does not breathe, and the liver does not have to process most waste products.

There are three fetal circulatory shunts:

1. **Ductus venosus:** diverts some blood away from the liver as it returns from the placenta.
2. **Foramen ovale:** diverts most blood from the right atrium directly to the left atrium, rather than circulating it to the lungs.
3. **Ductus arteriosus:** diverts most blood from the pulmonary artery into the aorta.

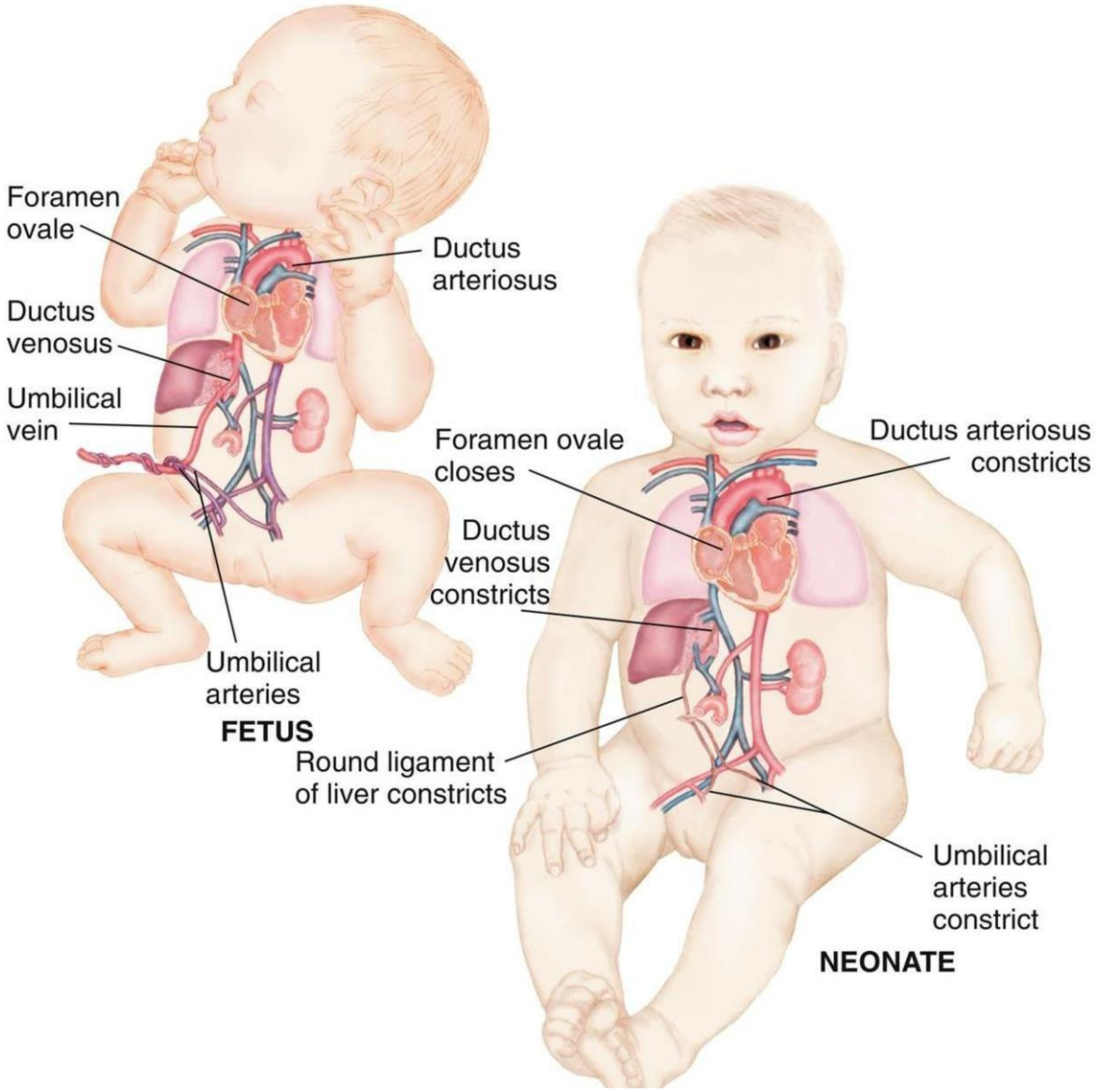


Circulatior

Oxygenated blood enters the fetal body through the umbilical vein. About half of the blood goes to the liver, with the remainder entering the inferior vena cava through the ductus venosus. Blood in the inferior vena cava enters the right atrium, where most passes directly into the left atrium through the foramen ovale. A small amount of blood is pumped to the lungs by the right ventricle. The rest of the blood from the right ventricle joins the blood from the left ventricle through the ductus arteriosus. After circulating through the fetal body, blood containing waste products is returned to the placenta through the umbilical arteries.

Circulation after birth

Fetal shunts are not needed following birth after the infant breathes and blood is circulated to the lungs. The foramen ovale closes because pressure in the right side of the heart falls as the lungs become fully inflated, and there is now little resistance to blood flow. The infant's blood oxygen level rises, causing the ductus arteriosus to constrict. The ductus venosus closes when the flow from the umbilical cord stops



Changes in fetal-newborn circulation at birth. The changes in the circulation of the fetus and the neonate are shown. The ductus arteriosus, ductus venosus, and foramen ovale are shunts that close because of the expansion of the lungs and pressure changes within the heart.

Lecture 3

Maternal AdaptationDuring Pregnancy

Learning Objectives

Upon completion of the chapter, you will be able to:

1. Define the key terms used in this lecture.
2. Differentiate between subjective (presumptive), objective (probable),and diagnostic (positive) signs of pregnancy.
3. Asses the maternal physiologic changes that occur duringpregnancy.

KEY TERMS

Ballottement, Braxton Hicks, contractions, Chadwick's sign, dietary reference, intakes (DRIs), Goodell's sign, Hegar's sign, linea nigra, pica, quickening, trimester.

OVERVIEW

Pregnancy is a normal life event that involves considerable physical and psychological adjustments for the mother. The most obvious are physical changes to accommodate the growing fetus, but pregnant women also undergo psychological changes as they prepare for parenthood.

Nurses caring for the childbearing family need to have a basic understanding of physical and psychological changes, so they canidentify problems or variations and can initiate appropriate interventions should any problems occur.

This lecture presents an overview of maternal adaptationduring pregnancy.

Pregnancy

Pregnancy, also known as **gestation**, is the term used to describe the period in which a fetus develops inside a woman's womb or uterus. Pregnancy usually lasts about 40 weeks, or just over9 months, as measured from the last menstrual period to delivery.

Pregnancy is a temporary, physiological (that is, normal) process that affects a woman physically and emotionally. All systems of her body adapt to support the developing fetus.

There are three phases of pregnancy: antepartum or prenatal (before birth), intrapartum (duringbirth), and postpartum (after birth).

Signs and symptoms of pregnancy

Signs and symptoms of pregnancy have been grouped into the following categories: presumptive, probable, and positive as shown in table below.

The only signs that can determine pregnancy with 100% accuracy are positive signs.

BOX 11.1

SIGNS AND SYMPTOMS OF PREGNANCY

Presumptive (Time of Occurrence)	Probable (Time of Occurrence)	Positive (Time of Occurrence)
Fatigue (12 wks)	Braxton Hicks contractions (16–28 wks)	Ultrasound verification of embryo or fetus (4–6 wks)
Breast tenderness (3–4 wks)	Positive pregnancy test (4–12 wks)	Fetal movement felt by experienced clinician (20 wks)
Nausea and vomiting (4–14 wks)	Abdominal enlargement (14 wks)	Auscultation of fetal heart tones via Doppler (10–12 wks)
Amenorrhea (4 wks)	Ballottement (16–28 wks)	
Urinary frequency (6–12 wks)	Goodell's sign (5 wks)	
Hyperpigmentation of the skin (16 wks)	Chadwick's sign (6–8 wks)	
Fetal movements (quickening; 16–20 wks)	Hegar's sign (6–12 wks)	
Uterine enlargement (7–12 wks)		
Breast enlargement (6 wks)		

Adapted from Bope, E. T., & Kellerman, R. D. (2012). *Conn's current therapy 2012*. Philadelphia, PA: Saunders Elsevier; Shields, A. D. (2012). Pregnancy diagnosis. *eMedicine*. Retrieved from http://emedicine.medscape.com/article/262591-overview; and Simpson, K. R., & Creehan, P. A. (2011). *AWHONN's perinatal nursing* (3rd ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Subjective (Presumptive) changes: are the symptoms that woman experiences and reports.

1. **Amenorrhea,** or the absence of menses, is the earliest symptom of pregnancy. The missing of more than one menstrual period, especially in a woman whose cycle is ordinarily regular.
2. **Nausea and vomiting in pregnancy (NVP)** occur frequently during the first trimester and may be the result of elevated human chorionic gonadotropin (hCG) levels and changed carbohydrate metabolism. Because these symptoms often occur in the early part of the day, they are commonly referred to as **morning sickness**.
3. **Excessive fatigue** may be noted within a few weeks after the first missed menstrual period and may persist throughout the first trimester.

4. **Urinary frequency** is experienced during the first trimester as the enlarging uterus presses on the bladder.
5. **Changes in the breasts** are frequently noted in early pregnancy. These changes include tenderness and tingling sensations, increased pigmentation of the areola and nipple, and changes in Montgomery's glands. The veins also become more visible and form a bluish pattern beneath the skin.
6. **Quickening,** or the mother's perception of fetal movement, occurs about 18 to 20 weeks after the last menstrual period in a woman pregnant for the first time but may occur as early as 16 weeks in a woman who has been pregnant before. Quickening is a fluttering sensation in the abdomen that gradually increases in intensity and frequency.

Objective (Probable) changes:

An examiner can perceive the objective changes that occur in pregnancy.

1. Changes in the pelvic organs

- **Goodell's sign:** a softening of the cervix.
- **Chadwick's sign:** is a bluish, purple discoloration of the mucous membranes of the cervix, vagina, and vulva (some sources consider this a presumptive sign).
- **Hegar's sign** is a softening of the isthmus of the uterus, the area between the cervix and the body of the uterus.

2. **Braxton Hicks contractions** can be palpated most commonly after 28 weeks. They are then often called false labor.
3. **Uterine souffle** may be heard when the examiner auscultates the abdomen over the uterus. It is a soft, blowing sound that occurs at the same rate as the maternal pulse and is caused by the increased uterine blood flow and blood pulsating through the placenta.
4. It is sometimes confused with the **funic souffle**, a soft, blowing sound of blood pulsating through the umbilical cord. The funic souffle occurs at the same rate as the fetal heart rate. **Skin pigmentation** are common in pregnancy. The nipples and areola may darken, and the linea nigra may develop. Facial melasma (chloasma) may become noticeable, and striae may appear.
5. **Positive pregnancy tests** detect the presence of hCG in the maternal blood or urine. These are not considered a positive sign of pregnancy because other conditions can cause elevated hCG levels.

Diagnostic (Positive) changes

The positive signs of pregnancy are completely objective, cannot be confused with a pathologicstate, and offer conclusive proof of pregnancy:

1. **Fetal heartbeat** can be detected with an electronic Doppler device as early as weeks 10 to 12. The heartbeat can be detected with a fetoscope by weeks 17 to 20.

2. **Fetal movement** is actively palpable by a trained examiner after about week 20 of pregnancy.

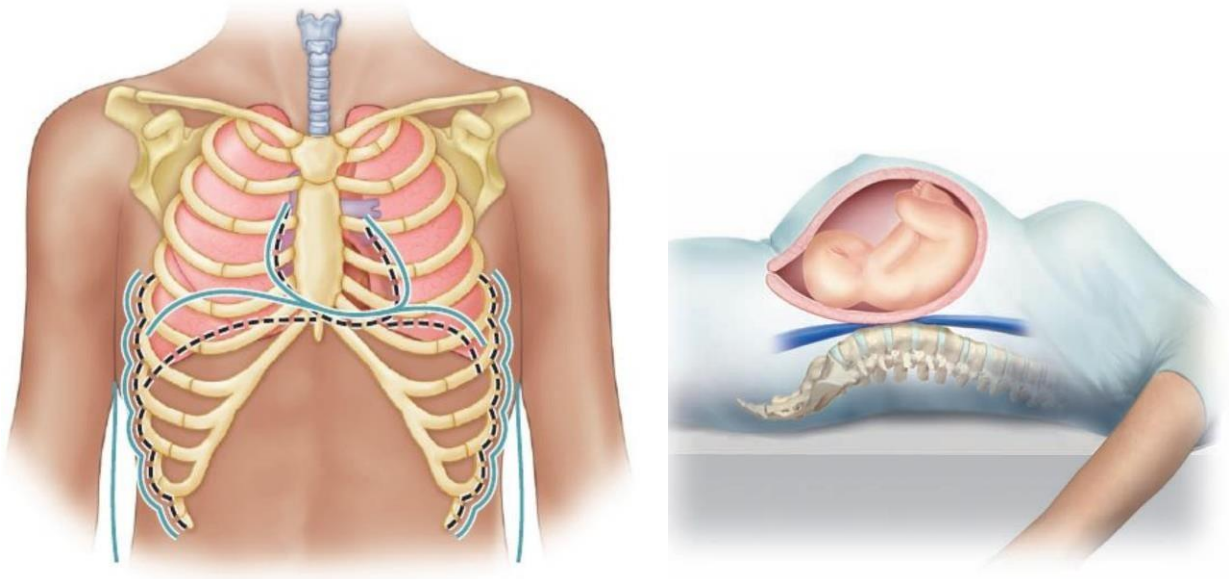
3. **Visualization of the fetus** by ultrasound examination confirms a pregnancy. The gestational sac can be observed by 4 to 5 weeks' gestation. Fetal parts and fetal heart movement can be seen as early as 8 weeks' gestation. More recently ultrasound using a vaginal probe has been used to detect a gestational sac as early as 10 days after implantation.

Changes In Body Systems

Although pregnancy challenges each body system to adapt to increasing demands of the fetus,the most obvious changes are in the reproductive system.

Cardiovascular system

1. Circulating blood volume increases, plasma increases, and total red blood cell volume increases (**total volume increases** by approximately 40% to 50%).
2. Physiological **anemia** occurs as the **plasma increase** exceeds the increase in production of red blood cells, so iron requirements are increased.
3. **Heart size increases**, and the heart is **elevated**
   slightly **upward** and to the left because of displacement of the diaphragm as the uterusenlarges.
4. When the pregnant woman lies supine, the enlarging uterus may press on the aorta and vena cava, thus reducing blood flow to the right atrium, lowering blood pressure, and causing dizziness, pallor, and clamminess, this condition is called **vena caval syndrome or aortocaval compression.**



Changes in the outlines of the heart, lungs, and thoracic cage

——— pregnant,---------- nonpregnant

Respiratory system

1. **Oxygen consumption increases** by approximately 15% to 20%.
2. **Diaphragm is elevated** because of the enlarged uterus.
3. **Shortness of breath** may be experienced.

Note: During pregnancy, a woman's **pulse rate** may **increase** about 10 to 15 beats/ minute;the **blood pressure** slightly **decreases** in the second trimester, then increases in the third trimester, and the respiratory rate remains unchanged or slightly increases.

Gastrointestinal system

1. **Nausea and vomiting** may occur as a result of the secretion of human chorionic gonadotropin; it typically subsides by the third month.
2. **Poor appetite** may occur because of **decreased gastric motility**.
3. **Alterations** in **taste and smell** may occur.
4. **Constipation** may occur because of an increase in progesterone production or pressure of the uterus resulting in decreased gastrointestinal motility.
5. **Flatulence** and **heartburn** may occur because of decreased gastrointestinal motility and slowed emptying of the stomach caused by an increase in progesterone production.
6. **Hemorrhoids** may occur because **of increased venous pressure**.
7. **Gum tissue** may become **swollen** and easily bleed because of **increasing levels of estrogen**.
8. **Ptyalism** (excessive secretion of saliva) may occur because of increasing levels of estrogen.

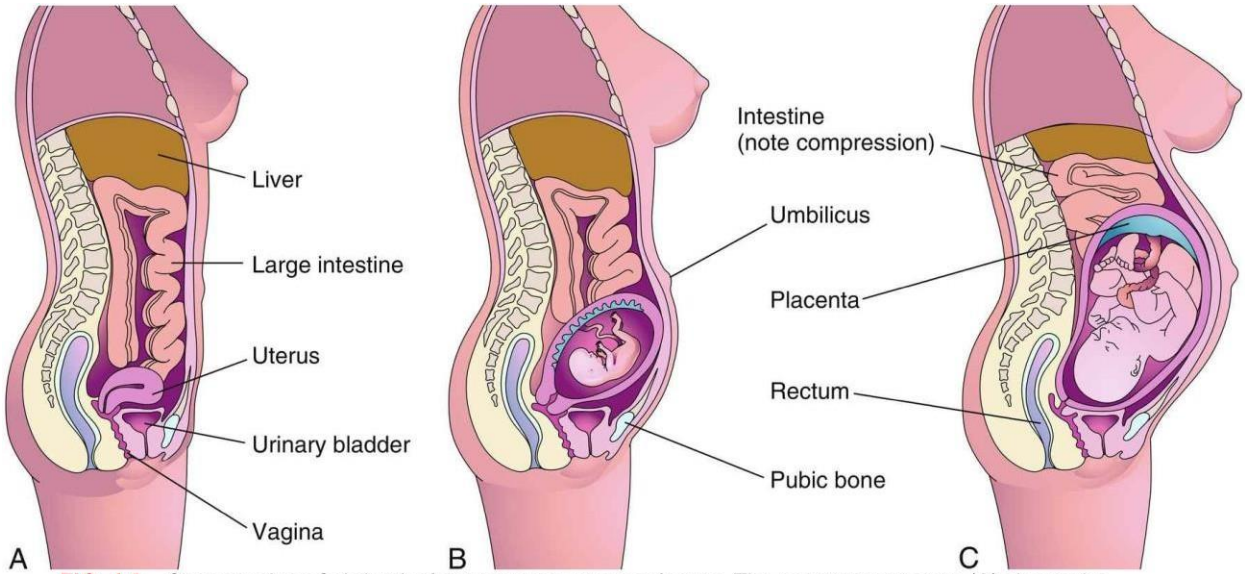


FIG. 4.6 Compression of abdominal contents as uterus enlarges. The nonpregnant state (A) shows the relationship of the uterus to the abdominal contents. As the uterus enlarges at 20 weeks gestation (B) and 30 weeks gestation (C), the abdominal contents are displaced and compressed. (From Moore KL, Persaud TVN, Torchia MG: *The developing human: clinically oriented embryology,* ed 10, Philadelphia, 2016, Saunders.)

Renal system

1. **Frequency of urination** increases in the first and third trimesters because of increased bladder sensitivity and pressure of the **enlarging uterus on the bladder**.
2. **Decreased bladder tone** may occur and is caused by an increase in progesterone and estrogen levels; bladder capacity increases in response to increasing levels of progesterone.

Endocrine system

1. Basal **metabolic rate increases** and metabolic function increases.
2. The **anterior** lobe of the **pituitary gland enlarges** and produces serum **prolactin** needed for the lactation process.
3. The **posterior lobe** of the pituitary gland produces **oxytocin**, which stimulates uterine contractions.
4. The **thyroid enlarges slightly**, and **thyroid activity increases**.The **parathyroid increases in size**.
5. **Aldosterone levels gradually increase**.
6. **Water retention is increased**, which can contribute to weight gain.

Reproductive System

Uterus

A. Uterus enlarges, increasing in mass from approximately 60 to 1000 g as a result of hyperplasia (influence of estrogen) and hypertrophy.
B. Size and number of blood vessels and lymphatics increase.
C. Irregular contractions occur, typically beginning after 16 weeks of gestation.

Cervix

A. Cervix becomes shorter, more elastic, and larger in diameter.
B. Endocervical glands secrete a thick mucus plug, which is expelled from the canal when dilation begins.
C. Increased vascularization and an increase in estrogen cause softening and a violet discoloration known as Chadwick's sign, which occurs at about 6 weeks of gestation.

Ovaries

A major function of the ovaries (Corpus luteum) is to secrete progesterone for the first 6 to 7weeks of pregnancy.

A. The maturation of new follicles is blocked.
B. The ovaries cease ovum production.

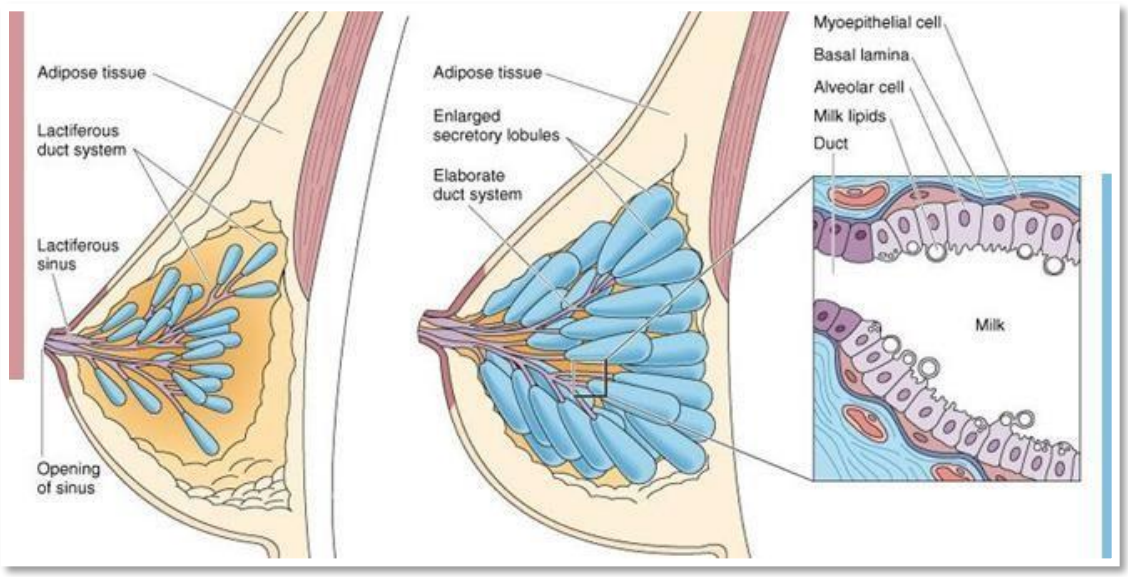
Vagina

A. Hypertrophy and thickening of the muscle occur.
B. An increase in vaginal secretions is experienced; secretions are usually thick, white, and acidic.

Breasts

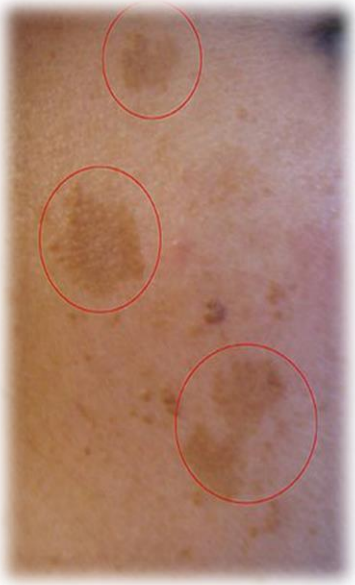
Breast changes occur because of the increasing effects of estrogen and progesterone.

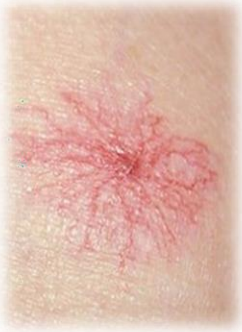
A. Breast size increases, and breasts may be tender.
B. Nipples become more pronounced.
C. The areolae become darker in color.
D. Superficial veins become prominent.
E. Hypertrophy of Montgomery's follicles occurs.
F. Colostrum may leak from the breast (in late trimester).

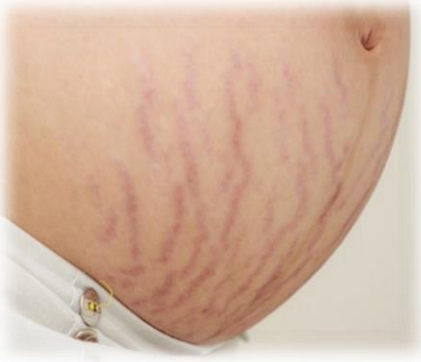


Skin changes

A. Some changes occur because the levels of **melanocyte-stimulating hormone** increase as a result of an increase in estrogen and progesterone levels; these changes include the following:
    i. Increased pigmentation
    ii. Dark streak down the midline of the abdomen (linea nigra)
    iii. Chloasma (mask of pregnancy)—a blotchy brownish hyperpigmentation, over the forehead, cheeks, and nose
B. Reddish purple stretch marks (striae gravidarum) on the abdomen, breasts, thighs, and upper arms
C. Vascular spider nevi may occur on the neck, chest, face, arms, and legs.
D. Rate of hair growth may increase.



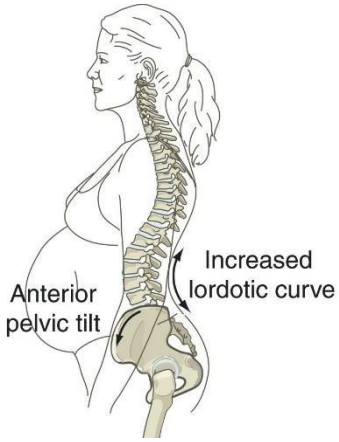


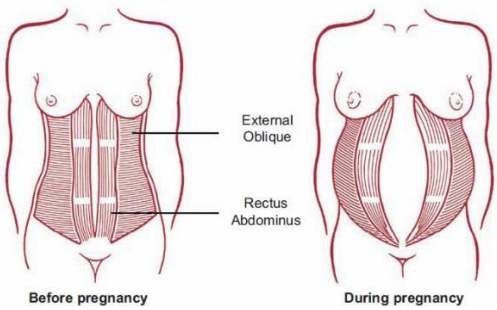


Musculoskeletal System

A. Changes in the center of gravity begin in the second trimester and are caused by the hormones relaxin and progesterone.
B. The lumbrosacral curve increases.
C. Aching, numbness, and weakness may result; walking becomes more difficult, and the woman develops a waddling gait and is at risk for falls.
D. Relaxation and increased mobility of pelvic joints occur, which permit enlargement of pelvic dimensions.
E. Abdominal wall stretches with loss of tone throughout pregnancy, regained postpartum.
F. Umbilicus flattens or protrudes.



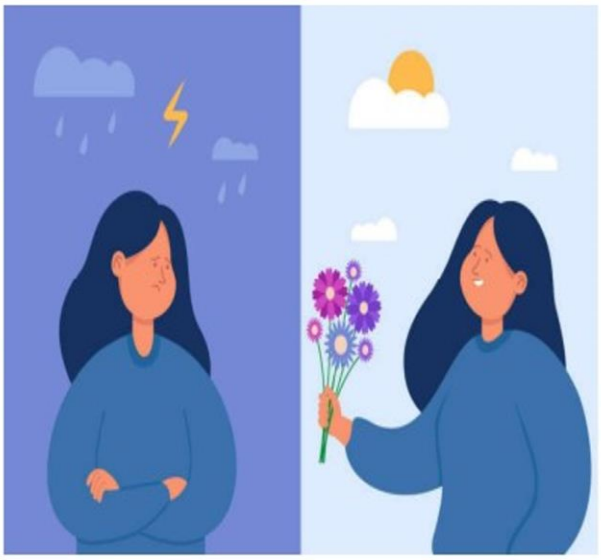




Psychosocial adaptation to pregnancy

First Trimester

- Most women have conflicting feelings about pregnancy **(ambivalence)** during the early weeks.
- The woman **focuses on herself** during this time. She feels many new physical sensations, causing her emotions to be more **unstable (labile).**
- The nurse can reassure the woman and her husband about the cause of these fluctuations, that they are normal, and that they will stabilize after pregnancy.



Psychosocial adaptation to pregnancy

Second Trimester

- women begin to take on the role of an expectant mother.
- The woman becomes totally involved with her developing child and her changing body image (**narcissism**).
- She often devotes a great deal of time to selecting just the right foods and the best environment to promote her health and that of her infant.

Psychosocial adaptation to pregnancy

Third Trimester

- She becomes introspective about the **challenge of labor** that is ahead and its outcome.
- Her moods may again be more **labile**.
- The woman's thinking gradually shifts from **"I am pregnant" to "I am going to be a mother."**

"Prenatal care"

1- Evaluate the benefits of prenatal care and problem of accessibility for some women
2- Describe nutritional needs of pregnant women

Explain cause and nursing intervention for common discomfort of pregnancy

Prenatal care

This includes :

1. Medical & nursing care
2. Taking history
3. Physical exam.
4. Obstetrical exam.
5. Nutrition during pregnancy
6. General hygiene during pregnancy
7. Minor discomforts during pregnancy
8. Preparation for labor & delivery

Antenatal care: is important for:

1. Maintaining mother in best possible health condition
2. Detecting complications earlier
3. Maternal education : for diet , general health , vaccination , psychological support

1st visit called booking . This include the followings :

1. History taking
2. General exam.
3. obstetric exam. → scheduled visits
4. Investigations → GUE , Hb%, Blood group & Rh

Maintaining general health of pregnant lady :

1. rest, sleep (10 hrs.)
2. exercise
3. employment activity
4. traveling
5. breast care
6. cloths (wide ,clean)
7. shoes (low healed)

8. teeth care
9. bowel habit
10. hemorrhoids
11. douches& vaginal hygiene
12. smoking
13. alcohol

14. drug abuse
15. diet intake (adequate, frequent, carbohydrates)
16. psychological support for labor

History taking :

The nurse should receive mother in pleasant manner, good relationship , able to answer all questions

It includes :

1. **Identifying data** : name , age, race, occupation, religion
2. **Chief complaint** : what makes the patient come to the clinic & duration
3. **History of present illness** : details of chief complaints

4-**Medical and Surgical History**: Chronic conditions can affect the outcome of the pregnancy and should be investigated. Infections, surgical procedures, and trauma may complicate the pregnancy or childbirth and should be documented. The history includes the following:

A-Childhood diseases and immunizations
B-Chronic illnesses (onset and treatment) such as asthma, eart disease, hypertension, diabetes, renal disease, and lupus
C- Previous illnesses, surgical procedures, and injuries (particularly of the pelvis and back)
D- Previous infections such as hepatitis, STDs, tuberculosis, and presence of group B Streptococcus
E-History of and treatment for anemia, including any previous blood transfusions
F-Bladder and bowel function (problems or changes)
G-Amount of caffeine and alcohol consumed each day
H- Tobacco use in any form (number of years and daily amount)
I- Complementary or alternative therapies used
J-Appetite, general nutrition, history of eating disorders
K-Contact with pets, particularly cats (increased risk for infections such as toxoplasmosis)
L-Allergies and drug sensitivities
M-Occupation and related risk factors

5- **Family history** : D.M , HT, respiratory or renal, thyroid disorders, bleeding disorders, hepatitis , epilepsy tuberculosis In addition, it may reveal information about patterns of genetic or congenital anomalies
6- **Social history** : habits , living accommodations
7- **Review of systems** : respiratory, cardiac, GIT, genitourinary , neurological
8-**Obstetric History**: The obstetric history provides essential information about previous pregnancies and may alert the health care provider to possible problems in the present pregnancy. Components of this history include the following: . Gravida, para, abortions (spontaneous or elective termination of pregnancies before the 20th week of gestation; spontaneous abortion is frequently called miscarriage), and living children
. Length of previous gestations
. Weight of infants at birth
. Labor experiences, type of deliveries, locations of births, and names of providers
. Types of anesthesia and any difficulties with anesthesia during childbirths or previous surgeries
. Maternal complications such as hypertension, diabetes, infection, bleeding, or psychologic complications
. Infant complications
. Methods of infant feeding used in the past and currently planned
9- **Gynecological history** : gynecological infection , operations , contraceptive use,
A detailed history of contraceptive method is important.

10- **Menstrual history** : menarche, regular , amount of blood loss, dysmenorrhea , LMP, Duration of period , Length of the cycle

General examination / physical exam.

1. **Vital signs** : Blood pressure , Temp. , PR, Respiratory rate, height , wt. lymph nodes , goiter , teeth , throat, breast , skin, signs of infection or disorders
2. **Abdomen exam**. : fundal height, fundal grips , lateral grip, pelvic grip
3. **Pelvic exam**. : bimanual exam. for comfirming pregnancy , any infection , adequacy of pelvic cavity
4. **Diagnose high risk pregnancy**
5. **Investigations** : Hb% , Bd. group & Rh , GUE
6. **Subsequent visits** → scheduled as follows :

a- Conception to 28 weeks → every 4 week
b- 29 to 36 weeks → every 2 week
c- 37 weeks to birth → weekly

Nutrition during pregnancy :

Studies show direct relationship between maternal diet & pregnancy outcome . Bad nutrition leads to difficulties in pregnancy , labor & delivery : ↑ perinatal mortality , LBW, ↑ infant morbidity

Possible effects of poor nutrition on reproductive cycle :

1. infertility
2. abortion , stillbirth, neonatal death
3. PET, eclampsia
4. placental abnormalities
5. LBW babies
6. slow postpartum recovery

7.difficulties in lactation

Nutritional assessment :

1. Assess dietary intake : nurse ask for amount of food intake , type , method of preparation
2. Assess nutritional status : by :

a- measuring height & wt. (BMI) to identify under wt. mother
b- doing investigations Hb%, S. level of folic acid used as indicator
c- Sometime, do total S. protein, Albumin, S. vit. B12

Nutritional risk factors :

1. < 17 years old : need ↑ nutrition for her body & her fetus
   Adolescent woman had LBW, ↑ perinatal mortality , prematurity

   Older woman may also need additional nutrition

2. Obstetric history : high parity , PET, gestational diabetes , anemia, APH, prematurity, neonatal
   Death

3. Pregnancy complications : anemia, D.M, PET
4. Medical history
5. Maternal wt.
   a- low pre pregnant wt. → 10% under standard wt. for height have LBW, premature, ↑ morbidity & mortality
   b- obesity → 20% over standard wt. for height have HT, DM & thrombophlebitis

Insufficient wt. gain related to LBW babies

↑ iron , folic acid , calcium 0.5 → 1.5 gm

Minor Discomforts of Pregnancy:

A. Nausea and vomiting
1. Occurs in the first trimester and usually subsides by the third month
2. Caused by elevated levels of human chorionic gonadotropin and other pregnancy hormones as well as changes in carbohydrate metabolism
3. Interventions
a. Eating dry crackers before arising
b. Avoiding brushing teeth immediately after arising
c.Eating small, frequent, low-fat meals during the day
d. Drinking liquids between meals rather than at meals
e. Avoiding fried foods and spicy foods
f. Taking antiemetic medications as prescribed (Meclezine 25 mg , Cyclizine 50 mg or Promethazine 25 mg TDS) , I.V fluid with sedative & sometime vit. B12 (10 mg) supplement
.

B. Urinary urgency and frequency
1. Usually occurs in the first and third trimesters
2. Caused by pressure of the uterus on the bladder
3. Interventions
a. Drinking no less than 2000 mL of fluid during the day
b. Limiting fluid intake in the evening
c. Voiding at regular intervals
d. Sleeping side-lying at night
e. Wearing perineal pads, if necessary
f. Performing Kegel exercises
C. Heartburn
1. Occurs in the second and third trimesters
2. Results from increased progesterone levels, decreased gastrointestinal motility, esophageal reflux, and displacement of the stomach by the enlarging uterus

3. Interventions
a. Eating small, frequent meals
b. Sitting upright for 30 minutes after a meal
c. Drinking milk between meals
d. Avoiding fatty and spicy foods
e. Performing tailor-sitting exercises
f. Consulting with the HCP about the use of antacids

D. Ankle edema
1. Usually occurs in the second and third trimesters
2. Results from vasodilation, venous stasis, and increased venous pressure below the uterus

3. Interventions
a. Elevating the legs at least twice a day and when resting
b. Sleeping in a side-lying position
c. Wearing supportive stockings or support hose
d. Avoiding sitting or standing in 1 position for long periods

E. Varicose veins
1. Usually occur in the second and third trimesters
2. Result from weakening walls of the veins or valves and venous congestion

3. Interventions
a. Wearing supportive stockings or support hose
b. Elevating the feet when sitting
c. Avoiding long periods of standing or sitting
d. Moving about while standing to improve circulation
e. Avoiding leg crossing
f. Avoiding constricting articles of clothing suchas knee-high stockings
4. Thrombophlebitis is rare, but it may occur.
a. Teaching leg exercises
b. Avoiding airline travel

F. Increased vaginal discharge
1. Can occur in the first through the third trimesters
2. Caused by hypertrophy and thickening of the vaginal mucosa and increased mucus production

3. Interventions
a. Using proper cleansing and hygiene techniques
b. Wearing cotton underwear
c. Avoiding douching
d. Consulting the HCP if infection is suspected

G. Hemorrhoids
1. Usually occur in the second and third trimesters
2. Result from increased venous pressure and constipation

3. Interventions
a. Soaking in a warm sitz bath
b. Sitting on a soft pillow
c. Eating high-fiber foods and drinking sufficient fluids to avoid constipation

d. Increasing exercise, such as walking
e. Applying ointments, suppositories, or compresses as prescribed by the HCP

H. Constipation
1. Usually occurs in the second and third trimesters
2. Results from an increase in progesterone production, decreased intestinal motility, displacement of the intestines, pressure of the uterus, and taking iron supplements
3. Interventions
a. Eating high-fiber foods such as whole grains, fruits, and vegetables
b. Drinking no less than 2000 mL per day
c. Exercising regularly, such as a daily 20- minute walk
d. Consulting with the HCP about interventions such as the use of stool softeners, laxatives, or enemas

I. Backache
1. Usually occurs in the second and third trimesters
2. Caused by an exaggerated lumbosacral curve resulting from an enlarged uterus
3. Risk for falls; teach to move about slowly
4. Interventions
a. Obtaining rest
b. Using correct posture and body mechanics
c. Wearing low-heeled, comfortable, and supportive shoes
d. Performing pelvic tilt (rock) exercises and conscious relaxation exercises
e. Sleeping on a firm mattress

J-Leg cramps
1. Usually occur in the second and third trimesters
2. Result from an altered calcium-phosphorus balance and pressure of the uterus on nerves or from fatigue
3. Interventions
a. Getting regular exercise, especially walking
b. Dorsiflexing the foot of the affected leg
c. Increasing calcium intake

K. Shortness of breath
1. Can occur in the second and third trimesters
2. Results from pressure on the diaphragm from the enlarged uterus
3. Interventions
a. Taking frequent rest periods
b. Sitting and sleeping with the head elevated or on the side
c. Avoiding overexertion

Preparation of pregnant lady for labor & delivery :

1. Education during antenatal care . Explain what will happen
2. Psychological support
3. Advise to have bath, clean cloths
4. Evacuate the bowel , catheterization for urination

5. Clean vagina by shaving hair
6. Measuring vital signs frequently
7. Checking her investigations
8. Thorough exam. (general & obstetrical exam.)
9. Position in the

theatre , isolation of the
patientDetect signs &
symptoms of maternal &
fetal distress

Lecture 4

"PREGNANCY COMPLICATIONS"

HEMORRHAGIC CONDITIONS OF EARLY PREGNANCY

OBJECTIVES

1.Describe potential complications of pregnancy and its management of hemorrhagic condition of early pregnancy , including spontaneous abortion, ectopic pregnancy and gestational trophoblastic disease .

2- Describe potential complications of pregnancy and its management of hemorrhagic condition of late pregnancy placenta previa and placenta abruption

3- Explain physiology and management of placenta previa and placenta abruption.

4- describe the development and management of hypertensive disorders of pregnancy

5- Discuss the effects and management of preexisting diabetes mellitus during pregnancy .

6- Explain the physiology and management of gestational diabetes mellitus .

The three most common causes of hemorrhage during the first half of pregnancy are abortion, ectopic pregnancy, and gestational trophoblastic disease .

Abortion:

Abortion is : the expulsion of a fetus from the uterus before it has reached the stage of viability (in human beings, usually about the 20th week of gestation

Spontaneous Abortion:

Spontaneous abortion is a termination of pregnancy without action taken by the woman or another person.

Incidence and Etiology.

Determining the exact incidence of spontaneous abortion is difficult because many unrecognized losses occur in early pregnancy, but it averages approximately 18% to 31% with any pregnancy. Most pregnancies (50% to 70%) are lost during the first trimester; many of these may occur before implantation or during the first month after the last menstrual period.

Causes:

First trimester (12 weeks)

1- Chromosomal a abnormalities (50 %-60%) Anembryonic (no embryo) causing a spontaneous abortion
2- maternal infections such as syphilis, listeriosis, toxoplasmosis, brucellosis, rubella, cytomegalic virus,
3- maternal endocrine disorders such as hypothyroidism, diabetes, and decreased progesterone.
4- Anatomic defects of the uterus,uterine septum, or cervical incompetence may contribute to pregnancy loss at any gestational age
5- Finally, heavy alcohol consumption and heavy smoking may play a role in spontaneous abortion
6- Teratogen drugs and radiation (cancer chemotherapy)

Pathophysiology:

the pathophysiology of spontaneous a abortion differs according to the cause in most cases embryonic death occurs , which results in loss human chorionic gonadotropin (HCG) anddecreased progesterone and estrogen levels . the uterine deciduas is then sloughed off (vaginal bleeding) and usually expels the embryo / fetus .

Classification :

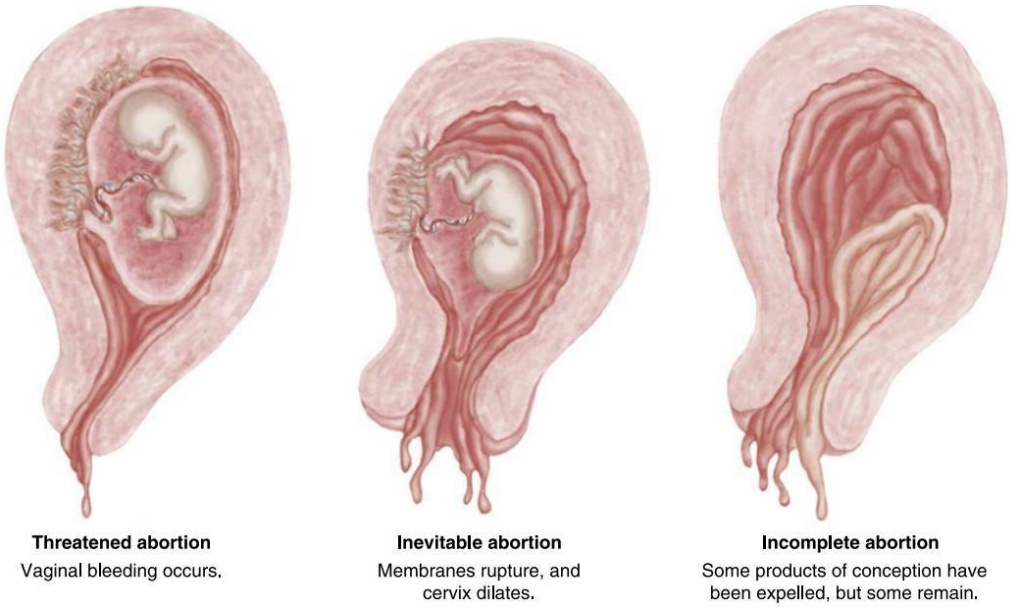
Spontaneous abortions are subdivided in to the following categories so that they can be differentiated clinically

1-**Threatened abortion** :

Unexplained bleeding ,cramping , or backache indicate that the fetus may be in jeopardy , bleeding persist for days the cervix is closed it may be followed by partial or complete expulsion of pregnancy , or it may resolve with out threatening the fetus these will continue to term other willend by missed abortion.

2- **Inevitable Abortion** Clinical Manifestations. Abortion is usually inevitable (i.e., it cannot be stopped) when membranes rupture and the cervix dilates. Rupture of membranes generally is experienced as a loss of fluid from the vagina and subsequent uterine contractions and active bleeding. Incomplete evacuation of the products of conception can result in excessive bleeding or infection.

3- **Incomplete Abortion** Clinical Manifestations. Incomplete abortion occurs when some but not all of the products of conception are expelled from the uterus. The major manifestations are active uterine bleeding and severe abdominal cramping. The cervix is open, and some fetal and/or placental tissues are passed



4- **Complete Abortion** Clinical Manifestations. Complete abortion occurs when all products of conception are expelled from the uterus. After passage of all products of conception, uterine contractions and bleeding subside and the cervix closes. The uterus feels smaller than the length of gestation would suggest. The symptoms of pregnancy are no longer present, and the pregnancy test becomes negative as hormone levels fall.

5-**Missed abortion** :

The fetus dies in utero but is not expelled uterine growth ceases , breast changes regress and the women may report brownish vaginal discharge . the cervix is closed on history , pelvic examination , and drop in (HCG) levels or a negative pregnancy test and may be confirmed by ultrasound if necessary .

If the fetus is retained beyond 4 weeks , fetal autolysis (break down of cells or tissue) results in the release of thromboplastin , and disseminated intravascular coagulation (DIC) may develop

6- **Recurrent or habitual abortion**:

Abortion occurs consecutively in three or more pregnancies .

Causes :

the primary causes of recurrent abortion are believed to be

1- Genetic or chromosomal abnormalities and anomalies of the reproductive tract , such as uterus with to horns or incompetent cervix
2- Additional causes include an inadequate luteal phase with insufficient secretion of progesterone Additional causes include an inadequate luteal phase with insufficient secretion of progesterone
3- Systemic diseases such as systemic lupus erythematosus and diabetes mellitus have been implicated in recurrent abortions.
4- Reproductive infections and some sexually transmitted diseases (STDs) are also associated with recurrent abortions

7- Septic abortion :

Presence of infection septic abortion is less common since the availability of legal abortion . may occur with prolonged , unrecognized rupture of the membranes , pregnancy with intrauterine device (IUD) in utero , or pregnancy attempts by in adequately prepared individuals to terminate a pregnancy .

Management of abortion:

1-bed rest .

2-sedation.

3- For incomplete abortion curettage before 14 wks. of gestation but after 14 wks of pregnancy we do induction of abortion by giving pit (oxytocin) drips.

4- Anti biotic to prevent infection.

5-RH-ve women give immunoglobulin after abortion.

Nursing care :

1-Monitor blood pressure and pulse frequently.

2- Observe women for indication of shock , such as pallor , chammy skin , perspiration ,dyspnea , or restlessness .

3-Count and weight pads to assess amount of bleeding over a given time period , save any tissue or clost expelled .

4- If pregnancy is of 12 weeks gestation or beyond , assess fetal heart tones with a Doppler .

5- Prepare for intravenous (IV) therapy . there may be standing orders to start IV therapy on bleeding clients .

6- Prepare equipment for examination have oxygen therapy available .

7-Collect and organize all data , onset of bleeding episode , laboratory studies (Hb ,Rh ,hormonal assays) .

8 -Obtain an order to type and cross – match for blood if there is evidence of significant blood loss .

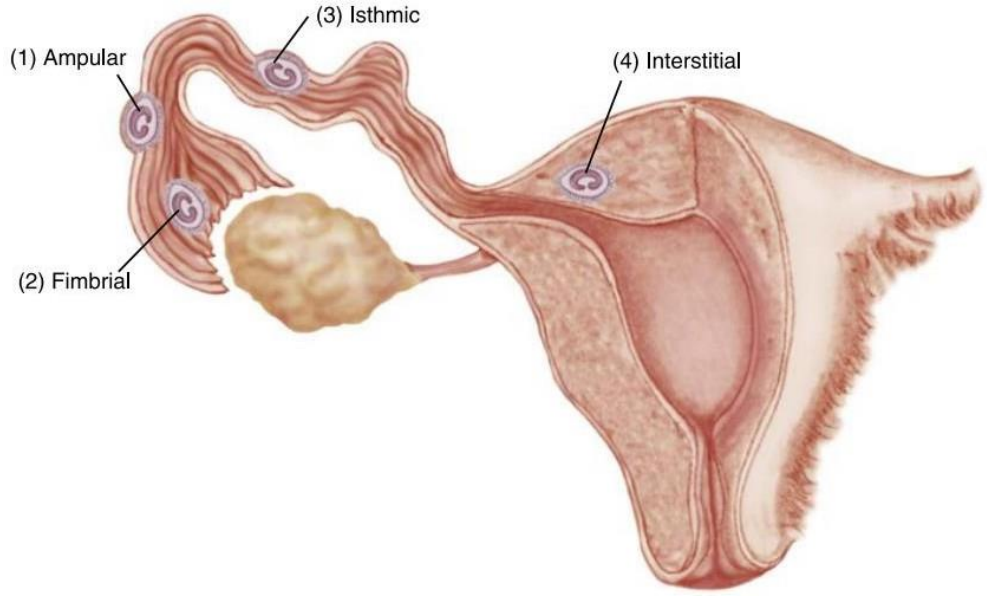
9- Asses coping mechanisms and support system of women in crisis

Give emotional support to enhance her coping abilities by continuous , sustained presence , by clear explanation of procedures , and by communicating her status to her family , most important , prepare the women for possible fetal loss Assess her expressions of anger , denial , guilt ,depression , or self – blame

10- Assess the family's response to the situation

Ectopic Pregnancy:

Ectopic pregnancy is an implantation of a fertilized ovum in an area outside the uterine cavity. Although implantation can occur in the abdomen or cervix, 97% of ectopic pregnancies occur in the fallopian tube. shows the common sites of ectopic implantation**.**



Sites of Tubal Ectopic Pregnancy. Numbers indicate the order of prevalence.

Causes:

1- Additional causes of ectopic pregnancy are delayed or premature ovulation, with the tendency of the fertilized ovum to implant before arrival in the uterus, and altered tubal motility in response to changes in estrogen and progesterone levels that occur with conception.

2- Previous pelvic or tubal surgery
3- Endometriosis
4- Previous ectopic pregnancy
5- Presence of an intrauterine device (IUD)
6- Congenital anomalies of the tube
7- Use of ovulation –inducing drugs
8- infertility
9- Smoking
10- Advanced maternal age(25-34)

PATHOPHYSIOLOGY of ectopic pregnancy.

The mechanisms responsible for ectopic implantation are unknown. The four main possibilities are an **anatomic obstruction to the passage of the zygote**, an abnormal concepts, abnormalities in the mechanisms responsible for tubal motility, and trans peritoneal migration of the zygote.

Clinical Manifestations:

The classic signs of ectopic pregnancy include the following:

1-Missed menstrual period
2-Positive pregnancy test
3- lower Abdominal pain
4-Vaginal "spotting"(6-8 weeks)
5- dark red or brown
6- shock
7- blood in peritoneal cavity
8- dizziness and faintness
9- blueness around the umbilicus hemato peritoneum (indicated intra abdominal ruptured)

Diagnosis :

1- A careful assessment of menstrual history , particularly the last menstrual period (LMP)
2- Careful pelvic exam to identify any abnormal pelvic masses and tenderness
3- Laboratory testing (pregnancy test)
4- Physical examination
5- Ultrasonography .
6- Laparoscopy (examination of the peritoneal cavity)

Management:

1- surgical for rupture either by laparoscopy or laparotomy to remove the affected tube or to perform a salpingectomy(incision in to the tube to terminate the pregnancy)
2- medical by metho trexate in case of early diagnosis when un ruptured mass is lass then 4 cm

Nursing care:

1-checking vital signs and laboratory test, take sample of blood send for Hb , blood group and Rh and cross match she must inform the doctor who will be responsible
2-Nursing care focuses on prevention or early identification of hypovolemic shock, pain control,

and psychological support for the woman who experiences ectopic pregnancy.
3-Nurses administer ordered analgesics and evaluate their effectiveness so pain can be adequately controlled.
4-Nurse administers Rh immune globulin to Rho(D)-negative women
5-After operation , nurse must be alert for the sign of infection and intra abdominal bleeding follow – up .Hcg levels are essential to confirm that all trophoblastic tissue was removed

Risk factors

Some things that make you more likely to have an ectopic pregnancy are:

- **Previous ectopic pregnancy.** If you've had this type of pregnancy before, you're more likely to have another.
- **Inflammation or infection.** Sexually transmitted infections, such as gonorrhea or chlamydia, can cause inflammation in the tubes and other nearby organs, and increase your risk of an ectopic pregnancy.
- **Fertility treatments.** Some research suggests that women who have in vitro fertilization (IVF) or similar treatments are more likely to have an ectopic pregnancy. Infertility itself may also raise your risk.
- **Tubal surgery.** Surgery to correct a closed or damaged fallopian tube can increase the risk of an ectopic pregnancy.
- **Choice of birth control.** The chance of getting pregnant while using an intrauterine device (IUD) is rare. However, if you do get pregnant with an IUD in place, it's more likely to be ectopic. Tubal ligation, a permanent method of birth control commonly known as "having your tubes tied," also raises your risk, if you become pregnant after this procedure.
- **Smoking.** Cigarette smoking just before you get pregnant can increase the risk of an ectopic pregnancy. The more you smoke, the greater the risk

Complication of ectopic pregnancy:

1- sever blood loss
2- residual trophoblastic tissues which cause infection and adhesion future infertility

Gestational Trophoblastic Disease
(Hydatidiform Mole)

Hydatidiform mole is one form of gestational trophoblastic disease, which occurs when trophoblasts (peripheral cells that attach the fertilized ovum to the uterine wall) develop abnormally. The placenta does not develop normally and, if a fetus is present, there will be a fatal chromosome defect. Gestational trophoblastic disease is characterized by proliferation and edema of the chorionic villi. The fluid-filled villi form grapelike clusters of tissue that can rapidly grow large enough to fill the uterus to the size of an advanced pregnancy. The mole may be complete, with no fetus present, or partial, in which fetal tissue or membranes are present

Type of hydatid formal
Hydatid formal subdivide in to

1-complete hydatid formal. is thought to occur when the ovum is fertilized by a sperm that duplicates its own chromosomes and the maternal chromosomes in the ovum are inactivated , a complete mole that is composed only of enlarged villi but contains no fetal tissue or membranes.

2-partial mole, the maternal contribution is usually present, but the paternal contribution is doubled, and therefore the karyotype is triploid (69,XXY or 69,XYY). If a fetus is identified with the partial mole, it is grossly abnormal because of the abnormal chromosomal composition. a partial mole that includes some fetal tissue and membranes

Pathophysiology.

A hydatidiform mole is **a pregnancy/concepts** in which the placenta contains grapelike vesicles (small sacs) that are usually visible to the naked eye. The vesicles arise by distention of the chorionic villi by fluid. When inspected under the microscope, hyperplasia of the trophoblastic tissue is noted.

clinical manifestations

1- Vaginal bleeding is almost universal with molar pregnancies and may occur as early as the fourth week or as late as the second trimester

It is often brownish like prune juice due to liquefaction of the uterine clot but it may be bright red .

2- Anemia occurs frequently due to the loss of blood

3- hydropic vesicles may be passed and if so , are diagnostic with a partial mole the vesicles are often smaller and may not be noticed by the women

4- Uterine enragement greater then expected for gestational age is a classic sign . enlargement is due to the proliferating trophoblastic tissue and to a large amount of clotted blood

5- Absence of fetal heart sounds in the presence of other signs of pregnancy is a classic sign of molar pregnancy

6- Markedly elevated serum HCG may be present due to continued secretion by the proliferation tropholastic tissue .

7- Very low levels of mafernal serum fetoprotein are found .

8- Hyper emesis gravid arum may occur , probably as are sult of the high levels of HCG .

9- pre eclampsia may be seen , especially in the molar pregnancy continues in to the second trimester .

10 – Rarely , hyperthyroidism results from production thyrotropin by molar tissue It produced thyrotoxicosis**.**

Diagnosis:

1- Ultrasound .

2- High level of HCG.

3- Chest X- ray will done to exclude metastatic to the lung .

Management:

Management of mal pregnancy is based on three principles

1- diagnosis of the mole .

2- evacuation of the uterus .

3 –monitoring of HCG levels .

Evacuation :

Done by suction of uterus and tissue will send for histopathology if patient has complete her family we do immediate hysterectomy it is will decrease the chance of malignancy

Follow – up of serum HCG level :

Women will have spontaneous regression of HCG levels by 15 weeks after evacuation during this time

Do pregnancy test every week but if become we do HCG maintain every month tell another 12 weeks

Pelvic examination every two weeks and then every 3 month where HCG level is be negative Avoid pregnancy for one year after pregnancy test is be negative

Chest –X- Ray :

To exclude lung metastasis if level of HCG is increasing by detection it is level in blood or pregnancy test remain +Ve and by result of tissue from pregnancy is mean

Choriocarcinoma we started chemotherapy gestational trophoblast is 100% curable in women with out metastasis or this with metastasis whose initial HCG level are less than 40.000 m /u/ml

Nursing care:

1- Assess sign and symptom .

2- In from the women about probable procedure and the need for follow up of HCG .

3- Discuss of pregnancy at the time of follow up might ask the ability to detect a trophoblastic tumor .

4- Psychological management a bout feeling related to loss her pregnancy and fear of developing cancer

Complication of hydatid for mole:

1- Anemia

2- Hyperthyroidism

3- Infection .usually seen with late diagnosis and spontaneous abortion of the mole

4- Disseminated intravenous coagulation (DIC)

5- Trophoblastic embolization of the lung , usually seen after molar evacuation of a significantly enlarged uterus (this creates a cardio respiratory emergency)

6-Ovarian cysts , which may be small or large enough to displace the uterus

Incompetent Cervix:

A. Description

1. Incompetent cervix refers to premature dilation of the cervix, which occurs most often in the fourth or fifth month of pregnancy and is associated with structural or functional defects of the cervix.
2. Treatment involves surgical placement of a cervical cerculage.

B. clinical manifestations

1. Vaginal bleeding
2. Fetal membranes visible through the cervix

C. nursing care:

1. Provide bed rest, hydration, and tocolysis, as prescribed, to inhibit uterine contractions.
2. Prepare for cervical cerculage (at 10 to 14 weeks of gestation), in which a band of fascia or no absorbable ribbon is placed around the cervix beneath the mucosa to constrict the internal os.
3. After cervical cerculage, the client is told to refrain from intercourse and to avoid prolonged standing and heavy lifting.
4. The cervical cerculage is removed at 37 weeks of gestation or left in place and a cesarean birth is performed; if removed, cerculage must be repeated with each successive pregnancy.
5. After placement of the cervical cerculage, monitor for contractions, rupture of the membranes, and signs of infection.
6. Instruct the client to report to the HCP immediately any post procedure vaginal bleeding or increased uterine contractions.

HEMORRHAGIC CONDITIONS OF LATE PREGNANCY

After 20 weeks of pregnancy, the two major causes of hemorrhage are the disorders of the placenta called placenta previa and placental abruption. Placental abruption may be further complicated by disseminated intravascular coagulation (DIC)

Placenta Previa:

Placenta previa is an implantation of the placenta in the lower uterus. As a result, the placenta is closer to the internal cervical 03 than to the presenting part (usually the head) of the fetus. The three classifications of placenta previa (total, partial, and marginal) depend on how much of the internal cervical os is covered by the placenta

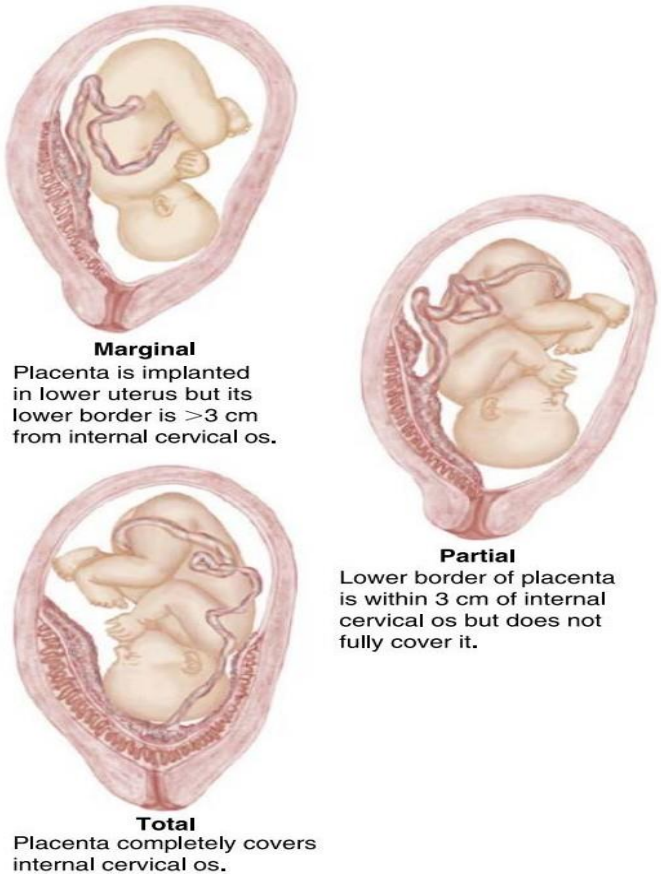
Classification

Placenta previa is classified in three degrees:

Marginal (sometimes called low-lying)—The placenta is implanted in the lower uterus, but its lower border is more than 3 cm from the internal cervical os.

. Partial—The lower border of the placenta is within 3 cm of the internal cervical os but does not completely cover the os.

. Total—The placenta completely covers the internal cervical 03.



Incidence and Causes:

The average incidence of placenta previa is 1 in 200 births

The causes of placenta previa is unknown but factors associated with placenta previa are

1- Multi parity(because large placenta area associated with these pregnancies) .

2- Increase age(older women more than 35 -40 years of age) .

3- Previous caesarean birth (myometreal scar).

4- Current use of cocaine and cigarette Smoking.

5- Recent spontaneous or induced abortion.

6- large placenta(genetic predisposition)area associated with uterine scarring and endometrial damage .

7- previous C.S and curettage in the past for miscarriage or induced abortion are risk factors for placenta previa because both result in endometrial damage and uterine scarring **.**

Pathophysiology:

Placenta previa is **initiated by implantation of the embryo (embryonic plate) in** the lower (caudad) uterus. With placental attachment and growth, the cervical os may become covered by the developing placenta.

singe and symptoms :

1. Sudden onset of painless, bright red vaginal bleeding occurs in the last half of pregnancy.
2. Uterus is soft, relaxed, and nontender.
3. Fundal height may be more than expected for gestational age

Diagnosis:

1- signs and symptoms.

2- Ultrasound: placenta is located over or very near internal os.

Dependent on:

a- gestational age.

b- Amount of hemorrhage.

If bleeding occur at early gestation we can prolong pregnancy by recent until the fetus is be viable we admit the pt.

1- a- bed rest with bathroom privileges only as long as the b- woman is not bleeding.

2- No vaginal examinations.

3- Monitoring blood loss, pain, and uterine contraction .

4- Evaluation of FHR with external monitor.

5- Monitoring of maternal vital signs.

6- Complete laboratory evaluation hemoglobin, hematocrit, Rh factor, and urinalysis.

7- Administration of intravenous fluid lactated Ringers solution with drip rate monitored.

8- Availability of two units of cross- matched blood for possible transfusion.

9- Administration of betamethasone to facilitate lung maturity.

If frequency, recurrent, or profuse bleeding persists or if fetal well- being appears threatened, a caesarian birth needs to be performed

Fetal Complications:

1- prematurity.

2- Asphyxia.

Material complication:

1- severe hemorrhage.

2- Embolism.

3- Endomatrities.

Abruptio placenta:

Premature separation of the placenta from the uterine wall after the twentieth week of gestation and before the fetus is delivered

The incidence of abruptio placenta is 1 in 226 birth but accounts for 15% of perinatal deaths .

Pathophysiology. Placental abruption ;is **where a part or all of the placenta separates from the wall of the uterus prematurely**. Abruption is thought to occur following a rupture of the maternal vessels within the basal layer of the endometrium. Blood accumulates and splits the placental attachment from the basal layer

Causes of abruptio placenta.

Maternal causes:

1- hypertension 44% .

2- maternal trauma 2-10 %(abdominal trauma) .

3- Cigarette smoking(cause vascular disruption in the placenta bed).

4- Alcohol consumption.

5- Short umbilical cord.

6- Multi gravid status .

7- Increases maternal age.

8- Presence of fibroids.

9- Over distension of the uterus. e.g. twins, poly hydromanious.

10- Pre-term labor

11- Pre mature rupture membranes and history of previous premature separation of placenta .

Classification (Type)

Classification of abruption placent is based on the extent of separation.

Premature separation of the placenta may be divided into three types:

1- marginal:

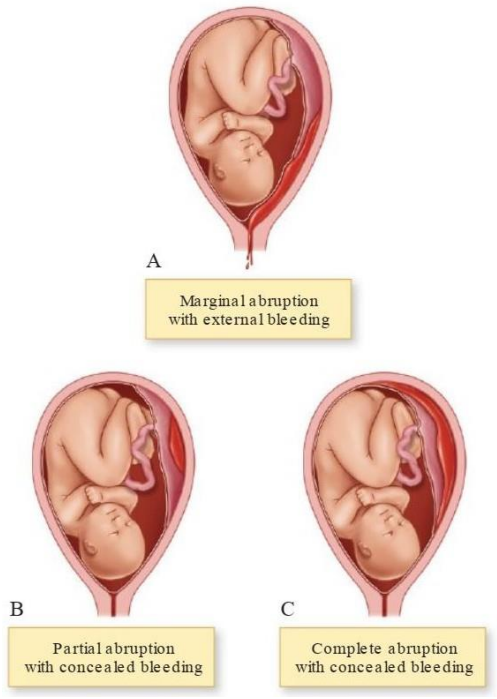
the blood passes between the fetal membrane and the uterine wall and escapes vaginally. Separation beings at the periphery of the placenta, this marginal Sinus rupture may or may not become more severe.

2- central:

the placenta separation centrally , and the blood is trapped between the placenta and the uterine wall in concealed bleeding.

3- complete:

massive vaginal bleeding is seen in the presence of almost fatal separation.



Types of abruptio placentae.

Signs and Symptoms:

Dark red vaginal bleeding. If the bleeding is high in the uterus or is minimal, there can be an absence of visible blood.

2. Uterine pain or tenderness or both

3. Uterine rigidity

4. Severe abdominal pain

5. Signs of fetal distress

6. Signs of maternal shock if bleeding is excessive

Management:

1- diagnosis is confirmed by ultrasound.

2- Put intravenous fluid (lacted Ringe's) and blood replacement.

3- Delivered the fetus as soon as possible.

4- Coagulation test is performed to rule or the DIC (Disseminated Intravascular Coagulate).

5- Cesarean birth is necessary in the face of severe hemorrhage to allow an immediate hysterectomy to save both woman and fetus.

6-central venous pressure (CVP) monitoring may be needed to evaluate intravenous fluid replacement.

7-(CVP) should be used to assess for hypovolemia.

8-Elevated (CVP) may indicate fluids over load and pulmonary edema.

Nursing Care:

The nursing care of bleeding in 3rd trimester:

1- take good history amount of bleeding , nature of vaginal bleeding.

2- Associated pain.

3- Maternal vital signs.

4- Fetal heart rate.

5- Uterine tone.

6- Send sample of blood for Hb, platelets, means corpus luteum volume, blood group and RH.

7- Put folly's catheter (check urine output).

8- Put fetal heart monitor (Doppler).

9- Electronic monitoring of the uterine contractions and resting tone between contractions provides information regarding labor pattern and effectiveness of

oxytocin induction.

10- Psychological supports.

Complication:

Maternal Risk	Fetal- New natal Risk
a- shock	a- preterm birth
b- cardiac or renal failure	b- perinatal mortality 20-30 %
c- postpartum hemorrhage	c- Intrauterine asphyxia
d- DIC (Disseminated Intravascular Coagulation	d- Anemia
	e- Neurology defects 1st years cerebral palsy
	f- irreversible brain damage 50 % fetal death

Hypertensive Disorders with Pregnancy

LEARNING OBJECTIVES :

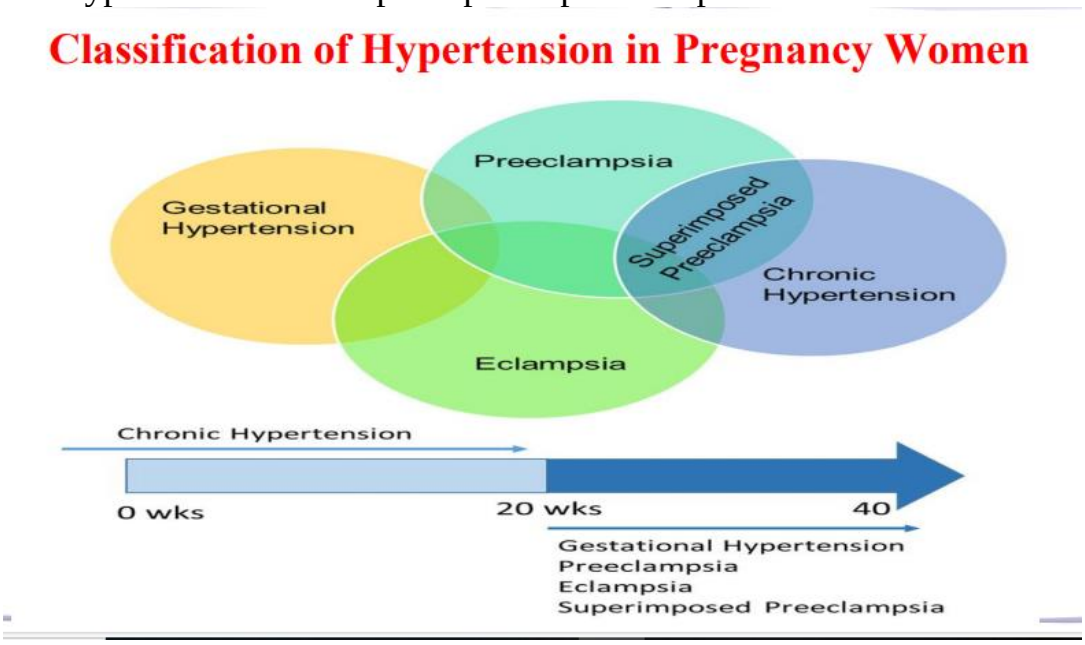
At the end of this lecture, the student will be enable to :

1. .Define Hypertension in relationship to pregnancy.
2. Classification of hypertension in pregnancy women
3. .Identify risk factors associated with preeclampsia.
4. .List criteria for the diagnosis of preeclampsia (mild, sever)
5. Discuss the effects of hypertension on the mother and fetus.
6. Nursing care of the pregnant woman with a Hypertensive Disorder

Hypertension(High blood pressure) is the most common medical disorder in pregnancy. • Hypertensive disorders of pregnancy comprise a spectrum of severity ranging from a mild elevation of blood pressure to severe preeclampsia and hemolysis. • The incidence of hypertension among pregnant women ranges from 12% to 22%

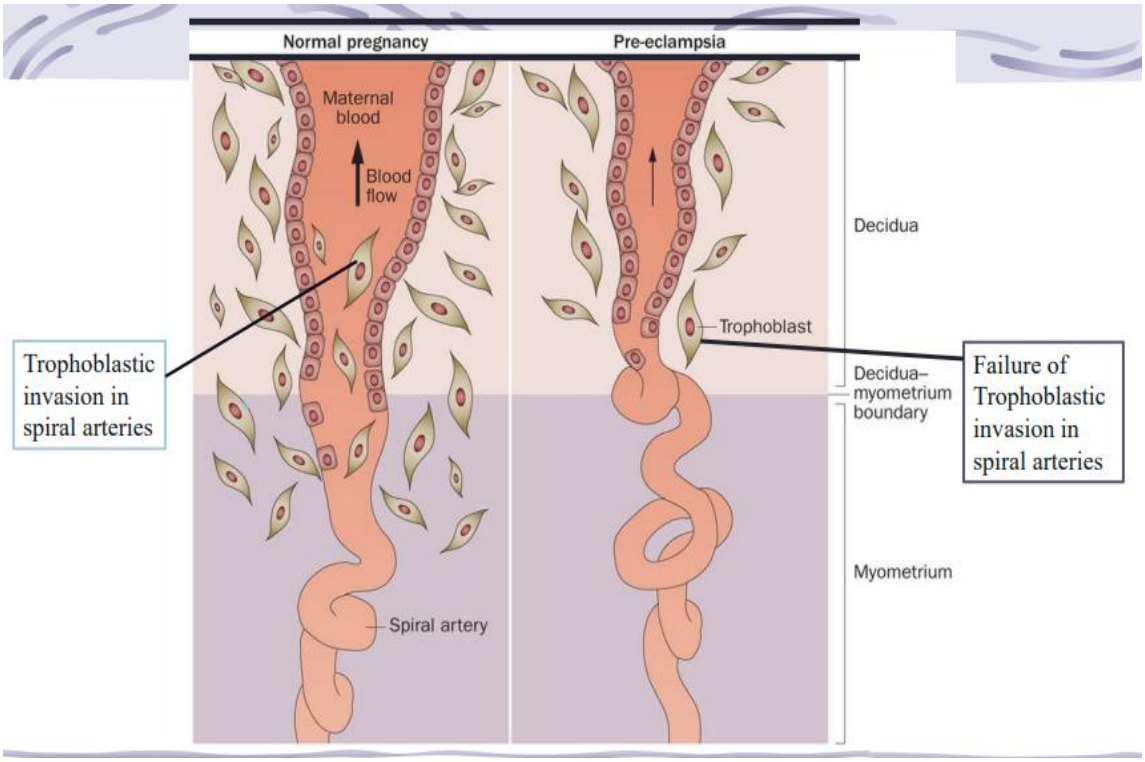
Classification of Hypertension in Pregnancy Women

1. Preeclampsia-eclampsia
2. Chronic hypertension
3. Gestational hypertension
4. Chronic hypertension with superimposed preeclampsia



Pathophysiology of preeclampsia Preeclampsia has been called a 'Disease of Theories' because the true mechanisms behind the pathogenesis are unknown.(Genetic, immunological, maternal vascular disease)

1- **Preeclampsia-eclampsia:** ¬Preeclampsia: occurs in 5% to 8% of all pregnancies ¬ Preeclampsia defined as an increase in blood pressure that occurs after 20 weeks gestation with proteinuria (protein in the urine) in a woman who had a normal blood pressure before pregnancy. ¬ Edema is no longer included in the definition because it is a common feature in normal pregnancy.



Pre-eclampsia divided into Mild and Sever

A- Mild Pre-eclampsia:

1- Increase in Bp (140/90mm Hg) after 20 weeks gestation
2- Presence of (+) proteinuria ≥ 300 mg/24 hr
3- Oedema :generalized edema or rapid weight gain. Puff face, hands, ankles and lower legs).

B- Sever Pre-eclampsia : may develop Suddenly

1. BP of 160/110 or higher on 2 occasions at least 4 hr apart while on bed rest. 2. Proteinuria ≥ 5g/L in 24 hr
3. Oliguria: urine output < 500ml/24hr
4. Visual disturbances, scotomata (a blind spots) or blurred vision
5. Odema
6. Epigastric pain , Impaired liver function
7. Thrombocytopenia (low platelet count).
8. Headache, Nausea and vomiting

Risk Factor

.First pregnancy
• Previous preeclamptic pregnancy
• Obesity, Body mass index (BMI) of 35 or more.
• Family history of preeclampsia.
• Age more than 35 years or less than 19 years
• Multi-fetal pregnancy (e.g., twins)
• Lower socioeconomic group
• History of diabetes type I and II
• Chronic hypertension. Chronic renal disease

Complication of Preeclampsia-Eclampsia

A- Maternal complication

1. Antepartum hemorrhage: Abruptio placentae
2. Central nervous system: Headache ,eclamptic seizure
3. Increase Intraocular pressure causes retinal detachment.
4. Acute tubular necrosis result from under-perfusion of the kidney(renal failure)
5. Coma
6. Maternal mortality

B- Fetal complication :

1) Small for gestational age, Intrauterine growth restriction,
2) low birth weight
3) Oligohydramnios
4) Prematurity
5) Stillbirth
6) Perinatal mortality

Nursing care :

1. Regular visiting ANC.
2. Bed rest and a quit environment to improve circulation to the heart and uterus.
3. Drink 8-10 glass of water daily.
4. Diet, low sodium diet, high-fiber foods.
5. Monitoring blood pressure daily (every 4_6 hr) & daily weighting to check edema
6. Monitoring intake _ output and give fluid and electrolyte.
7. Ask the patient to count fetal movement(kick count) and take ulterasound at least every 3 to 4 weeks for determine fetal growth.
8. Measure amount of protein in urine and other laboratory test
9. Anti-hypertensive, (anticonvulsants in sever preeclampsia)
10. Corticosteroids (Betamethasone or dexamethasone for fetus-mature lung) 11. Education the patient about signs and symptoms of preeclampsia and Contact the home health nurse if any of the following occurs: (Increase in blood pressure, Protein present in urine, sudden weight gain , Burning when urinating, Decrease in fetal activity or movement, Headache, Dizziness or visual disturbances, epigastric pain, Decreased urination and Nausea and vomiting)

Eclampsia

- Eclampsia : is the occurrence of a seizure in a women with preeclampsia, who has no other cause for seizure.
- Characterized by Convulsion or coma may occur before the onset of labor, during , or early in the postpartum period. Bp 160/110 mm Hg, proteinuria, Generalized edema,…..)
- Eclamptic seizures are generalized and start with facial twitching. The body then becomes rigid, in a state of tonic muscular contraction.

- The clonic phase of the seizure involves alternating contraction and relaxation of all body muscles.
- Eclampsia : It considered a complication of sever preeclampsia

Nursing Care of Eclampsia:

1. The airway should be maintained (clear airway) and oxygen administered during the seizure to resuscitated the mother and fetus.
2. Suction equipment must be readily available to remove secretions from her mouth.
3. Check the vital signs.(Bp every 1-4 hr and Temp. every 4 hr)
4. Hypertension, seizures is controlled with antihypertensive medications 5. Level of consciences : observed for alertness, mood change,….
6. Assess fetal heart rate. Also assess the client for uterine contractions
7. Check vaginal bleeding every 15 minutes which may present with abruption placenta
8. Frequent auscultation of maternal lungs is required.
9. Foley catheter is inserted to assess intake and output, monitor hourly. 10. Urine protein: protein in urine/24hr. 12. Check edema (legs, hands, face, eyelids, feet), and weight daily

2. Chronic Hypertension

When the blood pressure is 140\90 or higher before pregnancy or before 20 weeks of gestation.

Complication of chronic hypertension:

1. Maternal complication : About 25% of women with chronic hypertension develop preeclampsia during pregnancy , accidental hemorrhage (abruption placenta)
2. Fetal complication: Intrauterine growth retardation, Preterm labor

3.Gestational Hypertension also called transient hypertension.

♣ Exists when transient elevation of blood pressure (140/90 mm Hg) occur for the first time after mid pregnancy without proteinuria, after 20 weeks' gestation and resolving by 12 weeks' postpartum.
♣ If the blood pressure elevation persists after 12 weeks postpartum, the woman is diagnosed with chronic hypertension

4. Chronic hypertension with superimposed preeclampsia

This condition occurs in women who have been diagnosed with chronic high blood pressure before pregnancy, but then develop worsening high blood pressure and protein in the urine, or edema.

Hypertension Disorders with pregnancy-----(Summary)

- Preeclampsia: hypertension , protein in urine after 20 week of gestation.
- Eclampsia: preeclampsia, Seizures
- Gestational hypertension: hypertension after 20 weeks of gestation
- Chronic hypertension: hypertension before 20 weeks of gestation.
- Superimposed preeclampsia: Chronic hypertension and preeclampsia

COMPARISON CHART 19.2 PREECLAMPSIA VERSUS ECLAMPSIA

	Mild Preeclampsia	Severe Preeclampsia	Eclampsia
Blood pressure	>140/90 mm Hg after 20 weeks' gestation	>160/110 mm Hg	>160/110 mm Hg
Proteinuria	300 mg/24 hr or greater than 1+ protein on a random dipstick urine sample	>500 mg/24 hr; greater than 3+ on random dipstick urine sample	Marked proteinuria
Seizures/coma	No	No	Yes
Hyperreflexia	No	Yes	Yes
Other signs and symptoms	Mild facial or hand edema Weight gain	Headache Oliguria Blurred vision, scotomata (blind spots) Pulmonary edema Thrombocytopenia (platelet count <100,000 platelets/mm^3) Cerebral disturbances Epigastric or RUQ pain HELLP	Severe headache Generalized edema RUQ or epigastric pain Visual disturbances Cerebral hemorrhage Renal failure HELLP

Diabetes Mellitus in Pregnancy

LEARNING OBJECTIVES:

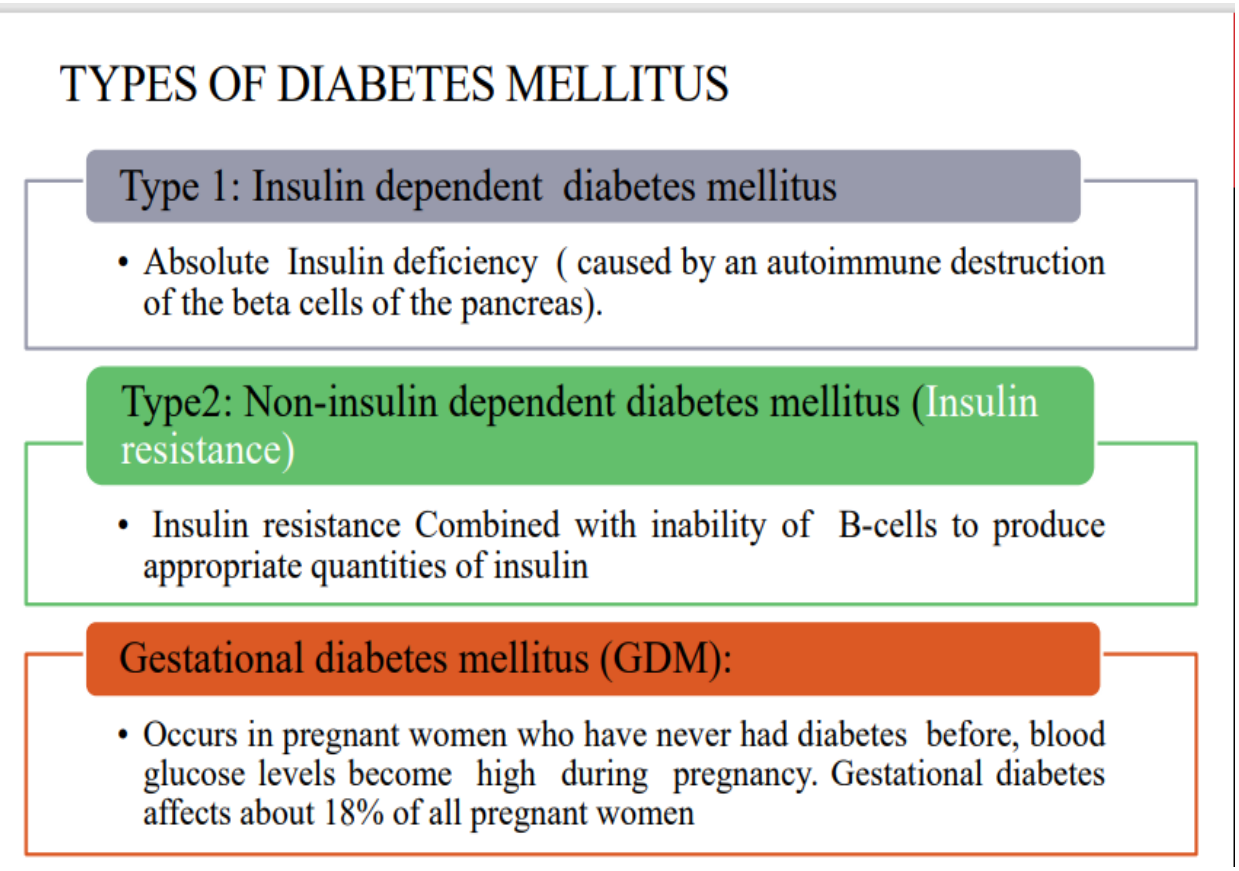
At the end of this lecture, the student will be enable to:

1- Definition of the Diabetes Mellitus
2- Types of Diabetes mellitus
3- Risk factors associated with gestational diabetes.
4- Identify the effects of diabetes on the mother and baby.
5- Distinguish the screening methods for gestational diabetes.
6- Treatment and nursing care of DM

DIABETES MELLITUS

The most common medical complication of pregnancy

Diabetes Mellitus is describe a metabolic disorder characterized by high levels of sugar in blood (hyperglycemia) caused by deficiency of insulin or resistance to insulin or both(hyperglycemia , glycosuria and microangiopathy).



Normal pregnancy is Diabetogenic : Due to placental anti insulin hormones (progesterone, cortisol, Human placental lactogen, estrogen) and insulinase enzyme**)**

- The placenta supplies a growing fetus with nutrients, and also produces a variety of hormones to maintain the pregnancy. Some of these hormones (estrogen, cortisol, and human placental lactogen) can have a blocking effect on insulin. This is called contra-insulin effect, which usually begins about 20 to 24 weeks into the pregnancy.
- During the second half of pregnancy, levels of placental hormones rise sharply. These hormones, particularly estrogen, progesterone, and human placental lactogen (HPL), create resistance to insulin in maternal cells. This resistance allows an abundant supply of glucose to be available in the mother's blood for transport to the fetus. Leave the woman with insufficient insulin and cause hyperglycemia.

SIGNS & SYMPTOM S OF GESTATIONAL DIABETES:

1. Polyuria (excessive urination)
2. Polyphagia (excessive hunger and eating)
3. Polydipsia (excessive thirst)
4. Dry mouth, Weight loss
5. Glucose in urine, UTI
6. Blurred vision
7. Headache, Fatigue
8. Elevated serum glucose, glucose in the urine
9. Greater than normal abdominal circumference,
10. polyhydarmnios

RISK FACTORS OF GESTATIONAL DIABETES

1. Family history of diabetes
2. Age 35 years or older.
3. Obesity
4. Previous pregnancy with gestational diabetes.
5. Previous infant weight more than 4 kg (macrocosmic baby)
6. Previous (congenital anomalies)
7. Polycystic ovarian syndrome (PCOS)

Complication

1- **Maternal**

1. Polyhydramnios,
2. Premature membrane rupture, Preterm labor
3. Difficult labor, cesarean birth
4. Vaginal tearing
5. Urinary tract infections resulting from excess glucose in the urine (glucosuria), which promotes bacterial growth
6. Ketoacidosis
7. DM later life

2- Fetal and Neonatal

1. Congenital anomaly
2. Macrosomia resulting from hyperinsulinemia.
3. Birth trauma :Shoulder dystocia
4. Polycythemia due to excessive red blood cell (RBC) production in response to hypoxia
5. Hyperbilirubinemia due to excessive RBC breakdown.
6. Neonatal hypoglycemia resulting from ongoing hyperinsulinemia after the placenta is removed.

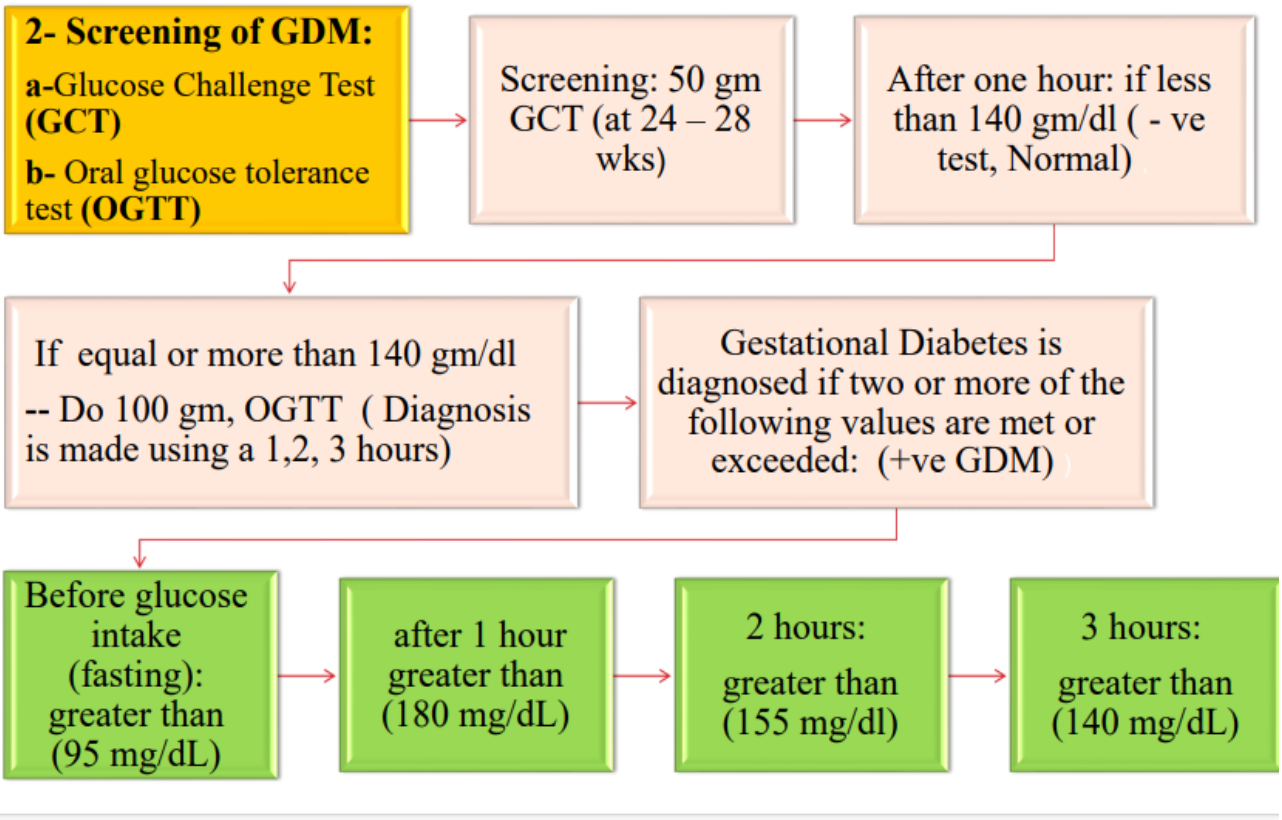
DIAGNOSIS & SCREENING OF GDM

The American College of Obstetricians and Gynecologists (ACOG) currently recommend : first prenatal visit and additional screening of all high-risk pregnant women again at 24 to 28 weeks

1-Clinically θ High risk of DM (+ve family history, obesity,..) Sign and Symptoms (polyuria, polyphagia, polydipsia , weight loss…)

2- Screening of GDM:

3- U/S for Macrosomia, Polyhydramnios.



Treatment of DM and GDM

Women with diabetes need comprehensive prenatal care. The primary goals of care are to maintain glycemic control and minimize the risks of the disease on the fetus. Eating healthy diet, Taking insulin, Monitoring of blood glucose levels and Close maternal and fetal surveillance .

Delivery : Depends on Glycemic Control:

1- Good control→→→→ till 40 wks.

2- Mild uncontrolled →→→→ terminate at 37 wks.

3- Severe uncontrolled cases →→→→ terminate before 37 wks after giving steroids for lung maturity.

4- C/S

NURSING CARE

1. Encourage to regular prenatal visit.

2. Obtain a finger-stick to monitor blood glucose level and give themselves insulin (technique, frequency, dose)

3. Daily Fetal kick count. Document them and report any decrease in activity, do U/S for assess well-being

(fetal growth, activity, amniotic fluid volume)

4. Encourage the client to drink 8-10 glasses of water each day to prevent bladder infection.

5. Urine check for protein (evaluation for preeclampsia)

6. Avoid (cake, candy), which raise blood glucose levels

7. Encourage the women to do Exercise(may lessen the need for dose of insulin NURSING CARE

8. During labor, woman with pre-gestational or gestational diabetes (Monitor blood glucose levels every 1 to 2 hours, Monitor fetal heart rate, Assess maternal vital signs every hour, assess urine output with an indwelling catheter.)

9- After birth, monitor blood glucose levels every 2 to 4 hours for the first 48 hours to determine the woman's insulin need and continue intravenous fluid administration as ordered. Encourage breast-feeding to assist in maintain good glucose control.

Anemia and pregnancy

Commonest medical disorder during pregnancy

Anemia is define decrease in the number of red blood cell, is measured by hematocrit(Hct), or a decrease in the concentration of hemoglobin (Hgb), this results in reduced capacity of the blood to carry oxygen to the vital organs of the mother and fetus. Hemoglobin less than 12 gm/dl in non-pregnant women, and less than 11 gm/dl in pregnant women

Types of Anemia:

1-Physiological.This is because the plasma volume expansion is greater than red blood cell (RBC) mass increase which causes hemodilution , (++ plasma > + RBCs)

2- Iron deficiency anemia(Nutritional) COMMONEST.

3.Folic acid. & Vit B12 deficiency (Megaloblastic anemia)

4.Hemorrhagic (bleeding in early, late pregnancy & PPH)

5.Thalassemia , sickle cell anemia(Hereditary)

6-Hemolytic anemia (RBC are destroyed faster than they can be made)

Anemia during pregnancy is considered:

1-Mild: hemoglobin concentration is 10.0 - 10.9 gm/dl,

2-Moderate: hemoglobin concentration is 7.0 - 9.9 gm/dl

3.Severe: hemoglobin concentration is 4-7.0 gm/dl

4.Verey sever (less than 4gm/dl).

Iron Deficiency Anemia

Dietary iron is needed to synthesize hemoglobin. Because hemoglobin is necessary to transport oxygen, a deficiency of iron may affect the body's transport of oxygen. Without enough iron, the body can't produce enough hemoglobin.

-Approximately 200mg of iron will be conserved because of the functional amenorrhea of pregnancy.

-Pregnant women needs approximately 1000 mg more iron intake during pregnancy. * 300- 400 mg of iron transferred to the fetus.

*500 mg is needed for the increased RBC mass.

*100 mg is needed for the placenta

*280 mg is needed to replace the 1 mg of iron lost daily through feces, urine, and sweat

Etiology Iron Deficiency Anemia during Pregnancy

1. Decrease intake of iron (poor diet, morning sickness).
2. Lack of vitamin C and proteins.
3. Decreased gastric acidity and use of Antacids.
4. Multiple pregnancy.
5. Hemorrhage with pregnancy.

Signs and symptoms Pallor, tiredness, fatigue, dyspnea, anorexia, nausea, vomiting, lack of concentration, headaches, brittle nails

Risks of iron deficiency anemia:

*****Maternal**

1. Labor dystocia
2. Post-partum hemorrhage
3. Puerperal sepsis, poor wound healing
4. HB lower than 6 gm\dl will cause cardiac failure

*****Fetal**

1. low birth weight
2. Still birth
3. IUGR (Intrauterine growth restriction)
4. Premature delivery

Prevention

Iron supplements are commonly used to meet the need of pregnancy and maintain iron stores, taking 27 mg of iron orally daily.

Prevented Iron deficiency anemia, the dosage increased to 60-120 mg/day ϖ Vitamin C may be enhance absorption of iron.

Eat an iron-rich diet ¬ Mild (10.0 - 10.9 g/dl) : oral iron ¬ Moderate (7.0 - 9.9 g/dl) :parenteral iron ¬

Severe (4-7 gm/dl) , Very sever (< 4gm/dl): blood or packed RBCs

TEACHING FOR THE WOMAN WITH IRON DEFICIENCY ANEMIA

1- Take your prenatal vitamin daily; if you miss a dose, take it as soon as you remember.
2- For best absorption, take iron supplements between meals.
3- Avoid taking iron supplements with coffee, tea, chocolate, milk.
4- Eat foods rich in iron, such as :Meats, green leafy vegetables, legumes, dried fruits, whole grains, Peanut butter, whole-wheat fortified breads and cereals
5- The women is taught to take iron tablets with vitamin C to increase absorption.
6- Increase your exercise, fluids, and high-fiber foods to reduce constipation.
7- Instruct the woman about adverse effects, which are predominantly gastrointestinal and include gastric discomfort, nausea, vomiting, anorexia, diarrhea, metallic taste, and constipation

Folic acid deficiency Anemia ϖ Folic acid is necessary red blood cell and neural tube formation. Maternal needs for folic acid double during pregnancy in response to the demand for greater production of erythrocytes and fetal and placental growth. **Folic acid deficiency** is characterized by Low levels of folic acid can cause megaloblastic anemia. With this condition, red blood cells are larger than normal, and are fewer in number They are also oval-shaped, not round. Sometimes these red blood cells don't live as long as normal red blood.

Folic acid deficiency Anemia : An inadequate intake of folic acid has been associated with:

1- Neural tube defects (spina bifida, anecephaly and meningomyelocele) in baby.
2- Cleft lip, cleft palate
3- Intrauterine growth restriction
4- Megaloblastic anemia

Folic acid deficiency Anemia ------Prophylactic measures: Supplement (0.4 gm) of folic acid orally per day are recommended for all women of childbearing and during pregnancy.

Treatment------- oral 5mg folic acid per day.

(Nursing Care: Folic acid deficiency Anemia)

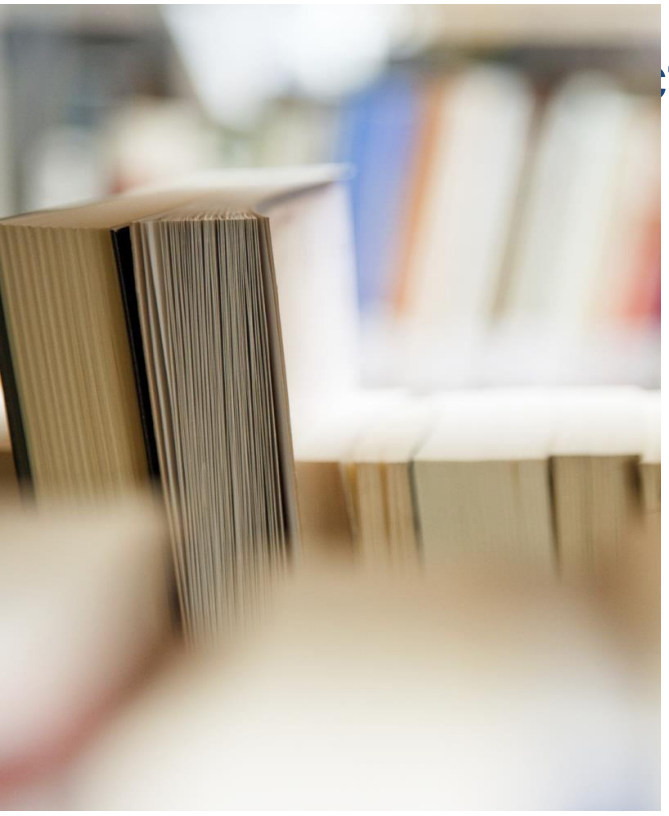
The nurse can help the pregnant women avoid folate deficiency by teaching her food sources of folic and cooking methods for preserving folic acid. The best sources are fresh leaf green, vegetables, poultry,

legumes Fruits like lemons, bananas, and melons.

Lecture 5

Nursing care of a Familyduring Labor and Birth

2023-2024



ctives

1. Identify common theories explaining the onset of labor
2. National Health Goals related to safe labor and birth that nurses can help the nation achieve.
3. Identify the premonitory signs of labor.
4. Compare and contrast true versus false labor.
5. Categorize the factors affecting labor and birth.
6. Analyze the cardinal movements of labor.
7. Differentiate among the four stages of labor.
8. Evaluate the maternal and fetal responses to labor and birth.
9. Characterize danger sings of labor
10. Analyze the nurse's role throughout the labor and birth process.

□

Labor overview

- Labor is the series of events by which uterine contractions and abdominal pressure expel a fetus and placenta from a woman's body.
- Regular contractions cause progressive dilation of the cervix and sufficient muscular force to allow the fetus to be pushed to the outside.it is a time of change, both an ending and a beginning, for a woman, a fetus, and her family.
-

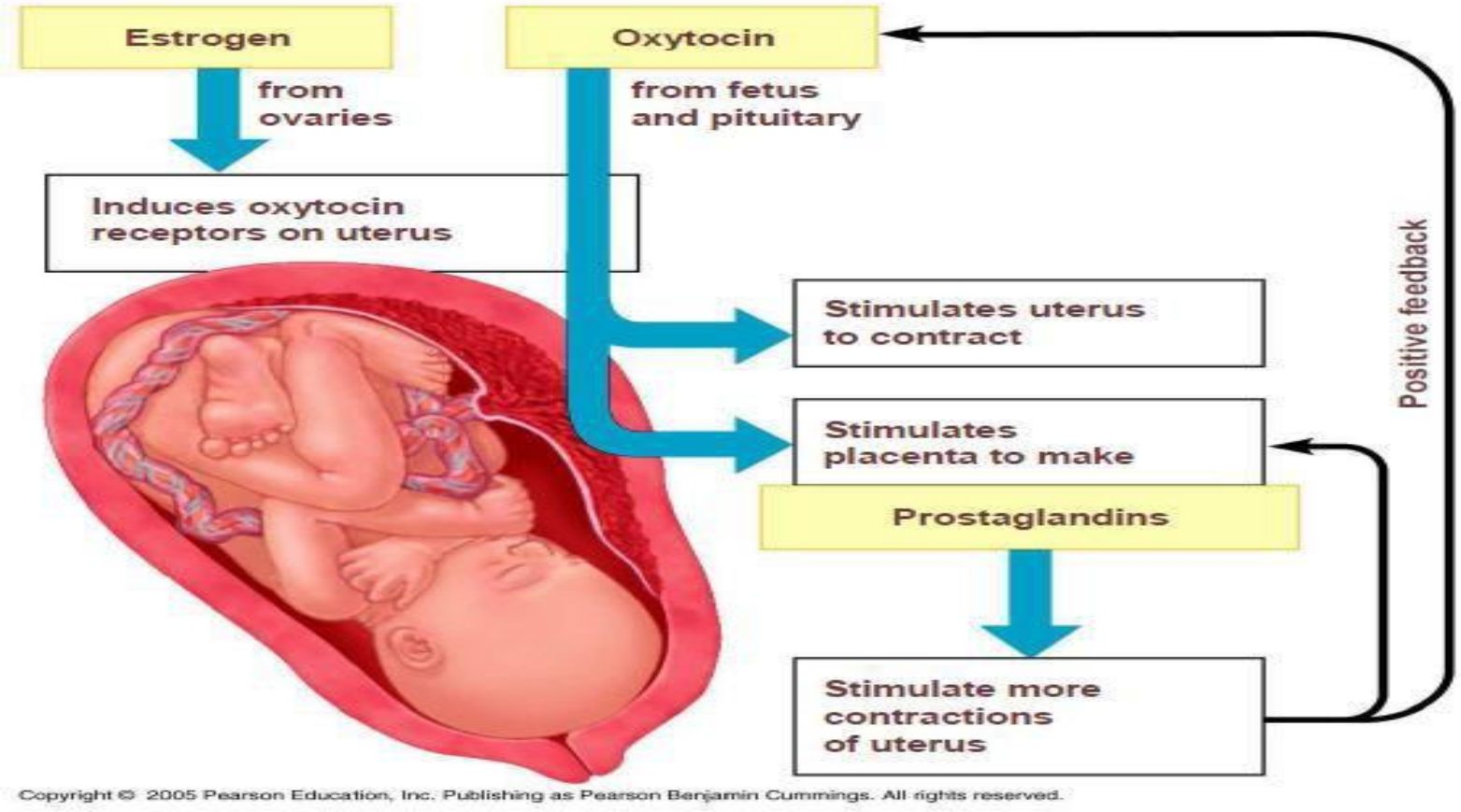
labor usually begins:

- Spontaneously, in about **(280)** days after conception
- Artificial means if the pregnancy continues past **(42)** weeks gestation.
- The average length of labor is about **(14)** hour for a first pregnancy and about **(8)** hours in subsequent pregnancies.

The initiation of labor (Theories)

Labor is influenced by combination of factors include:

- Uterine muscle stretching result in release of prostaglandins.
- Pressure on the cervix, which stimulates release of oxytocin.
- Oxytocin work together with prostaglandins to initiate contractions



National Health Goals

- Because labor and birth are high-risk times for both a fetus and a mother, several National Health Goals speak
- directly to them:

- • Reduce the rate of maternal deaths to no more than 3.3 per 100,000 live births, from a baseline of 7.1 per 100,000.

- • Reduce the rate of fetal deaths at 20 or more weeks' gestation to no more than 4.1 per 1000 live births, from a baseline of 6.8 per 1000.

- • Reduce the rate of fetal and infant deaths during the perinatal period (28 weeks' gestation to 7 days after birth) to no more than 4.5 per 1000 live births, from a baseline of 7.5 per 1000 live births

Premonitory signs of labor

1. Lightening

Breathing is much easier

Increased pelvic pressure

Shooting leg pains

increase in vaginal discharge

More frequent urination

In primigravida it occurs**10-14** days before labor begins.

When it occurs?

In Multiparas it occurs on the day of labor

2. Slight Loss of Weight

Premonitory signs of labor

As progesterone level falls, body fluid is more easily excreted from the body. This increase in urine production can lead to a weight loss between 1 and 3 pounds..

Premonitorysigns of labor

3. Increased in level of activity

such as cleaning, cooking, preparing the nursery, and spending extra time with other children in the household

Premonitory signs of labor

4. Braxton Hicks Contractions

the contractions are irregular and can be decreased by walking, voiding, eating, increasing fluid intake, or changing position. Braxton Hicks contractions usually last about 30 seconds but can persist for as long as 2 minutes

Premonitory signs of labor

5. Ripening of the Cervix

is an internal sign seen only on pelvic examination. Throughout pregnancy, the cervix feels softer than normal to palpation, similar to the consistency of an earlobe (Goodell's sign). At term, the cervix becomes still softer (described as "butter-soft"), and it tips forward. Cervical ripening this way is an internal announcement that labor is very close at hand.

Premonitory signs of labor

6. Spontaneous rupture of the membranes

Two risks associated with ruptured membranes are: .Intrauterine infection . Prolapsed of umbilical cord if engagement of the presenting part does not occur..

Premonitory signs of labor

7. Bloody show

At the onset of labor or before, the mucous plug that fills the cervical canal during pregnancy is expelled because of cervical softening and increased pressure of the presenting part.

Premonitory signs of labor

8. contractions

The contractions are involuntary and come without warning, their intensity can be frightening in early labor.

Prolapsed of umbilical cord

TABLE 15.1 ✻ Differentiation Between True and False Labor Contractions

False Contractions	True Contractions
Begin and remain irregular.	Begin irregularly but become regular and predictable.
Felt first abdominally and remain confined to the abdomen and groin.	Felt first in lower back and sweep around to the abdomen in a wave.
Often disappear with ambulation or sleep.	Continue no matter what the woman's level of activity.
Do not increase in duration, frequency, or intensity.	Increase in duration, frequency, and intensity.
Do not achieve cervical dilatation.	Achieve cervical dilatation.

Components of labor

Traditionally, the critical factors that affect the process of labor and birth are outlined as the “4 P’s”:

1. Passag (birth canal)

2. Passenger (fetus and placenta)

3. Powers (contractions)

4. Psychological response

The passage **Passage (birth canal):**
refers to the route a fetus must travel from the uterusthrough the cervix and vagina to the external perineum

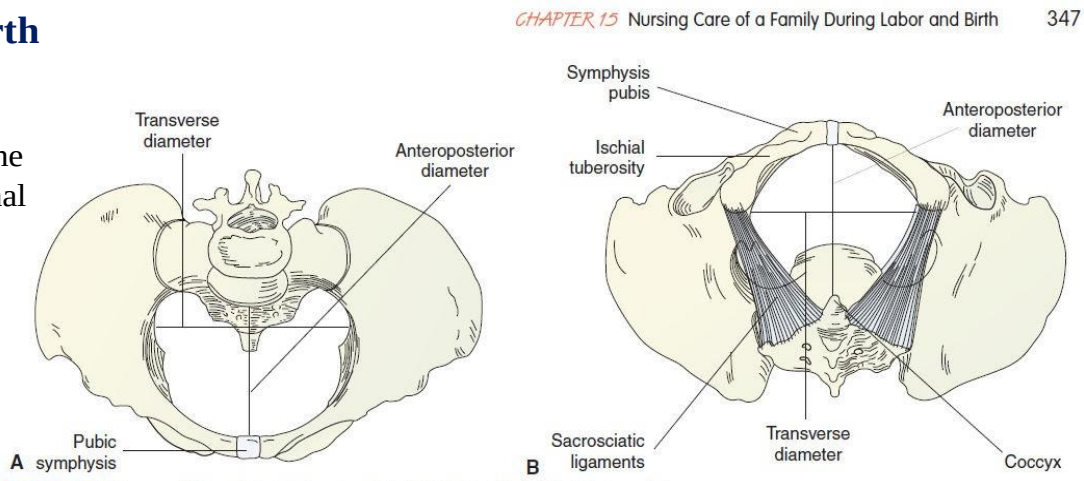
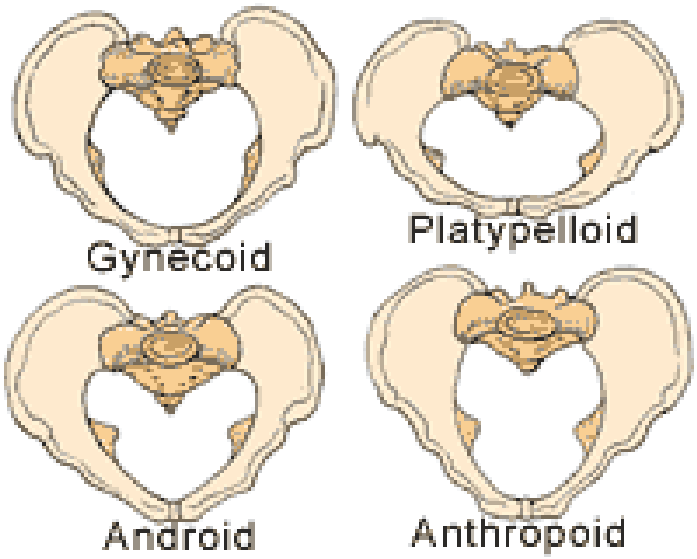


FIGURE 15.1 Views of the pelvic inlet and outlet. (**A**) Pelvic inlet. (**B**) Pelvic outlet.

The adequacy of the pelvic size: the diagonal conjugate (the anteroposterior diameter of the inlet) and the transverse diameter of the outlet. At the pelvic inlet, the anteroposterior diameter is the narrowest diameter; at the outlet, the transversediameter is the narrowest

Pelvic Shape



Passenger

The passenger is the fetus. The body part of the fetus that has the widest diameter is the head,

- **a.** Structure of the Fetal Skull
- The cranium, the uppermost portion of the skull, is composed of eight bones. The four superior bones—the frontal (two fused bones), the two parietal, and the occipital are the bones that are important in childbirth. The

other four bones of the skull (sphenoid, ethmoid, and two temporal bones) lie at the base of the cranium so are of little significance in childbirth because they arenever presenting parts.

The chin, referred to by its Latin name mentum, can be a presenting part.

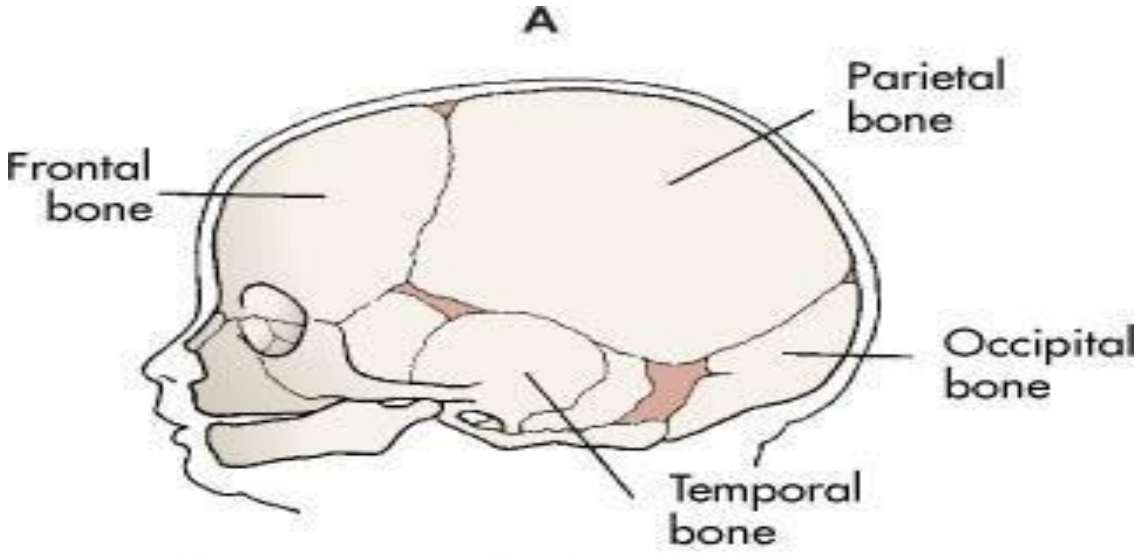


Fig. 18-1A Fetal head at term. Bones.

Passenger

b. Sutures – The suture lines are important in birth because, as membranous interspaces, they allow the cranial bones to move and overlap, molding or diminishing the size of the skull so that it can pass through the birth canal more readily..

1.) **Sagittal suture** – connects 2 parietal bones

2.) **Coronal suture** – connect frontal & 2 parietal bone

3.) **Lambdoidal suture** – connects occipital &2 parietal bone

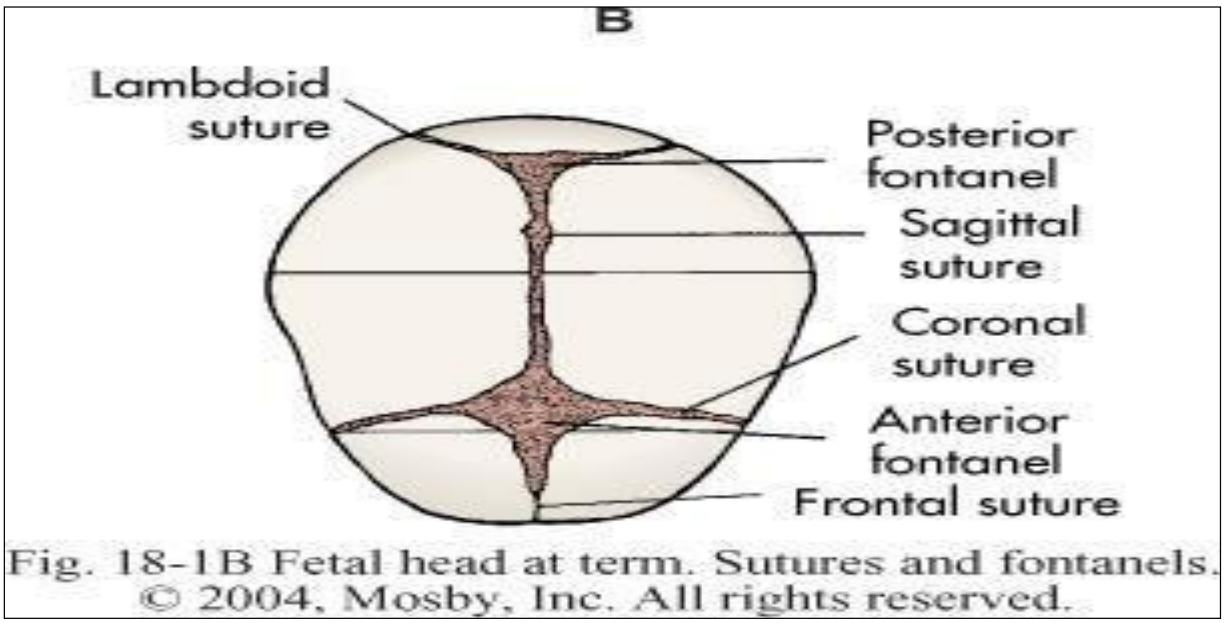


Fig. 18-1B Fetal head at term. Sutures and fontanels.

Passenger

Significant membrane-covered spaces called the fontanelles

The anterior fontanelle (sometimes referred to as the bregma)

- ✓ lies at the junction of the coronal and sagittal sutures.
- ✓ is diamond shaped.
- ✓ Its anteroposterior diameter measures approximately 3 to 4 cm; its transverse diameter, 2 to 3 cm.
- ✓ It closes when the infant is 12 to 18 months of age.

The posterior fontanelle

- ✓ lies at the junction of the lambdoidal and sagittal sutures
- ✓ is triangular shaped.
- ✓ It is smaller than the anterior fontanelle, measuring approximately 2 cm across its widest part.
- ✓ it closes when an infant is about 2 months of age.

Fontanelle spaces compress during birth to aid in molding of the fetal head. Their presence can be assessed manually through the cervix after the cervix has dilated during labor. Palpating for them during a pelvic examination helps to establish the position of the fetal head and whether it is in a favorable position for birth.

The space between the two fontanelles is referred to as the vertex. The area over the frontal bone is referred to as the sinciput.

The area over the occipital bone is referred to as the occiput

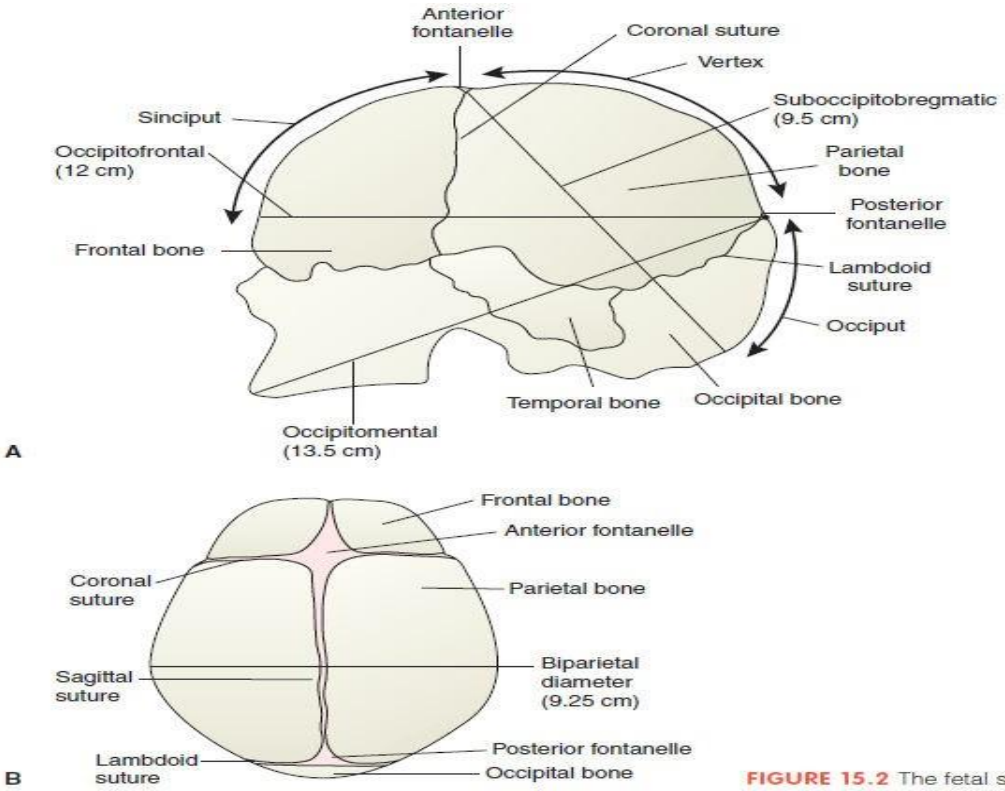


FIGURE 15.2 The fetal skull. (**A**) Lateral view. (**B**) Vertex view.

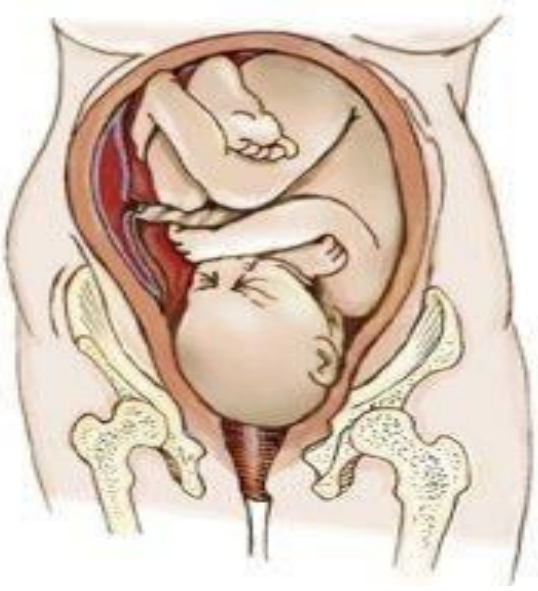
Molding

- **Molding** is a change in the shape of the fetal skull produced by the force of uterine contractions pressing the vertex of the head against the not- yet-dilated cervix.
- facilitates passage through the rigid pelvis. Molding is commonly seen in infants just after birth.

Fetal Presentation and Position

Fetal attitude

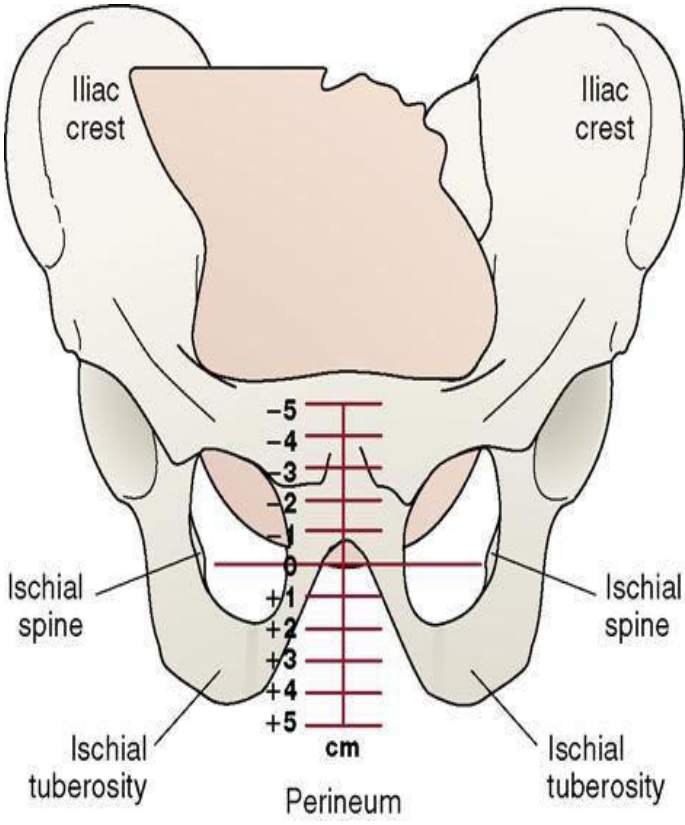
Attitude. describes the degree of flexion a fetus assumesduring labor or the relation of the fetal parts to each other .A fetus in good attitude is in complete flexion: the spinal column is bowed forward, the head is flexed forward so much that the chin touches the sternum, the arms are flexed and folded on the chest, the thighs are flexed onto the abdomen. This normal "fetal position" is advantageous for birth because it helps a fetus presentthe smallest anteroposterior diameter of the skull to the

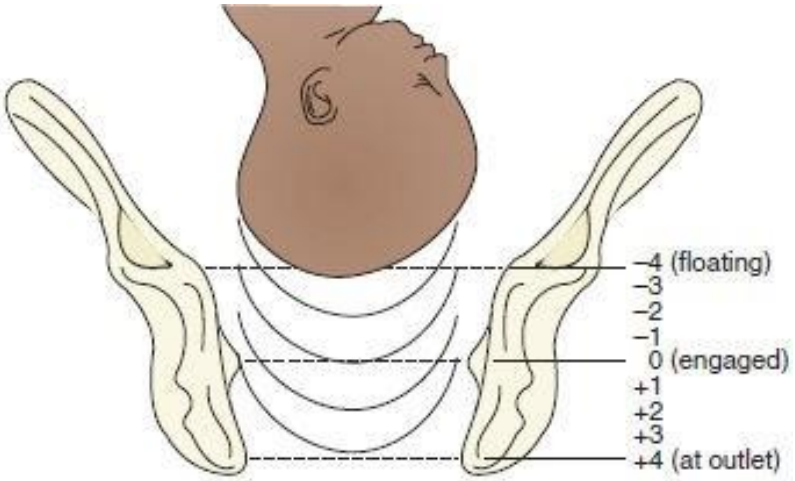


Engagement

- Engagement refers to the settling of the presenting part of a fetus far enough into the pelvis to be at the level of the ischial spines, a midpoint of the pelvis. Descent to this point means that the widest part of the fetus (the biparietal diameter in a cephalic presentation; the intertrochanteric diameter in a breech presentation) has passed through the pelvis inlet or the pelvic inlet has been proved adequate for birth.
- In a primipara, nonengagement of the head at the beginning of labor indicates a possible complication, such as an abnormal presentation or position, abnormality of the fetal head, or cephalopelvic disproportion.
- In multiparas, engagement may or may not be present at the beginning of labor.
- A presenting part that is not engaged is said to be “floating.”

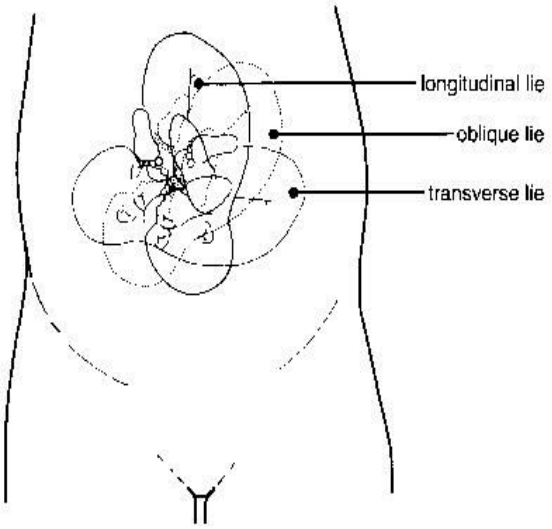
Station. **Station** refers to the relationship of the presenting part of a fetus to the level of the ischial spines When the presenting fetal part is at the level of theischial spines, it is at a 0 station .If the presenting part is above the spines, the distance is measured and described as minus stations, which range from 1 to 4 cm. (synonymous with engagement). If thepresenting part is below the ischial spines, the distance is stated as plus stations (1 to 4 cm).
At a 3 or 4 station, the presenting part is at theperineum and can be seen if the vulva is separated (i.e., it is crowning).





Fetal Lie

Lie is the relationship between the long(cephalocaudal) axis of the fetal body and the long(cephalocaudal) axis of a woman's body; in other words, whether the fetus is lying in a horizontal (transverse) or a vertical (longitudinal) position. Approximately 99% of fetuses assume a longitudinal lie (with their long axis parallel to the long axis of the woman). Longitudinal lies are further classified as cephalic, which means the head will be the first part to contact the cervix, or breech, with the breech, or buttocks, as the first portion to contact the cervix.

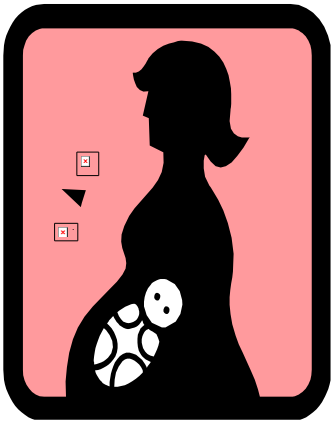


Fetal Presentation

Presentation : part of the fetus that is lowest in the pelvis inlet first

Three main fetal presentation:

- **The cephalic** (head): 95% of the term newborn
- **The breech** (pelvis): 3% of term births
- **The shoulder** (scapula): 2% of term births.



cephalic presentation

- The four types of cephalic presentation (vertex, brow, face, and mentum) are described in Table 15.2. The vertex is the ideal presenting part, because the skull bones are capable of effectively molding to accommodate the cervix. This may actually aid in cervical dilatation and prevents complications such as a prolapsed cord (i.e., a portion of the cord passing between the presenting part and the cervix and entering the vagina before the fetus

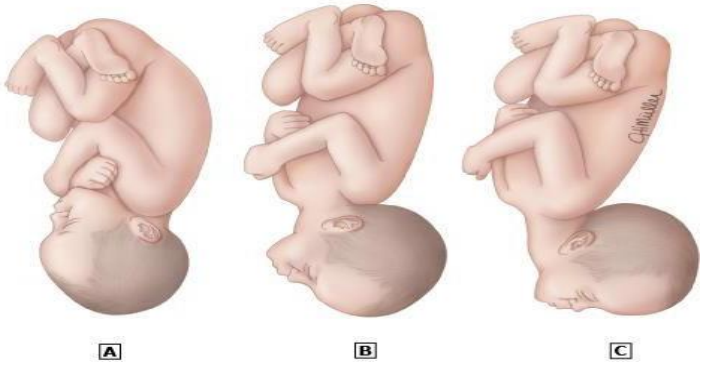
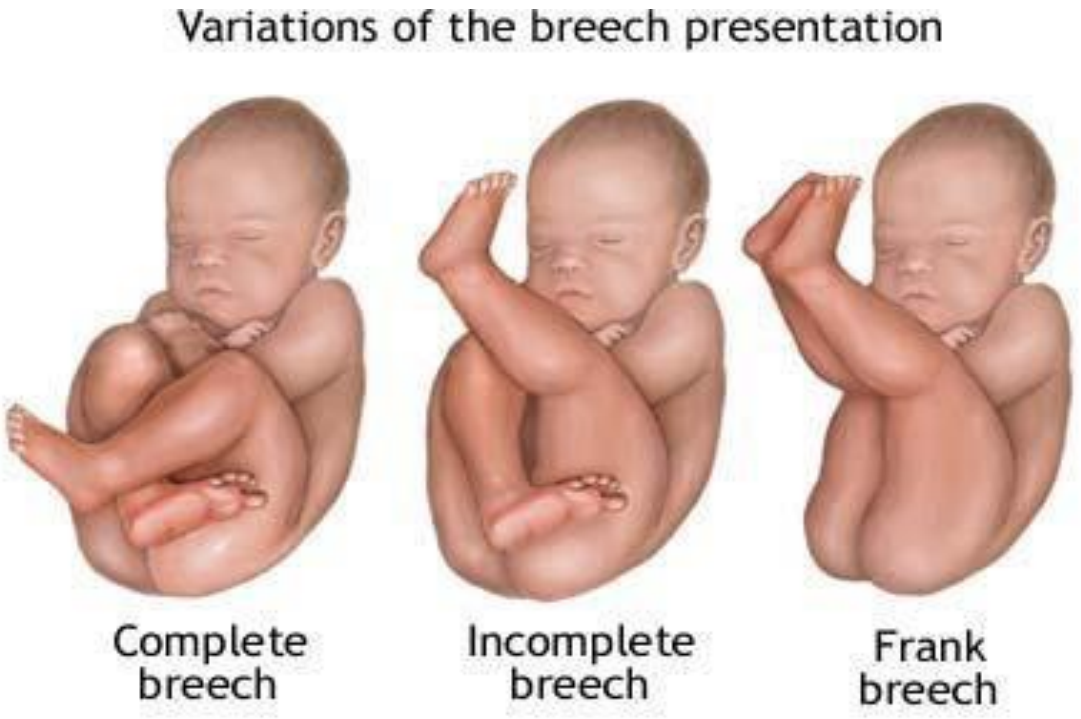
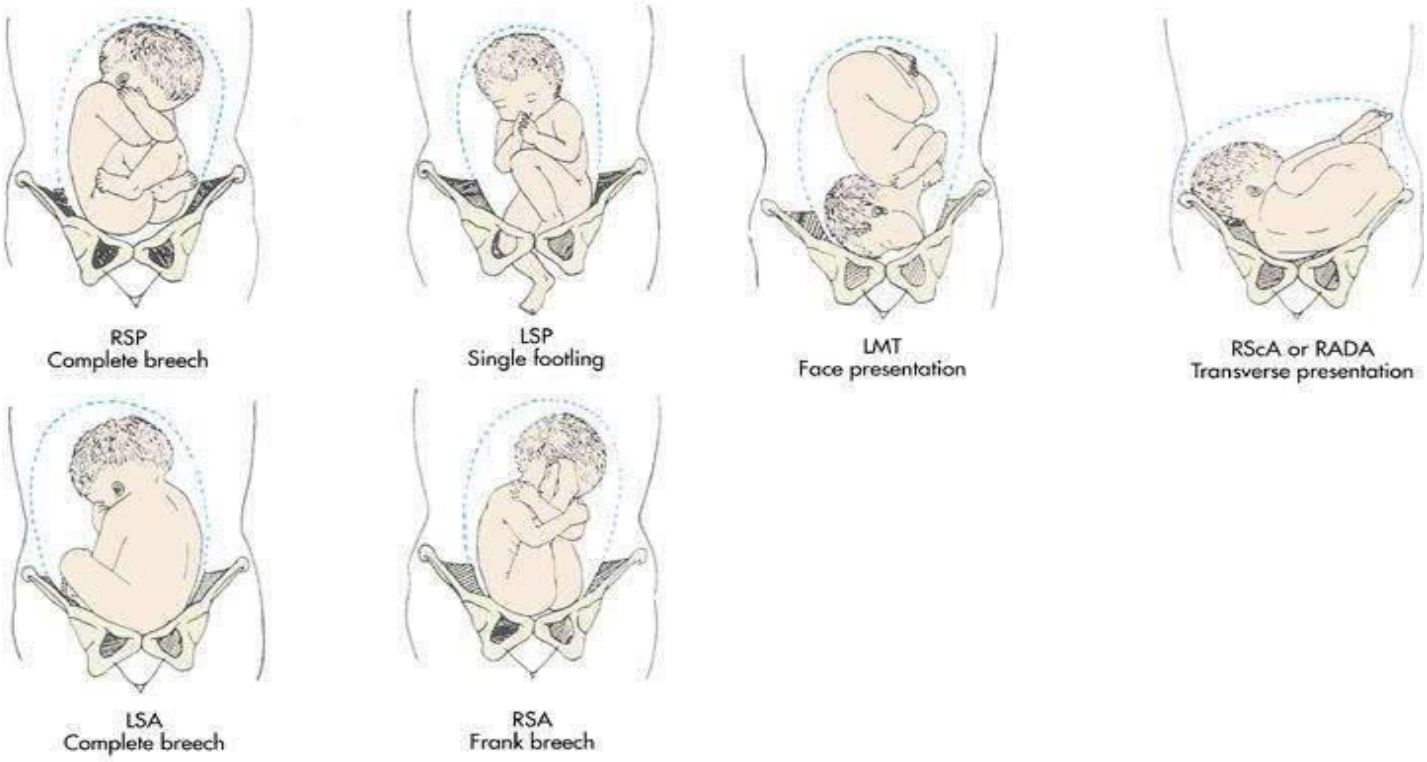


TABLE 15.2 ✻ Types of Cephalic Presentation

Type	Lie	Attitude	Description
Vertex	Longitudinal	Good (full flexion)	The head is sharply flexed, making the parietal bones or the space between the fontanelles (the vertex) the presenting part. This is the most common presentation and allows the suboccipitobregmatic diameter to present to the cervix.
Brow	Longitudinal	Moderate (military)	Because the head is only moderately flexed, the brow or sinciput becomes the presenting part.
Face	Longitudinal	Poor	The fetus has extended the head to make the face the presenting part. From this position, extreme edema and distortion of the face may occur. The presenting diameter is so wide that birth may be impossible.
Mentum	Longitudinal	Very poor	The fetus has completely hyperextended the head to present the chin. The widest diameter (occipitomental) is presenting. As a rule, a fetus cannot enter the pelvis in this presentation.





(From Novak, J.C., Broom, B.L. [1995]. *Ingalls & Salerno's maternal and child health nursing*. [8th ed.]. St. Louis: Mosby.)

Shoulder Presentation. In a transverse lie, a fetus lies horizontally in the pelvis so that the longest fetal axis is perpendicular to that of the mother. The presenting part is usually one of the shoulders (acromion process), an iliac crest, a hand, or an elbow

Fetal position

Position is the relationship of the presenting part to a specific quadrant of a woman's pelvis, the maternal pelvis is divided into four quadrants according to the mother's rightand left:

(a) right anterior
(b) left anterior
(c) right posterior
(d) left posterior.

Four parts of a fetus have been chosen as landmarks to describe the relationship of thepresenting part to one of the pelvic quadrants.

a) In a vertex presentation, the occiput is the chosen point;
b) in a face presentation, it is the chin (mentum)
c) in a breech presentation, it is the sacrum
d) in a shoulder presentation, it is the scapula or the acromion process.

- Position is indicated by an abbreviation of three letters.
- **The middle letter denotes the fetal landmark**

(O for occiput, M for mentum or chin, Sa for sacrum, and A for acromion process).

- **The first letter defines whether the landmark is pointing to the mother's right (R) or left (L).**
- **The last letter defines whether the landmark points anteriorly (A), posteriorly(P), or transversely (T).**
- If the occiput of a fetus points to the left anterior quadrant in a vertex position, for example, this is a left occipitoanterior (LOA) position.
- If the occiput points to the right posterior quadrant, the position is right occipitoposterior (ROP).
- LOA is the most common fetal position, and right occipitoanterior (ROA) the second most frequent.

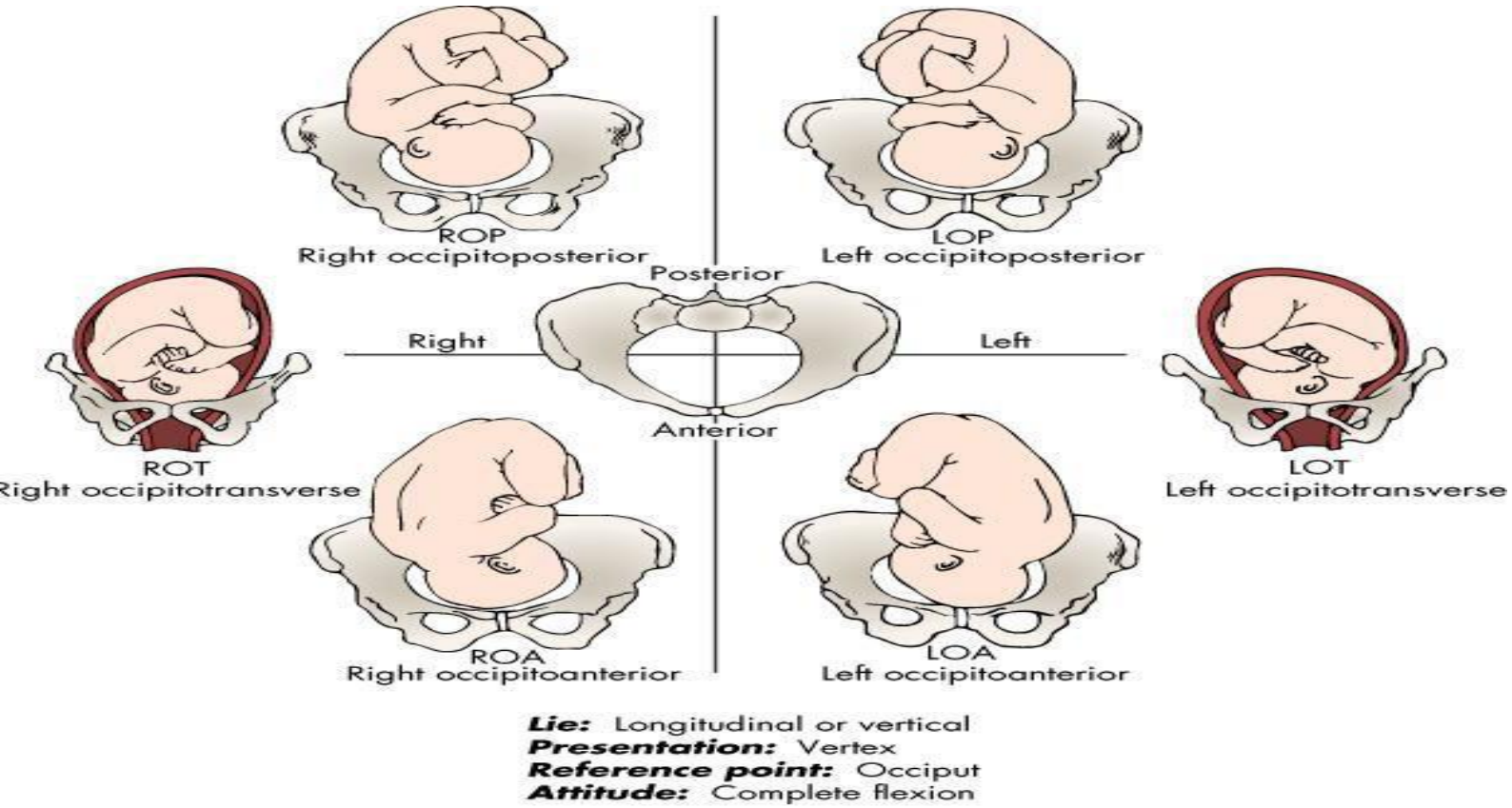
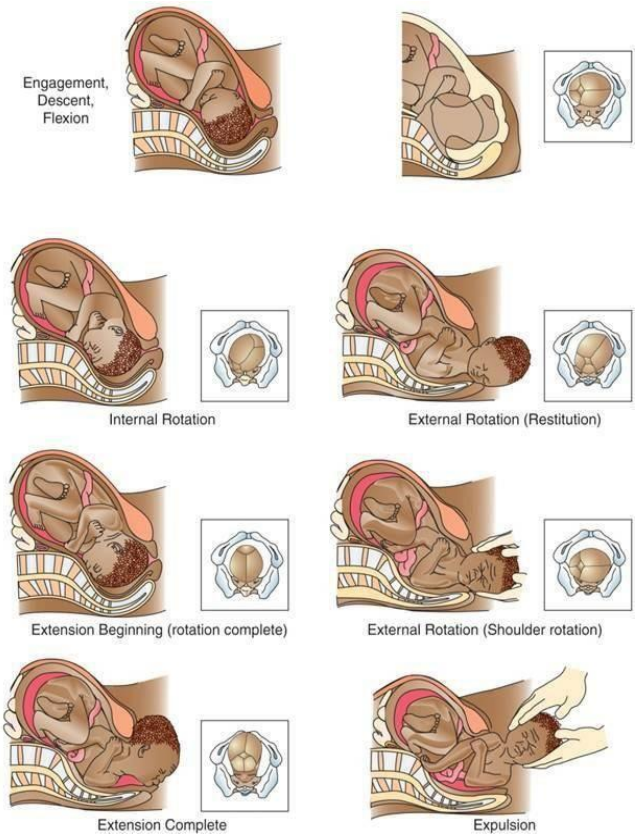


Fig. 18-2 Fetal vertex (occiput) presentations in relation to front,back, or side of maternal pelvis.

Cardinal movement of labor: Mechanism of labor



Engagement

Occurs when the biparietal diameter of the fetus's head passes through the pelvic inlet (usually 0 stations).

Descent

Is the downward movement of the fetal head through the pelvic inlet.

Flexion

Occurs when the head is flexes so the chin is brought into contact with the fetal thorax and the presenting diameter is changed from.

Internal Rotation

The head rotates about 45 degrees anteriorly to the midline under the symphysis.

Extension.

The head emerges through extension under the symphysis pubis along with the shoulders.

External rotation.

External rotation of the fetal head allows the shoulders to rotate internally to fit the maternal pelvis.

Expulsion

Occurs more smoothly after the birth of the head and the anterior and

posterior shoulders.

Importance of Determining Fetal Presentation and Position

- It is important to document fetal presentation and position,because these help
- predict if the presentation of a body part other than the vertex could be putting a fetus at risk. If a body part other than the vertex presents to the cervix, labor is invariably longer because of ineffective descent of the fetus, ineffective dilatation of the cervix, or irregular and weak uterine contractions.
- It may also lead to early rupture of membranes, increasing the possibility of infection, fetal anoxia, and meconium staining, complications that lead to respiratory distress at birth and may require cesarean birth.
- If a cesarean birth is necessary and postoperative complications occur, a woman may require a longer hospital stay and have more pain and disability after the birth.
- If a fetus is born vaginally after a complicated labor, there is an increased risk for perineal tears or cervical lacerations, which may also increase a woman's disability and possibly interfere with her future childbearing
- If labor is threatening and unsatisfactory, it can also interfere with maternal–child bonding.

- 4 methods are used to determine fetal position, presentation,and lie:
- (a) Leopold's maneuvers
- (b) vaginal examination
- (c) auscultation of fetal heart tones
- (d) ultrasound.

The Power

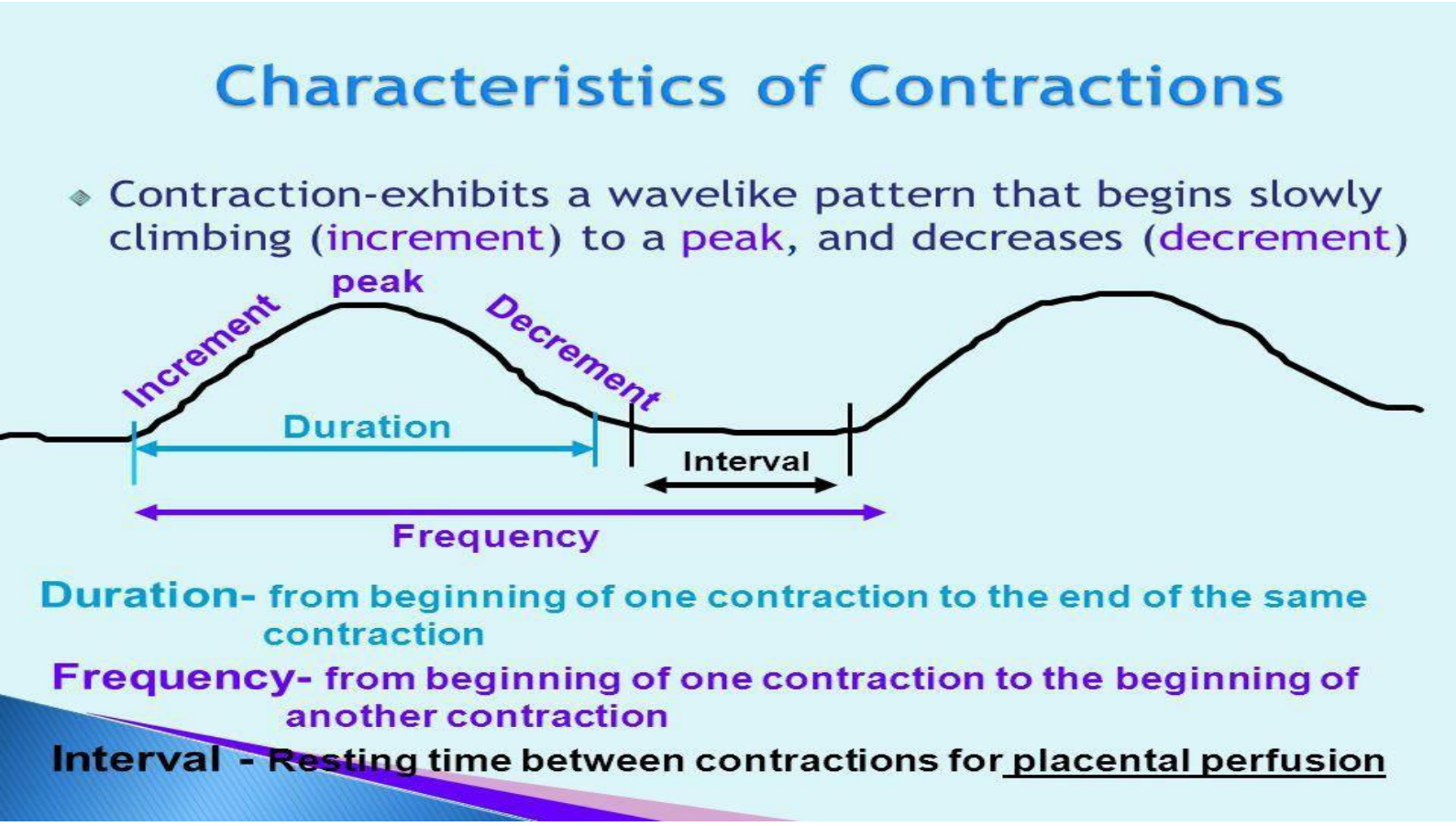
- Forces generated by uterine musculature
- Contractions cause complete dilation and effacement of the cervix.

Uterine Contractions

Uterine contraction : is involuntary and therefore cannot be controlled by the experiencing women. Ut. Cont. is intermittent and rhythmic with a period of relaxation. Uterine contraction has

Three phases:

- **Increment:** building up of the contraction
- **Acme:** peak or highest intensity
- **Decrement:** descent or relaxation of the uterine muscle fibers



Assessment of Contractions

- **Palpation:** Use the fingertips to palpate the fundus of the uterus
- **Mild:** Uterus can be indented with gentle pressure at peak of contraction
- **Moderate:** Uterus can be indented with firm pressure at peak of contraction (feels like chin)
- **Strong:** Uterus feels firm and cannot be indented during peak of contraction

Psychological responses

The fourth "P," or a woman's psychological outlook, refers to the psychological state or feelings that a woman brings into labor. For many women, this is a feeling of apprehension
or fright. For almost everyone, it includes a sense of excitement or awe. Women who manage best in labor typically are those who have a strong sense of self-esteem and a meaningful support
person with them. These factors allow women to feel in control of sensations and circumstances that they have not experienced previously and that may not be at all what they pictured as happening. Women without adequate support can have an experience so frightening and stressful they can develop a posttraumatic stress syndrome Encouraging women to ask questions at prenatal visits and to attend preparation for childbirth classes helps prepare them for labor. Encouraging them to share their experience after labor serves as "debriefing time" and helps them integrate the experience into their total life.

Stages of Labor

First stage

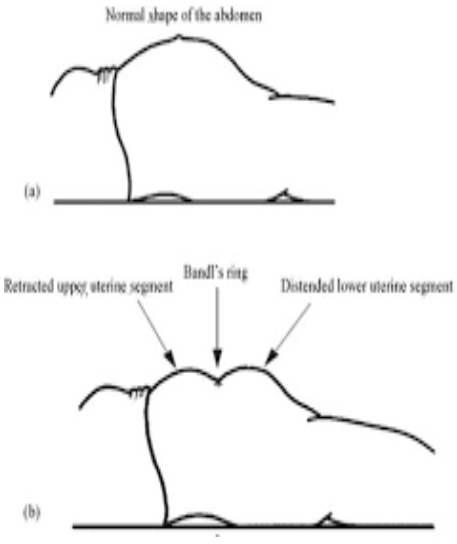
Begins with initiation of rhythmic true uterine contractions and ends with complete dilatation of cervix (10 cm). It is divided into three phases as illustrated below:

Phases Characteristics	latent phase	Active phase	Transition phase
Cervical dilation	0-3cm	4-7 cm	8-10 cm
Cervical effacement	from 0% to 40%	from 40% to 80%	from 80% to 100%
Contraction frequency	every 5–10 minute	every 2–5 minute	every 1–2 minute
Contraction duration	20–40 seconds	40–60 seconds	60-90 seconds
Contraction intensity	mild and short	moderate to palpation	strong by palpation

Danger signs of labor

<u>Fetal danger signs</u>:

- High or low fetal heart rate
- Meconium staining
- Hyperactivity
- oxygen saturation
- **<u>Maternal danger signs:</u>**
- Rising or falling blood pressure
- Abnormal pulse
- Inadequate or prolonged contractions
- Pathological retraction ring
- Abnormal lower abdominal contour
- Increasing apprehension



Maternal and fetal responses to labor
(Physiological responses)

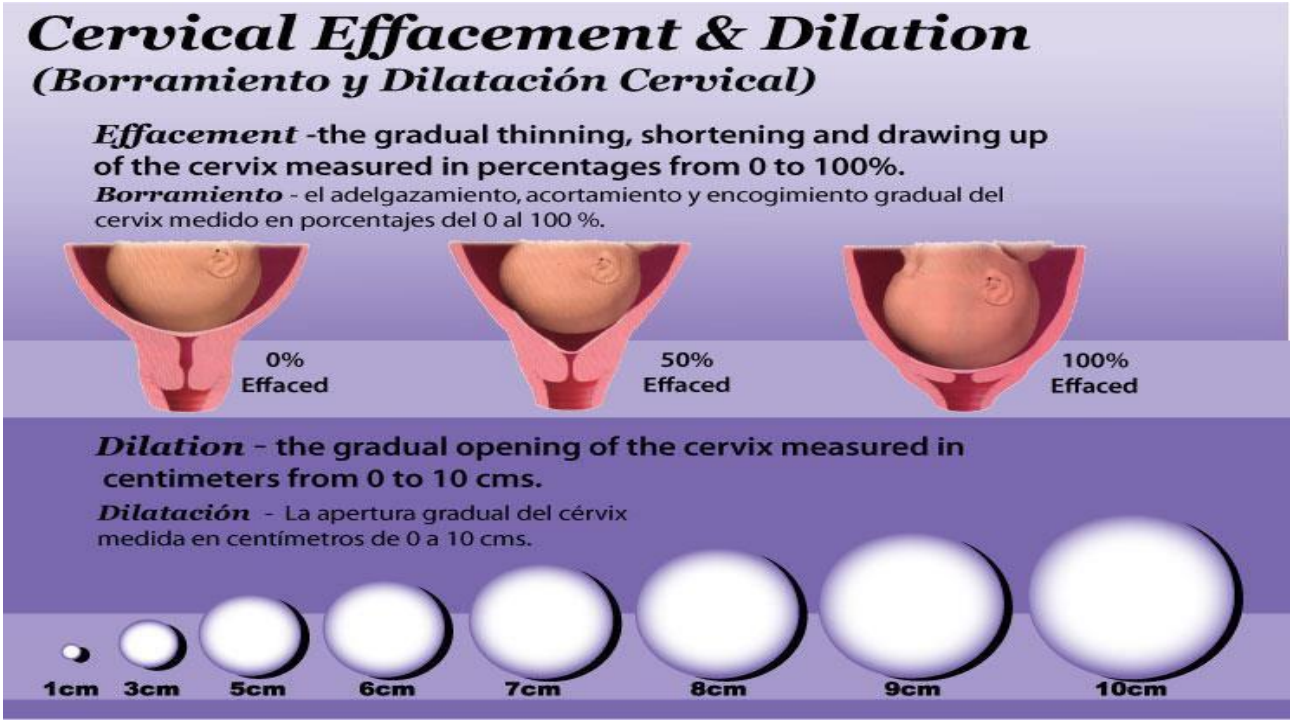
- Maternal physiologic responses include:
  - Heart rate increases by 10 to 20 bpm.
  - Cardiac output increases by 12% to 31% during the first stage of labor and by 50% during the second stage of labor.
  - Blood pressure increases by up to 35 mm Hg during uterine contractions in all labor stages.
  - The white blood cell count increases to 25,000 to 30,000 cells/mm3, perhaps because of tissue trauma.
  - Respiratory rate increases, and more oxygen is consumed related to the increase in metabolism.
  - Gastric motility and food absorption decrease, which may increase the risk of nausea and vomiting during the transition stage of labor.
  - Gastric emptying and gastric pH decrease, increasing the risk of vomiting with aspiration.
  - Temperature rises slightly, possibly due to an increase in muscle activity.
  - Muscular aches/cramps occur because of the stressed musculoskeletal system.
  - Basal metabolic rate increases, and blood glucose levels decrease because of the stress of labor

Fetal responses to labor include

- • Periodic fetal heart rate accelerations and slight decelerations related to fetal movement, fundal pressure, and uterine contractions
- • Decrease in circulation and perfusion to the fetus secondary to uterine contractions

(a healthy fetus can compensate for this drop)

- • Increase in arterial carbon dioxide pressure (PCO2)
- • Decrease in fetal breathing movements throughout labor



Second stage of labor (Fetal delivery)

2. Second stage of labor (From complete dilation (10 cm) to birth of the newborn; may last up to (2) hours in nullipara and (1) or less in multipara. This stage is consisting of two phases as show in table below.

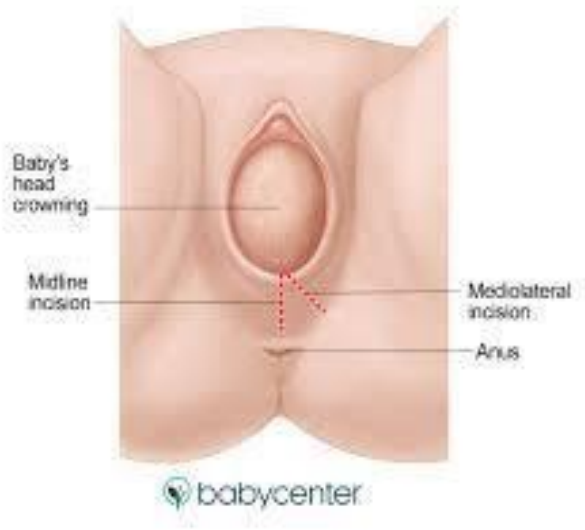
Phases of Second Stage of Labor

Phases	Pelvic phase (a period of fetal descent)	Perineal phase (a period of active pushing)
Lasting	Nullipara lasts up to 1 hour	multipara, lasts up to 30 minute
Contraction frequency	every 2-3 minute or less	
Contraction duration	60-90 second	
Contraction intensity	strong by palpation	

Stages of Labor and Delivery

Episiotomy
Surgical incision of perineum at the end of second stage of labor to:-
1- facilitate delivery and
2-to avoid laceration of perineum
3-Allows easier delivery

Most common is midline or median incision



Third stage of labor (placenta delivery)

- Is separation and delivery of the placenta; usually takes (5–10) minutes and may take up to (30) minute. **It consists of two phases:**

A. Placental separation (it means detaching from uterine wall) The signs of separation include:

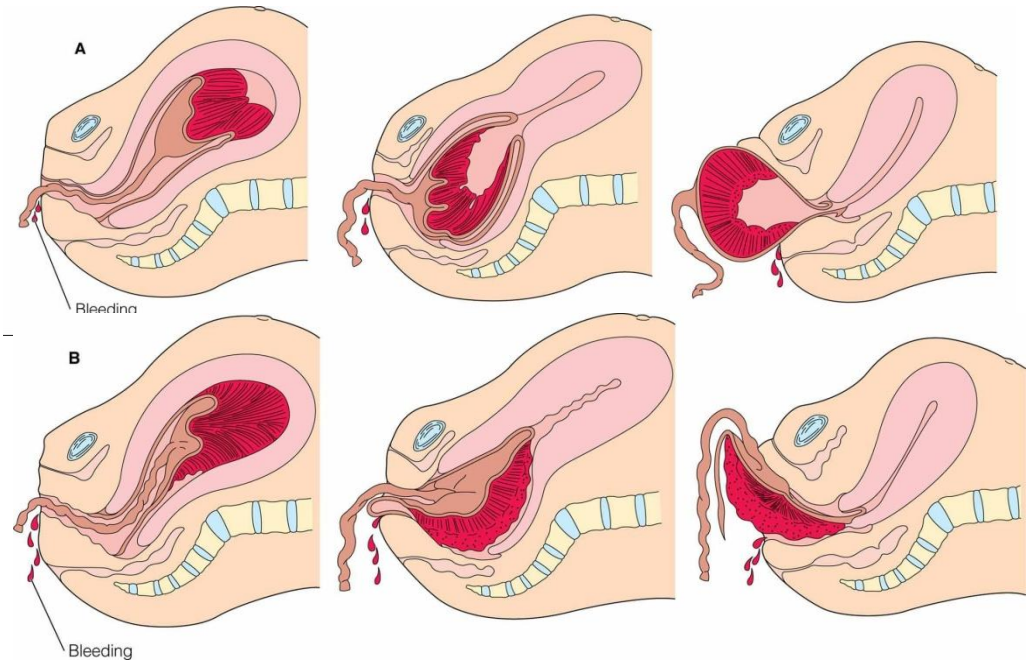
- The uterus rises upward and become globular
- The umbilical cord lengthens.
- A sudden trickle of blood from the vaginal opening.

- Spontaneous delivery of the placenta occurs in one of two ways:

- Schultz's mechanism when fetal side (shiny gray side) presenting first or called shiny Schultz's.
- Duncan's mechanism when the maternal side (red raw side) presenting first or called dirty Duncan.

B. Placental Expulsion means coming outside the vaginal opening within 2 to 30 minutes. Normal blood loss is approximately 500 ml for a vaginal birth.

Placental Delivery



Forth stage of labor

From 1–4 hours after the birth of the newborn; time of maternal physiologic adjustment).

At this stage, the mother usually experiences the following:

- The woman begins attachment process with inspecting her newborn and desiring to cuddle and breast-feed him or her.
- Usually, the mother is thirsty and hungry during this time and may request for food and drink.
- The woman will be feeling cramp-like discomfort during this time due to uterine contraction

Maternal and Fetal assessment during Labor and Delivery

- Initial Interview and Physical Examination
  - Expected date of birth
  - Frequency, duration, and intensity of contractions
  - Amount and character of show
  - Whether rupture of membranes has occurred
  - Time the woman last ate
  - Any known drug allergies
  - Past pregnancy and previous pregnancy history
  - Assess: Vital signs
  - Auscultation of Fetal Heart Sounds

- Detailed Assessment During the First Stage of Labor
  - History
  - Leopold's Maneuvers
  - Assessing Rupture of Membranes
  - Vaginal Examination
  - Ultrasound
  - Laboratory Analysis
  - Assessment of Uterine Contractions

CARE OF A WOMAN DURING THE FIRST STAGE OF LABOR

Six major concepts to make labor and birth as natural as possible are: 1. Labor shouldbegin on its own, not be artificially induced.

2. Women should be able to move about freely throughout labor, not be confined to bed.

3. Women should receive continuous support during labor.

4. No interventions such as intravenous fluid should be used routinely.

5. Women should be allowed to assume a nonsupine (e.g., upright, side-lying) position for birth.

6. Mother and baby should be together after the birth, with unlimited opportunity for breastfeeding

- Promote Change of Positions.
- Promote Voiding and Provide Bladder Care
- Support a Woman's Pain Management Needs
- Amniotomy

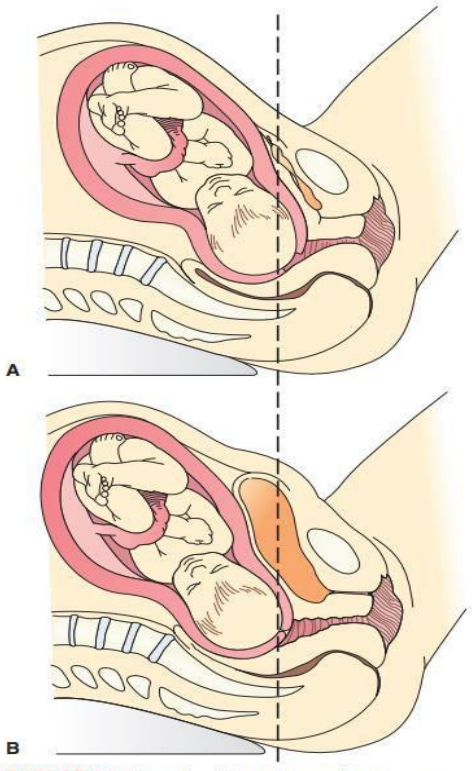


FIGURE 15.26 Effect of a full bladder on fetal descent. (**A**) Bladder is empty. (**B**) A full bladder impedes fetal progress.

Care of a woman during the second stage of labor

- **Preparing the Place of Birth**
- **Positioning for Birth**
- **Promoting Effective Second-Stage Pushing**

Pushing is usually best done from a semi-Fowler's, squatting, or "all-fours" positionrather than lying flat, to allow gravity to aid the effort

FIGURE 15.28 Positions for pushing during second stage labor. (**A**) Squatting with support person. (**B**) All-fours. (**C**) All-fours with chest support. (© Barbara Proud.)

- **Perineal Cleaning**
- **Episiotomy**
- **Cutting and Clamping the Cord**

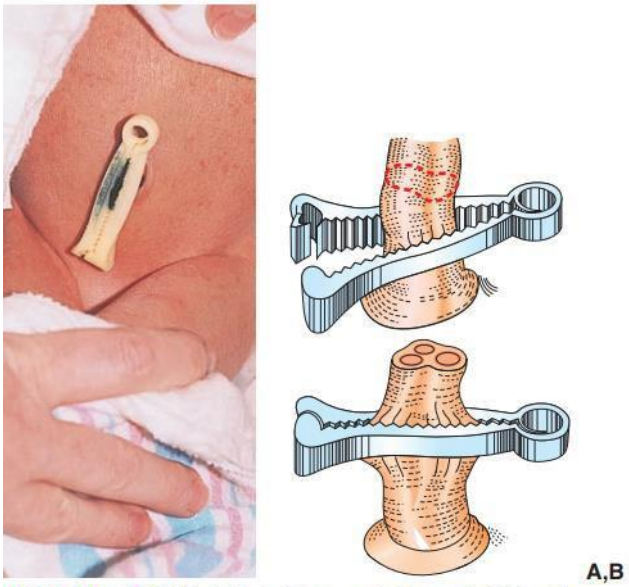


FIGURE 15.33 (**A**) Umbilical clamp applied to cord. (© Caroline Brown, RNC, MC, DEd.) (**B**) Placing clamp; locking clamp.

Care of a woman during the third and fourth stages of labor

- Placenta Delivery
- Oxytocin
- Perineal Repair
- Immediate Postpartum Assessment and

Nursing Care

- ✓ Obtain vital signs
- ✓ Palpate a woman's fundus
- ✓ observe the amount and characteristics of lochia. Perform perineal lochia, and apply a perineal pad

BOX 15.10 ✻ Focus on Pharmacology

Oxytocin (Pitocin)

Action: A synthetic form of the hormone produced by the hypothalamus and stored in the posterior pituitary. An oxytocic, it stimulates the uterus to contract to control postpartum hemorrhage (Karch, 2009).

Pregnancy Category: X

Dosage: Add 10–40 units to 1000 mL of a nonhydrating intravenous solution, or administer 10 units intramuscularly after delivery of the placenta.

Possible Adverse Effects: Hypertension, excessive uterine contractility.

Nursing Implications

- Do not administer after delivery of the placenta until the physician or nurse-midwife approves the drug's use.
- Monitor the woman for blood pressure, because hypertension can occur.

- After care

This is the beginning of the postpartal period or the fourth stage of labor. Because theuterus may be so exhausted from labor that it cannot maintain contraction, there is ahigh risk for hemorrhage during this time

Unique concerns of a woman in labor

- A Woman Without a Support Person
- A Woman Who Will Be Placing Her Baby for Adoption
- Vaginal Birth After Cesarean Birth

Lecture 6

WHo Labour Care Guide

Learning Objectives

1

By the end of the session, the learners will be able to:

2

Describe the significance of using partograph in monitoring the progress of labour, fetal and maternal condition

3

Describe the frequency of recording different parameters during labour

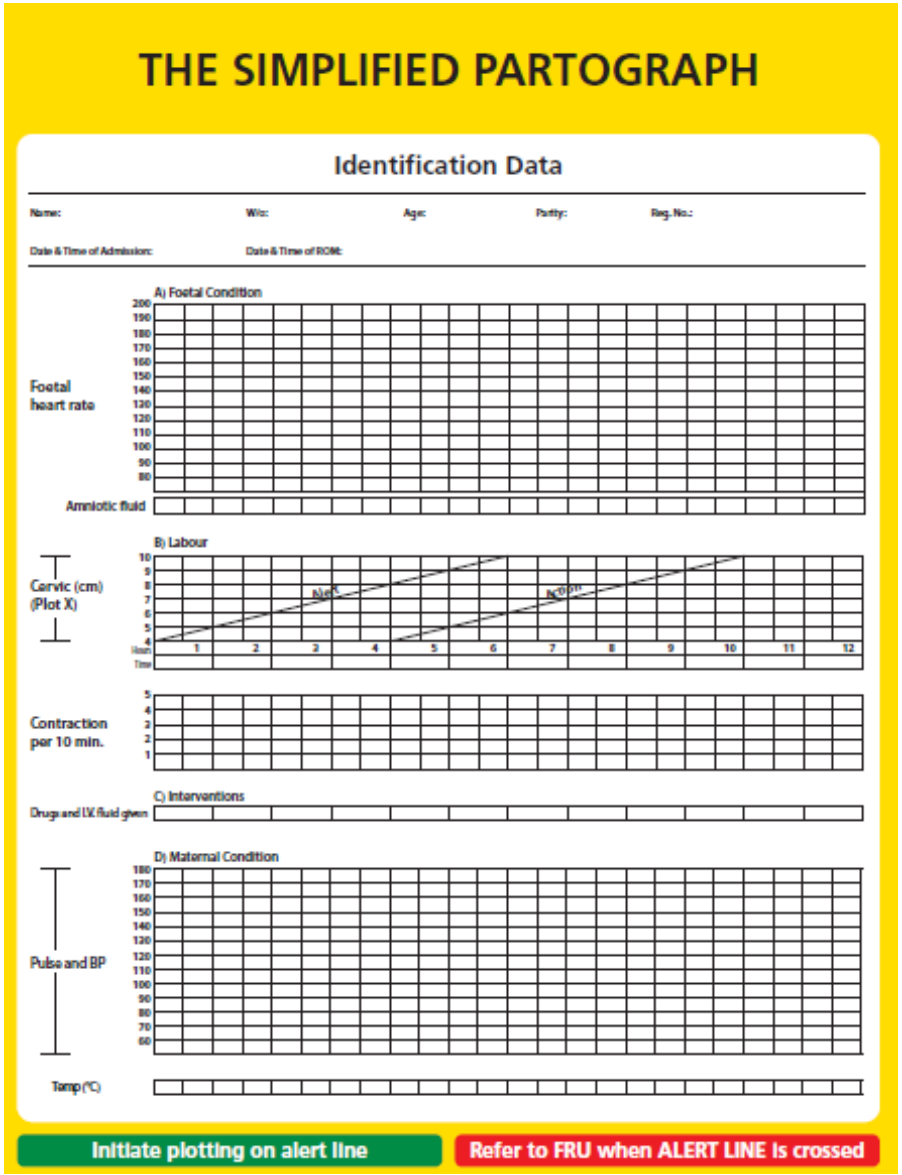
4

Plot the case study findings and interpret the filled partograph for decision making

What is a Partograph?

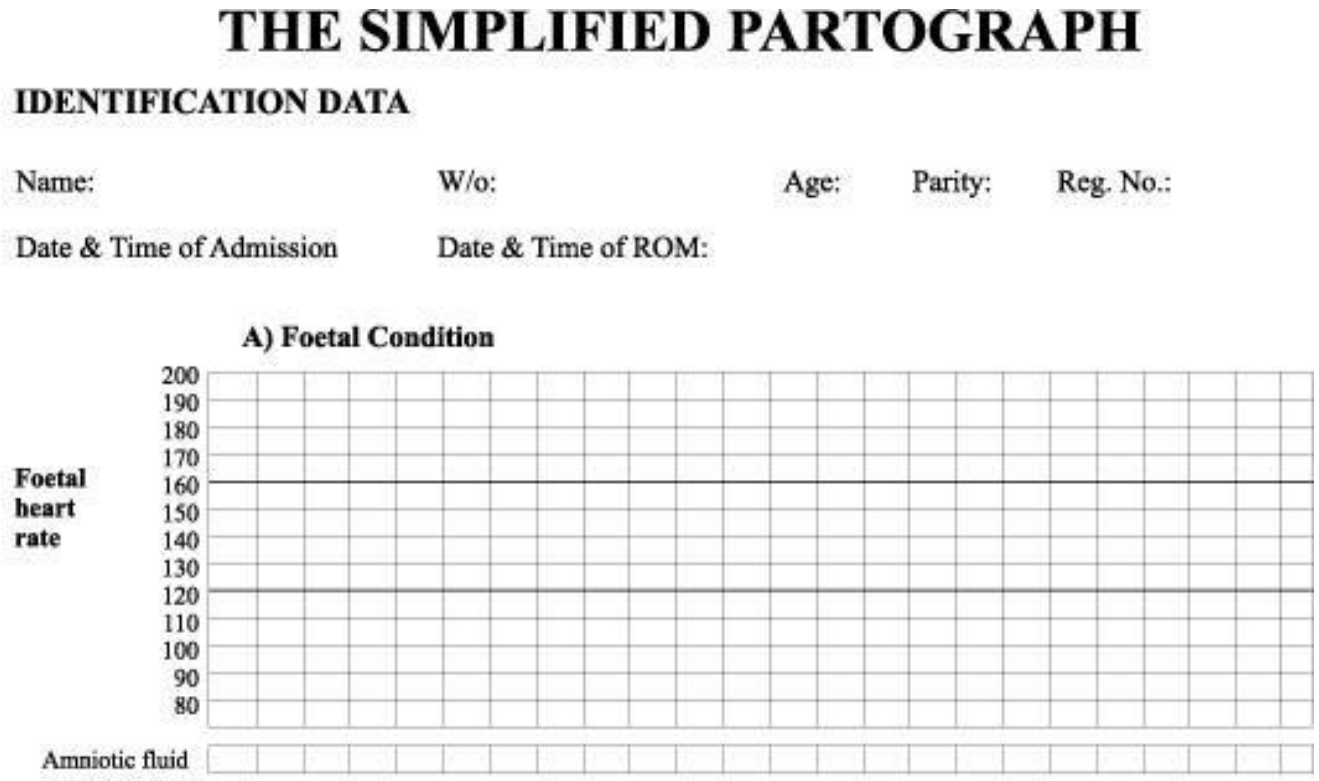
- Partograph is the most important tool for health workers at any level to assess the progress of labour and take appropriate actions
- Graphic recording of the progress of labor and condition of mother and fetus
- Labor record , thus reduces paper work
- Partogrpah is applicable for the active phase of first stage of labour i.e., from cervical dilatation >=4cm to full dilatation of cervix

THE SIMPLIFIED PARTOGRAPH



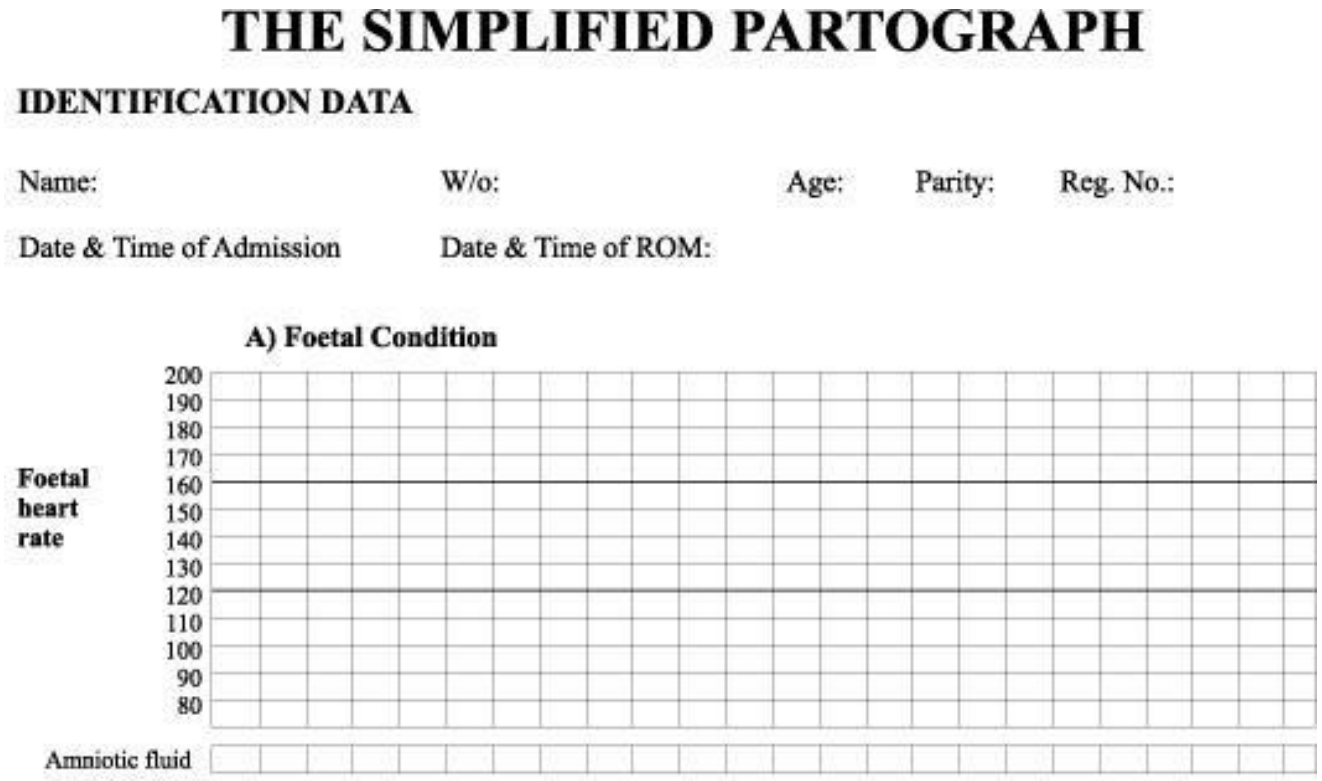
Plotting a Partograph

- ***Identification data***
- Name
- Age,
- Parity,
- Date and time of admission
- Registration number;
- Time of rupture of membranes.



Plotting a Partograph

- ***Fetal Condition***
- Count fetal heart rate every 30 minutes
- Count for one full minute, immediately following a uterine contraction
- Fetal distress: FHR <120beats/minute or >160 beats/minute
- **Arrange for referral**



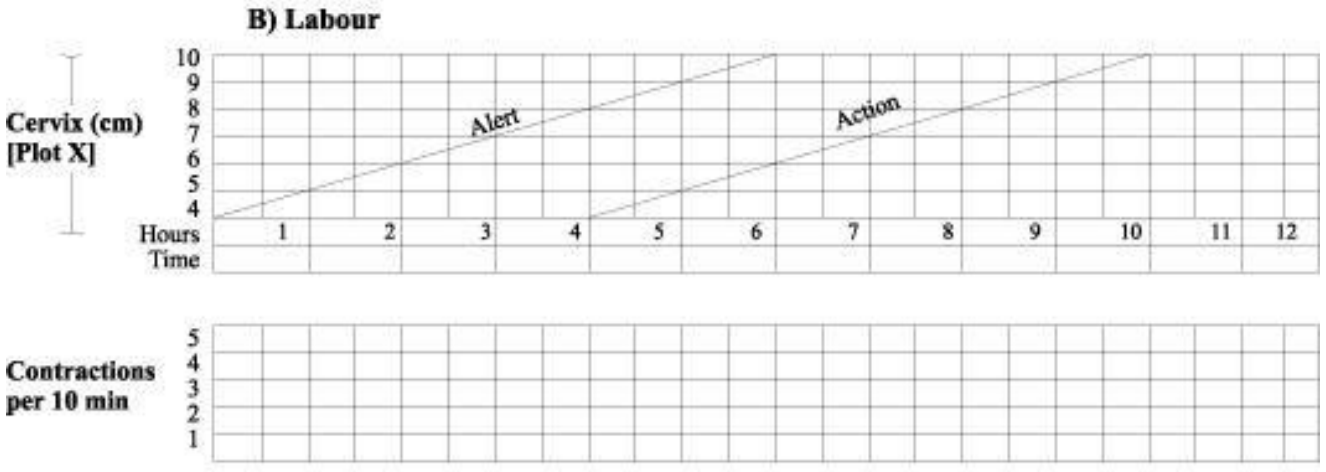
Plotting a Partograph

- **Record status of membranes and amniotic fluid color every half hourly in Partographas follows:**
- Membranes intact (mark ‘I’)
- Blood stained (mark ‘B’)
- Clear liquor (mark ‘C’)
- Meconium stained liquor (mark ‘M’)

Use sterile perineal pad to look for colour of liquor and status of membrane

Plotting a Partograph

- ***Labor***
- Begin plotting in active labor
- Cervical dilatation > = 4 cm and > 2contractions / 10 minutes
- **Always plot initial finding at Alertline.** Note the time.
- Repeat P/V after 4 hours and plot the cervical dilatation
- In active phase cervical dilatation should be 1 or ore than 1 cm/ hour.



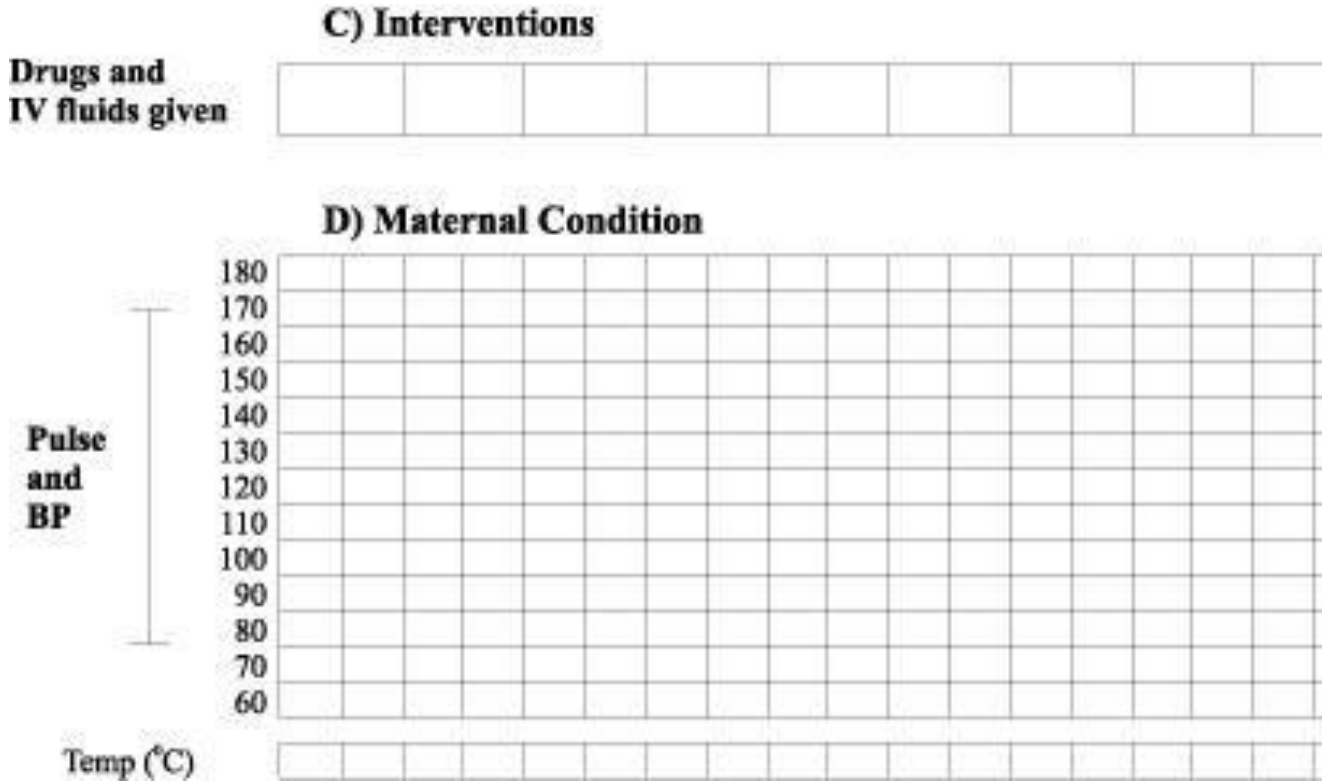
Plotting a Partograph

Chart the contractions every half an hour

- Number of contractions in 10 mins
- Duration in seconds.
  - Less than 20 seconds 
  - Between 20 and 40 seconds 
  - More than 40 seconds 

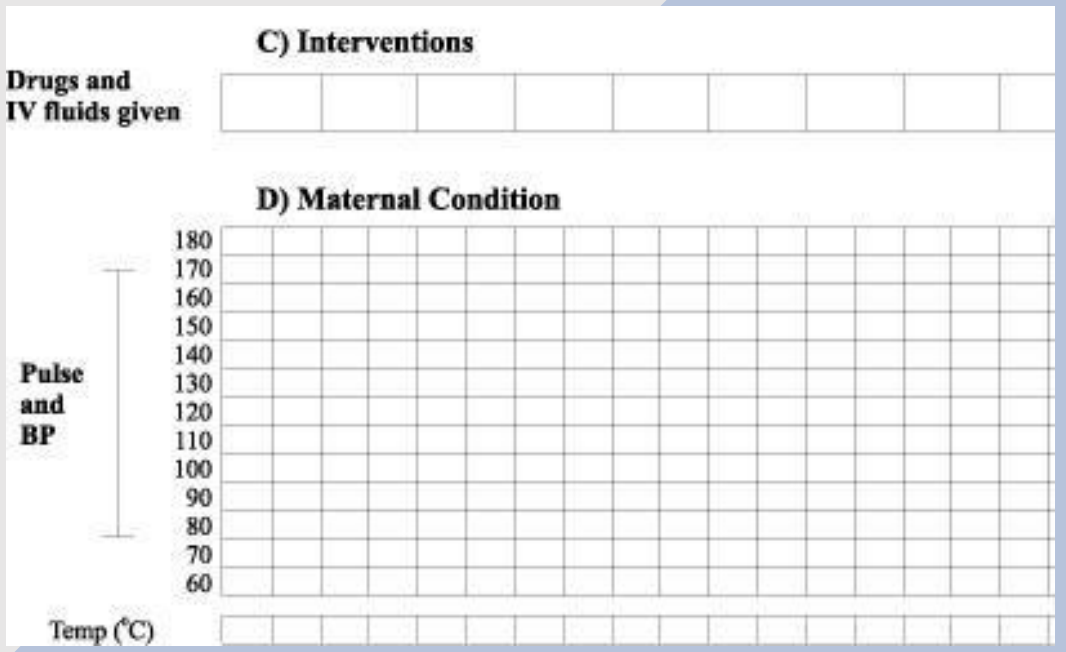
Plotting a Partograph

- ***Maternal Condition***
- Record maternal pulse every half hour and mark with a dot (.)
- Record maternal BP every 4 hours using a vertical arrow, with upper end signifying systolic BP and lower end diastolic BP
- Record the temperature every 4 hours and note on temperature graph



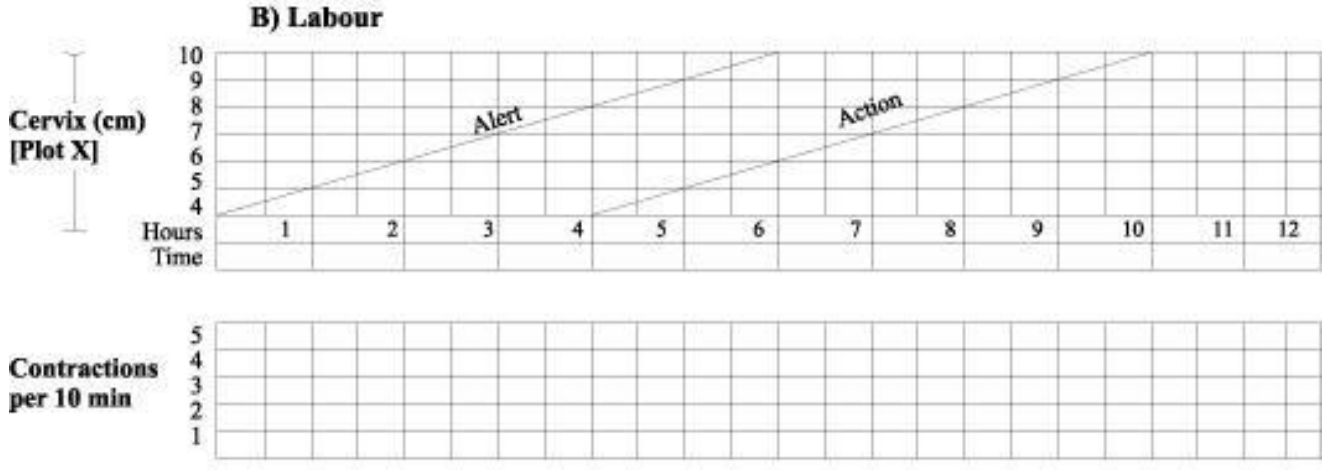
Interventions

Mention dose, route, and time of administration of any drug and IV fluid given before delivery



Interpreting a Partograph

- If **Alert line** is crossed (the plottingmoves to the right of the alert line) it indicates abnormal labour :prolonged/ obstructed labour
- Note the time
- **Refer patient to FRU**
- Send partograph with patient



Interpreting a Partograph

- Crossing of the **Action line** (the plotting movesto the right of the Action line) : indicates the need for intervention
- By the time the action line is crossed the woman should ideally have reached the FRU for the appropriate intervention to take place

What are the Indications for Referral to FRU – Interpretation of Partograph for timely referral

FHR is <120 beats / min or >160 beats / min

Meconium and /or blood stained amniotic fluid

When cervical dilatation plotting crosses the alert line (moves towards the right side of the alert line)

Contractions not increasing in duration, intensity and frequency e.g. 2 or less contractions lasting for <20 sec in 10 min

Key Messages

Labour should be plotted on the partograph during the active stage when cervical dilatation is 4 cms or more

FHR, status of membranes and amniotic fluid uterine contractions and pulse are recorded every half an hour

Cervical dilatation, BP and temperature are recorded every 4 hours

Correctly filled partograph helps to identify any abnormality early and helps to decide appropriate care or referral

PARTOGRAPH – CASTE STUDY 1

- Radha (wife of Gangaram), 26 years of age, third gravida, was admitted at 5:00 am on 11 June 2009 with the complaint of labour pains since 2:00 am. Her membranes had ruptured at 4:00 am. She has two children of the ages of 5 and 2 years. On admission, her cervix was 2 cm dilated.
- Plot the following findings on the partograph:
- **At 09:00 am:** • The cervix is dilated 5 cm.
- • She had 3 contractions in 10 minutes, each lasting 20–40 seconds.
- • The FHR is 120 beats per minute.
- • The membranes have ruptured and the amniotic fluid is clear.
- • Her BP is 120/70 mmHg.
- • Her temperature is 36.8°C.
- • Her pulse is 80 per minute.
    - **9:30 am:** FHR 120, contractions 3/10 each 30 seconds, pulse 80/minute, amniotic fluid clear
    - **10:00 am**: FHR 136, contractions 3/10 each 35 seconds, pulse 80/minute, amniotic fluid clear
    - **10:30 am:** FHR 140, contractions 3/10 each 40 seconds, pulse 88/minute, amniotic fluid clear
    - **11:00 am**: FHR 130, contractions 3/10 each 40 seconds, pulse 88/minute, amniotic fluid clear
    - **11:30 am**: FHR 136, contractions 4/10 each 45 seconds, pulse 84/minute, amniotic fluid clear
    - **12:00 noon**: FHR 140, contractions 4/10 each 45 seconds, pulse 88/minute, amniotic fluid clear
    - **12:30 pm**: FHR 130, contractions 4/10 each 50 seconds, pulse 88/minute, amniotic fluid clear
    - **1:00 pm:** FHR 140, contractions 4/10 each 55 seconds, pulse 90/minute, temp. 37°C, BP 100/70 , amniotic fluid clear
- **At 1:00 pm**:
- • Cervix fully dilated
- • Amniotic fluid clear and BP 100/70 mmHg
- **1:20 pm: Spontaneous birth of a live female infant weighing 2.85 kg.**
-

Radha *Gangaram* *26 Years* $G_3P_2L_2A_0$

XYZ1 *11/06/09,5:00Hrs*

11/06/09, 04:00 Hrs

FHR = 140

AMNIOTIC FLUID CLEAR

C C C C C C C C C

Cervix fully dilated

Cervix dilated = 5cm

AM 11 AM 12 PM 1 PM

4 CONTRACTION

BP 120/70mmhg

BP 100/70mmhg

Pulse – 90/min

Temp

Spontaneous birth of a live female infant weighing 2.85 kg at 1.20 PM

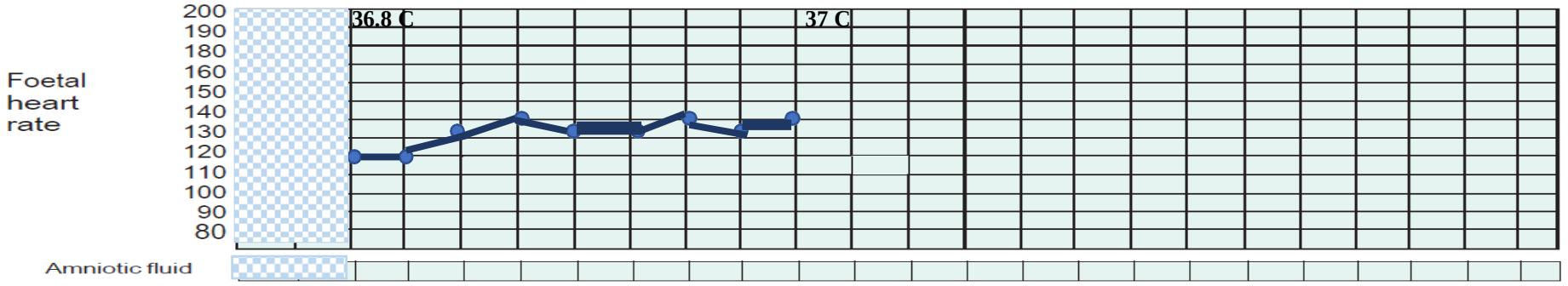
THE SIMPLIFIED PARTOGRAPH

IDENTIFICATION DATA

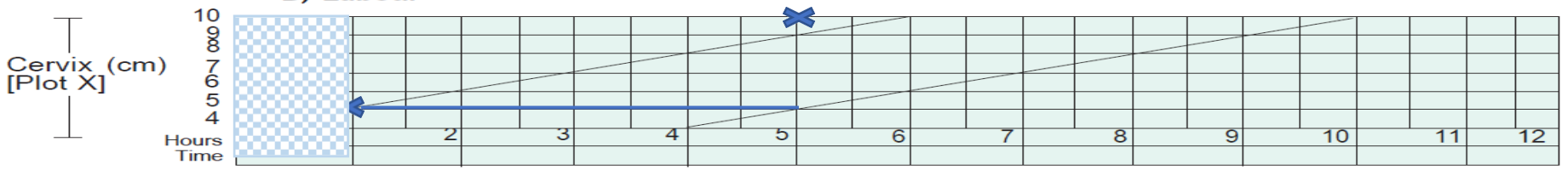
Name: **W/o:** **Age:** **Parity:** **Reg. No:**

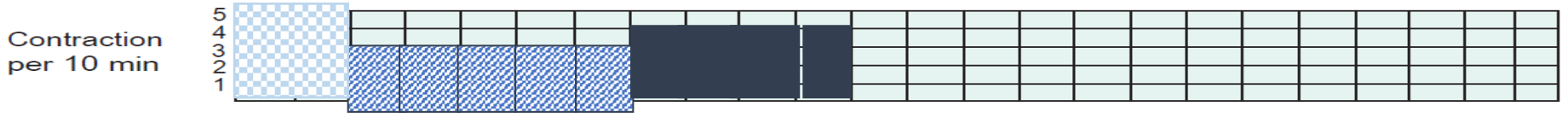
Date & Time of Admission: 6.8 C Temp – 37 C **Date & Time of ROM:**

A) Foetal Condition



B) Labour

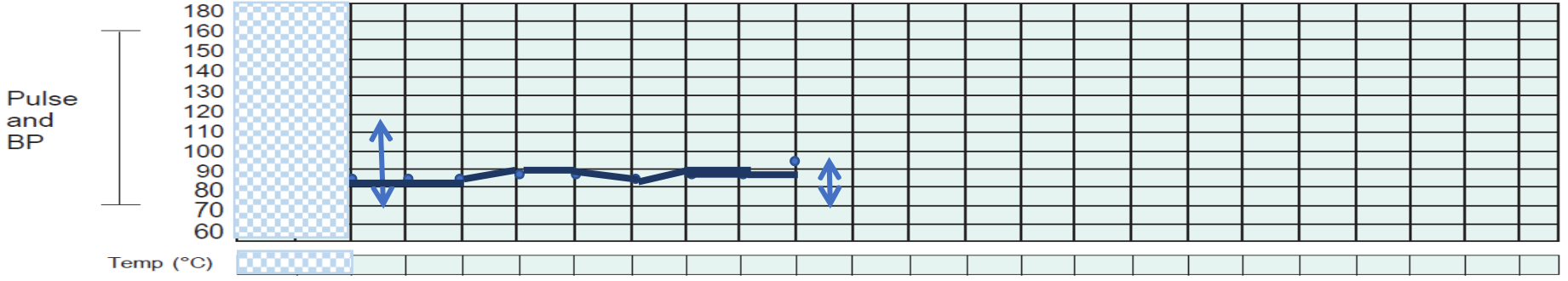




C) Interventions

Drugs and IV fluids given

D) Maternal Condition



Case study 3

Valentyna S. First pregnancy, no history of births. Birth record file # 411,admitted on 25.01 at 04:00

04:00

Fetal heart rate – 132 beats /min
Amniotic fluid – clear, membrane rupture at 2.30
Head moulding – no
Cervical dilatation – 1
cmHead descent - 4/5
Contractions in 10 min – 3 contractions each lasts 30 seconds
Blood pressure – 110/60
Pulse –70 beats /min
Temperature – 36.2
ºCUrine – 80 ml

Fetal heart rate
04:30 - 140 beats / min,
05:00 - 150 beats / min,
05:30 - 150 beats / min,
06:00 - 140 beats / min,
06:30 - 140 beats / min,
07:00 - 130 beats / min,
07:30 - 150 beats / min,

Contractions per 10 minutes
04:30 - 3 contractions each lasts 30 seconds,
05:00 - 3 contractions each lasts 25 seconds,
05:30 - 3 contractions each lasts 30 seconds,
06:00 - 3 contractions each lasts 30 seconds,
06:30 - 3 contractions each lasts 40 seconds,
07:00 - 3 contractions each lasts 40 seconds
07:30 - 3 contractions each lasts 40 seconds

Pulse
04:30 - 80 beats / min,
05:00 - 80 beats / min,
05:30 - 90 beats / min,
06:00 - 90 beats / min,
06:30 - 90 beats / min,
07:00 - 80 beats / min,
07:30 - 80 beats / min,

08:00

Fetal heart rate – 136 beats

/minAmniotic fluid – clear
Head moulding – no
Cervical dilatation – 4
cmHead descent - 4/5
Contractions in 10 min – 3 contractions each lasts 45 seconds
Blood pressure – 115/65
Pulse – 74 beats /min

Temperature – 36.6
ºCUrine – 150 ml

Fetal heart rate
08:30 - 140 beats / min,
09:00 - 150 beats / min,
09:30 - 150 beats / min,
10:00 - 140 beats / min,
10:30 - 140 beats / min,
11:00 - 130 beats / min,
11:30 - 150 beats / min,

Contractions per 10 minutes
08:30 - 3 contractions each lasts 45 seconds,
09:00 - 3 contractions each lasts 45 seconds,
09:30 - 3 contractions each lasts 50 seconds,
10:00 - 3 contractions each lasts 50 seconds,
10:30 - 4 contractions each lasts 50 seconds,
11:00 - 4 contractions each lasts 50 seconds
11:30 - 4 contractions each lasts 50 seconds

Pulse
08:30 - 80 beats / min,
09:00 - 80 beats / min,
09:30 - 90 beats / min,
10:00 - 90 beats / min,
10:30 - 90 beats / min,
11:00 - 80 beats / min,
11:30 - 80 beats / min,

12:00

Fetal heart rate – 150 beats
/minAmniotic fluid – clear
Head moulding – no
Cervical dilatation – 9
cmHead descent - 2/5
Contractions in 10 min – 4 contractions each lasts 50 seconds
Blood pressure – 120/80
Pulse – 90 beats
/min Temperature –
36.5 ºCUrine – 110
ml

Delivery – 13:10

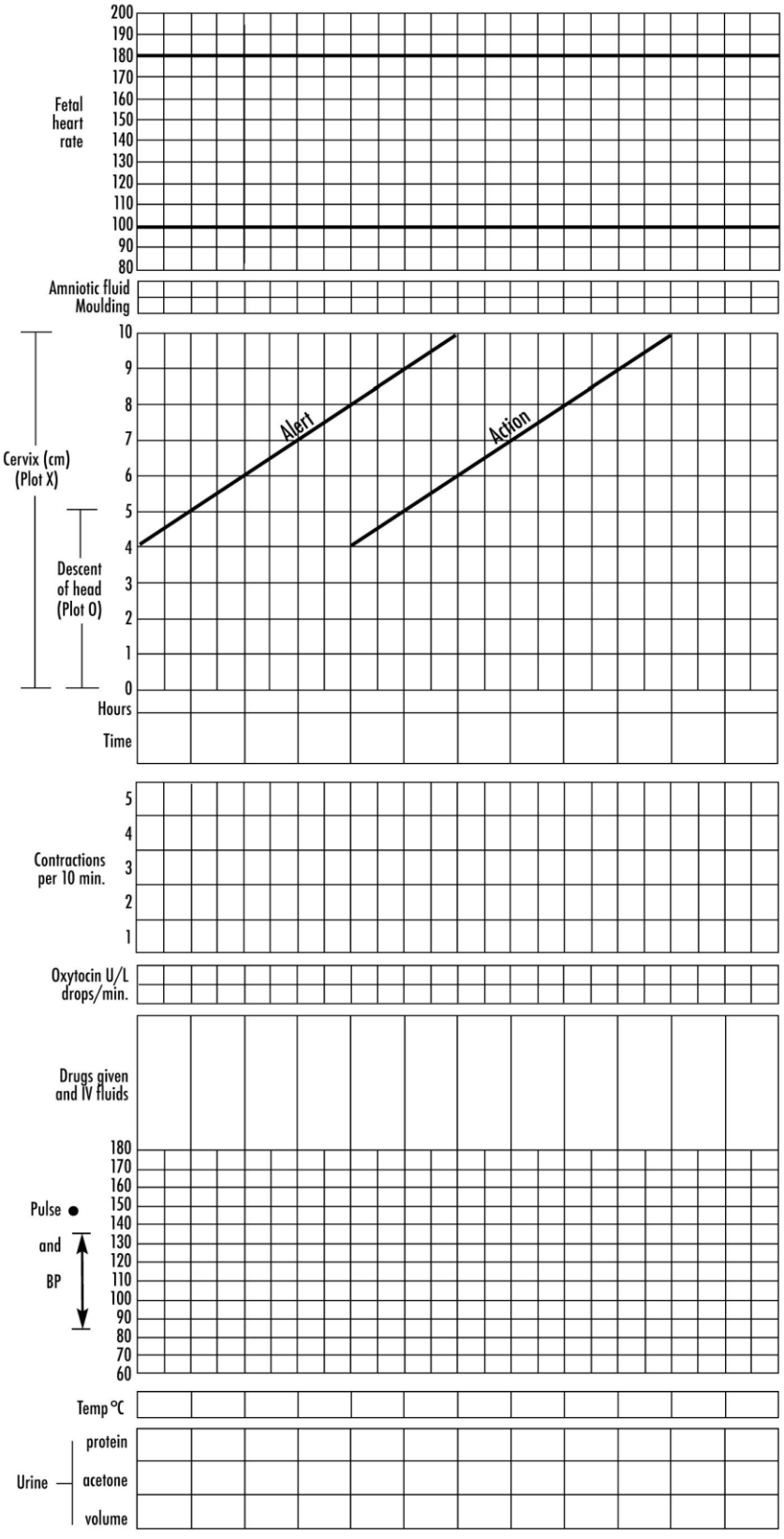
A live girl

Weight –
3100 Length
– 50 cm
Apgar – 8/9 points

- Discuss each presentation with the whole group.

Name | Gravida | Para | Hospital number

Date of admission | Time of admission | Ruptured membranes | hours



Lecture 7

Nursing Care of a Family Experiencing a Complication of Labor or Birth

an overview

Although labor often proceeds without any deviation from the normal, many potential complications can occur

A difficult labor

Dystocia—can arise from any of the four main components of the labor process: (a)the **p**ower (uterine contractions)

(b) the **p**assenger (the fetus)

(c) the **p**assageway (the birth canal)

(d) the **p**syche (the woman's and family's perception of the event

National Health Goals related to attempts to decrease maternal complications and prevent infant injury are shown in Box 23.1.

BOX 23.1 ✻ Focus on National Health Goals

A number of National Health Goals speak directly to complications of labor.

- Reduce the number of cesarean births among low-risk women to no more than 15 per 100 births from a baseline of 18 per 100.
- Reduce the maternal mortality rate to no more than 3.3 per 100,000 live births from a baseline of 7.1 per 100,000.
- Reduce the rate of maternal complications during hospitalized labor and birth to no more than 24 per 100 births from a baseline of 31.2 per 100 births (http://www.nih.gov).

Complications with the power (the force of labor)

Inertia is a sluggishness of contractions,

This dysfunction can occur at any point in labor, but it is generally classified as:

primary (occurring at the onset of labor)

secondary (occurring later in labor).

The risk of maternal postpartal infection, hemorrhage, and infant mortality is higher in women who have a prolonged labor than in those who do not.

Prolonged labor appears to result from **several factors**. It is most likely to occur if a fetus is large. Hypotonic, hypertonic, and uncoordinated contractions all play additional roles

Ineffective Uterine Force

Uterine contractions are the basic force moving the fetus through the birth canal. They occur because of the interplay of

- **the contractile enzyme adenosine triphosphate**
- **influence of major electrolytes such as calcium, sodium, and potassium**
- **specific contractile proteins (actin and myosin),**
- **epinephrine and norepinephrine**
- **oxytocin (a posterior pituitary hormone**
- **estrogen, progesterone, and prostaglandins**

When they become abnormal or ineffective, ineffective labor occurs.

Hypotonic Contractions

the number of contractions is unusually low or infrequent (not more two or threeoccurring in a 10-minute period) occur during the active phase of labor.

Causes

1. They may occur after the administration of analgesia, especially

2. if bowel or bladder distention prevents descent

3. may occur in a uterus that is overstretched by a multiple gestation, a larger-than-usual single fetus, hydramnios, or in a grand multiparity.

Risk for mother

1. increase the length of labor

2. cause the uterus to not contract as effectively during the postpartal period because of exhaustion, increasing a woman's chance for postpartal hemorrhage.

Hypertonic contractions

- Contractions are irregular and more frequent, but ineffective in dilating and effacing the cervix.
- Usually occurs in latent phase of first stage of labor
- More frequent in primigravida woman

Risk for mother and fetus:

- lack of relaxation between contractions may not allow optimal uterine artery filling; this could lead to fetal anoxia
- Fetal distress(Poor blood flow from placenta)
- Maternal distress (Physically exhausted , Emotionally discouraged)
- If deceleration in the fetal heart rate (FHR) or an abnormally long first stage of labor or lack of progress with pushing ("second-stage arrest") occurs, cesarean birth may be necessary
- ineffective and are not achieving cervical dilatation.

Uncoordinated Contractions

may occur so closely together such as one on top of another and then a long period without any, it may be difficult for a woman to rest between contractions or to use breathing exercises with contractions.

- Applying a fetal and a uterine external monitor and assessing the rate, pattern, resting tone, and fetal response to contractions for at least 15 minutes
- Oxytocin administration may be helpful in uncoordinated labor to stimulate a more effective and consistent pattern of contractions

Dysfunctional Labor and Associated Stages of Labor

- Dysfunction at the First Stageof Labor

➢Prolonged Latent Phase

TABLE 23.2 ✻ Lengths of Phases and Stages of Normal Labor in Hours

	Nullipara		Multipara	
Phase	*Average*	*Upper Normal*	*Average*	*Upper Normal*
Latent phase	8.6	20.0	5.3	14.0
Active phase	5.8	12.0	2.5	6.0
Second stage	1	1.5	0.25	—*

➢A protracted active phase

is usually associated with

❑cephalopelvic disproportion (CPD)

❑or fetal malposition,

❑ineffective myometrial activity.

This phase is prolonged if cervical dilatation does not occur at a rate of at least 1.2 cm/hr in a nullipara or 1.5 cm/hr in a multipara, or if the active phase lasts longer than 12 hours in a primigravida or 6 hours in a multigravida.

If the cause of the delay in dilatation is fetal malposition or CPD, cesarean birth may be necessary.

➢ Prolonged Deceleration Phase.

A deceleration phase has become prolonged when it extends beyond 3 hours in a nullipara or 1 hour in a multipara. Prolonged deceleration phase most often results from abnormal fetal head position. A cesarean birth is frequently required.

➢ Secondary Arrest of Dilatation.

has occurred if there is no progress in cervical dilatation for longer than 2 hours. cesarean birth may be necessary

Dysfunction at the Second Stage of Labor

1. Prolonged Descent of the fetus occurs if the rate of descent is less than 1.0 cm/hr in a nullipara or 2.0 cm/hr in a multipara. It can be suspected if the second stage lasts over 3 hours in a multipara

intervention

- If the membranes have not ruptured, rupturing them at this point may be helpful.
- Intravenous (IV) oxytocin may be used to induce the uterus to contract effectively
- A semi-Fowler's position, squatting, kneeling, or more effective pushing may speed descent.

2. Arrest of Descent. results when no descent has occurred for 1 hour in a multipara or 2 hours in a nullipara.

Failure of descent has occurred

- descent of the fetus does not begin or engagement or movement beyond 0 station
- The most likely cause is CPD.

Intervention

- Cesarean birth usually is necessary. If there is no contraindication to vaginal birth,
- oxytocin may be used to assist labor.

2MO -

3. Contraction Rings

is termed a pathologic retraction ring (**Bandl's ring**). A contraction ring is a hard band that forms across the uterus at the junction of the upper and lower uterine segments and interferes with fetal descent.

Contraction rings often can be identified by ultrasound

Administration of IV morphine sulfate or the inhalation of amyl nitrite may relieve a retraction ring.

A tocolytic can also be administered to halt contractions

Most likely, a cesarean birth will be necessary to ensure safe birth of the fetus.

If the situation is not relieved, uterine rupture and neurologic damage to the fetus may occur

Manual removal of the placenta under general anesthesia may be required if the retraction ring does not allow the placenta to be delivered.

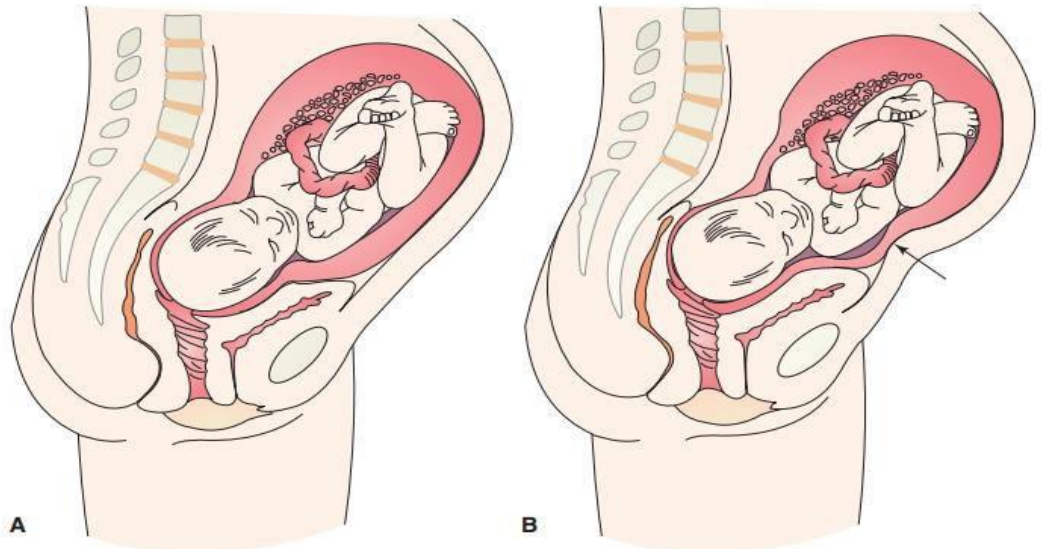


FIGURE 23.4 Pathologic retraction ring. (**A**) Uterus in the normal second stage of labor. Notice how the upper uterine segment is becoming thicker and the lower uterine segment is thinning. A physiologic retraction ring is normally formed at the division of the upper and lower uterine segments. (**B**) Uterus with a pathologic retraction ring (Bandl's ring). The wall below the ring is thin and the abdomen shows an indentation. This constriction is caused by obstructed labor and is a warning sign that if the obstruction is not relieved, the lower segment may rupture.

4. Precipitate Labor

• It is often defined as a labor that is completed in fewer than 3 hours

the rate is greater than 5 cm/hr (1 cm every 12 minutes) in a nullipara or 10 cm/hr (1 cm every 6 minutes) in a multipara

Risk to mother:

• they lead to premature separation of the placenta,

• placing the woman at risk for hemorrhage.

• lacerations of the birth canal from the forceful birth.. In such instances,

a tocolytic may be administered to reduce the force and frequency of contractions.

5. Induction and Augmentation of Labor

➢ **Induction of labor** means that labor is started artificially

➢ **Augmentation of labor** refers to assisting labor that has started spontaneously but is not effective

Before induction of labor is begun, the following conditions should bepresent:

• The fetus is in a longitudinal lie.

• The cervix is ripe, or ready for birth.

• A presenting part is engaged.

• There is no CPD.

• The fetus is estimated to be mature by date.

BOX 23.3 * Focus on Pharmacology

Misoprostol (Cytotec)

Classification: Misoprostol is a synthetic prostaglandin (PGE1 analog).
Action: Produces cervical dilatation
Pregnancy Risk Category: X
Dosage: 50 to 100 µg orally or 25 to 50 µg placed intravaginally in the posterior fornix
Possible Adverse Effects: Uterine hyperstimulation, nonreassuring fetal heart rate pattern, nausea, diarrhea, flatulence, headache

Nursing Implications

- Ensure that the woman's condition is rated as safe for cervical dilatation and vaginal birth (absence of placenta previa, vasa previa, or cephalopelvic disproportion and the fetus is mature) before administration.
- Anticipate the need for a nonstress test to ensure fetal health before the drug is used.
- Continuously monitor uterine activity and fetal heart rate.
- Have an intravenous fluid line and a tocolytic readily available should uterine hyperstimulation occur (Karch, 2009).

BOX 23.4 * Focus on Pharmacology

Oxytocin for Labor Induction

Classification: Oxytocin is a synthetic form of the naturally occurring posterior pituitary hormone.
Action: Used to initiate uterine contractions in a term pregnancy
Pregnancy Risk Category: C
Dosage: Initially 1 to 2 mU/min by intravenous (IV) infusion, increased at a rate no more than 1 to 2 U/min at 15- to 30-minute intervals until a contraction pattern similar to normal labor is achieved
Possible Adverse Effects: Nausea, vomiting, cardiac arrhythmias, uterine hypertonicity, tetanic contractions, uterine rupture (with excessive dosages), severe water intoxication, and fetal bradycardia

Nursing Implications

- Prepare IV solution by adding 1 mL (10 IU) to 1000 mL of designated intravenous fluid (resulting solution contains 10 mU/mL).
- Use an infusion pump to ensure accurate control of infusion rate.
- Regulate infusion rate to establish uterine contractions similar to a normal labor pattern.
- Monitor frequency, duration, and strength of contractions.
- Assess maternal pulse and blood pressure, and watch for possible hypertension. If hypertension occurs, discontinue drug and notify physician.
- Continuously monitor fetal heart rate for signs of fetal distress.
- Monitor intake and output and watch for signs of possible water intoxication, such as headache or vomiting. Limit IV fluids to 150 mL/hr.
- Prepare the woman for birth (Karch, 2009)

- If stopping the oxytocin infusion does not stop the hyperstimulation, a beta-adrenergic receptor drug such as terbutaline sulfate (Brethine) or magnesium sulfate may be prescribed to decrease myometrial activity

Uterine Rupture

Is rare, is always a possibility. It is always serious, because it accounts for as many as 5% of all maternal deaths.

Contributing factors may include

- ❑ Prolonged labor
- ❑ Abnormal presentation
- ❑ Multiple gestation
- ❑ Unwise use of oxytocin
- ❑ Obstructed labor
- ❑ Traumatic maneuvers of forceps or traction.

When uterine rupture occurs, fetal death will follow unless immediate cesarean birth can be accomplished. In these instances, fetal outcome can be optimal

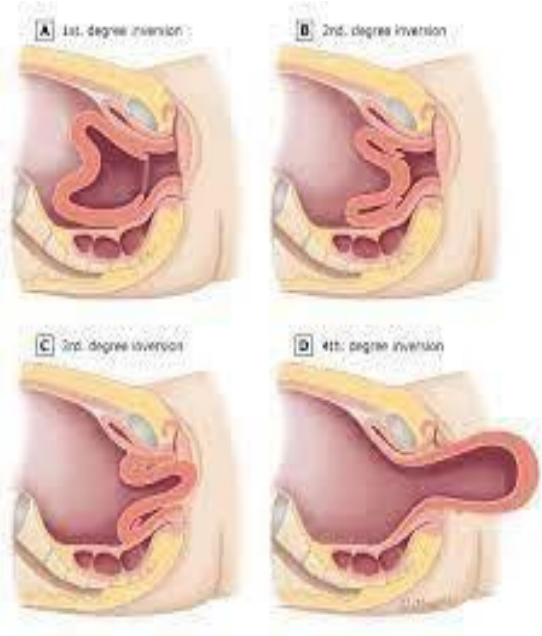
- Rupture can be **complete**, going through the endometrium,myometrium, and peritoneum layers
  - ➢ With a complete rupture, uterine contractions will immediately stop. Two distinct swellings will be visible on the woman's abdomen: the retracted uterus and the extrauterine fetus
  - ➢ Signs of shock begin, including rapid, weak pulse; falling blood pressure; cold and clammy skin; and dilatation of the nostrils from air hunger. Fetal heart sounds fade and then are absent
- or **incomplete,** leaving the peritoneum intact..

intervention

1. Administer emergency fluid replacement therapy as ordered.
2. use of IV oxytocin to attempt to contract the uterus and minimize bleeding.
3. Prepare the woman for a possible laparotomy as an emergency measure to control bleeding and achieve a repair.
4. Most women are advised not to conceive again after a rupture of the uterus, unless the rupture occurred in the inactive lower segment.

- The physician, with consent, may perform a cesarean hysterectomy (removal of the damaged uterus) or tubal ligation at the time of the laparotomy; both procedures result in loss of childbearing ability

Inversion of the Uterus



- Refers to the uterus turning inside out with either birth of the fetus or delivery of the placenta. It is a rare phenomenon, occurring in about 1 in 20,000 births . It may occur if :

➢ Traction is applied to the umbilical cord to remove the placenta

➢ or if pressure is applied to the uterine fundus when the uterus is not contracted.

➢ It may also occur if the placenta is attached at the fundus so that, during birth, the passage of the fetus pulls the fundus down.

- Inversion occurs in various degrees. The inverted fundus may lie within the uterine cavity or the vagina, or, in total inversion, it may protrude from the vagina. **When an inversion occurs**,

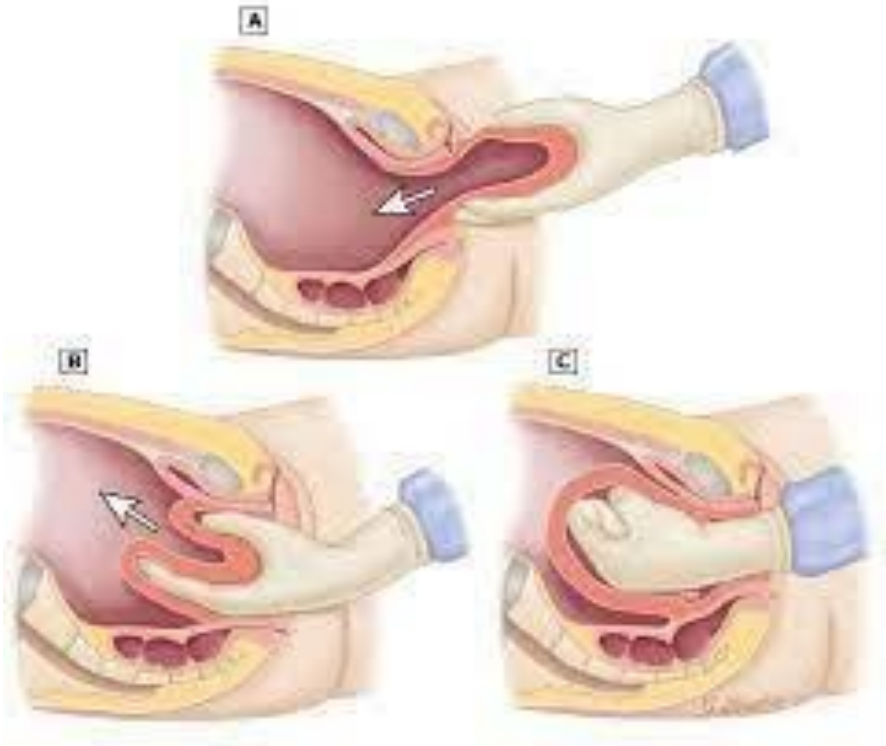
❑ a large amount of blood suddenly gushes from the vagina.

❑The fundus is not palpable in the abdomen.

❑ If the loss of blood continues unchecked for longer than a few minutes, the woman will show signs of blood loss: hypotension, dizziness, paleness, or diaphoresis.

Intervention

- ❑ Never attempt to replace an inversion, because handling of the uterus may increase the bleeding.
- ❑ Never attempt to remove the placenta if it is still attached, because this only creates a larger surface area for bleeding.
- ❑ In addition, administration of an oxytocic drug only compounds the inversion or makes the uterus more tense and difficult to replace. An IV fluid line needs to be starte
- ❑ Administer oxygen by mask,
- ❑ and assess vital signs. Be prepared to perform cardiopulmonary resuscitation (CPR) if the woman's heart should fail from the sudden blood loss.
- ❑ The woman will immediately be given general anesthesia or possibly nitroglycerin or a tocolytic drug intravenously, to relax the uterus.
- ❑ The physician or nurse midwife then replaces the fundus manually. Administration of oxytocin after manual replacement helps the uterus to contract and remain in its natural place.
- ❑ a woman will need antibiotic therapy to prevent infection. She needs to be informed that cesarean birth will probably be necessary in any future pregnancy, to prevent the possibility of repeat inversion.



Amniotic Fluid Embolism

occurs when amniotic fluid is forced into an open maternal uterine blood sinus through some defect in the membranes or after membrane rupture or partial premature separation of the placenta

Possible risk factors include

oxytocin administration, abruptio placentae, and hydramnios

Signs and symptoms

- A woman, grasps her chest because of sharp pain and inability to breathe as she experiences pulmonary artery constriction.
- She becomes pale and then turns the typical bluish gray associated with pulmonary embolism and lack of blood flow to the lungs.

The immediate management

- ✓is oxygen administration by face mask or cannula.
- ✓Within minutes, she will need CPR. CPR may be ineffective, however, because these procedures (inflating the lungs and massaging the heart) do not relieve the pulmonary constriction.
- ✓Therefore, blood still cannot circulate to the lungs. Death may occur within minutes. A woman's prognosis depends on the size of the embolism, the speed with which the emergency condition was detected, and the skill and speed of emergency interventions. Even if the woman survives the initial insult, the risk for disseminated intravascular coagulation (DIC) is high, further compounding her condition. In this event, she will need continued management that includes **endotracheal intubation** to maintain pulmonary function and therapy with **fibrinogen to counteract DIC.** Most likely, she will be transferred to an ICU. The prognosis for the fetus is guarded, because reduced placental perfusion results from the severe drop in maternal blood pressure. Labor often begins or the fetus is born immediately by cesarean birth.

Problems with the passenger

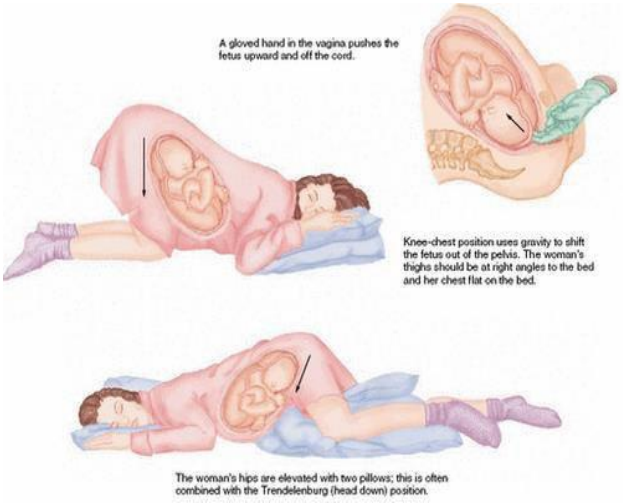
1. Prolapse of the Umbilical Cord

It tends to occur most often with:

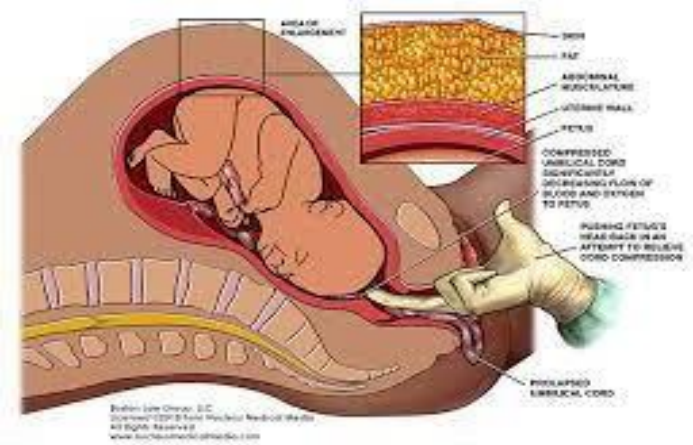
- **Premature rupture of membranes**
- **Fetal presentation other than cephalic**
- **Placenta previa**
- **Intrauterine tumors preventing the presenting part from engaging**
- **A small fetus**
- **Cephalopelvic disproportion preventing firm engagement**
- **Hydramnios**
- **Multiple gestation**

Therapeutic Management

1. placing a gloved hand in the vagina and manually elevating the fetal head off the cord, or by placing the woman in a knee–chest or Trendelenburg position, which causes the fetal head to fall back from the cord.
2. Administering oxygen at 10 L/min by face mask to the woman is also helpful to improve oxygenation to the fetus.
3. A tocolytic agent may be prescribed to reduce uterine activity and pressure on the fetus. Amnioinfusion



- If the cord has prolapsed to the extent that it is exposed to room air, drying will begin, leading to atrophy of the umbilical vessels. Do not attempt to push any exposed cord back into the vagina. This may add to the compression by causing knotting or kinking. Instead, cover any exposed portion with a sterile saline compress to prevent drying.
- If the cervix is fully dilated at the time of the prolapse, the physician may choose to birth the infant quickly, possibly with forceps, to prevent fetal anoxia.
- If dilatation is incomplete, the birth method of choice is upward pressure on the presenting part, applied by a practitioner's hand in the woman'svagina, to keep pressure off the cord until the baby can be born by cesarean birth. Prolapsed cord is always an emergency situation, because the reducedblood flow to the fetus can quickly cause fetal harm.

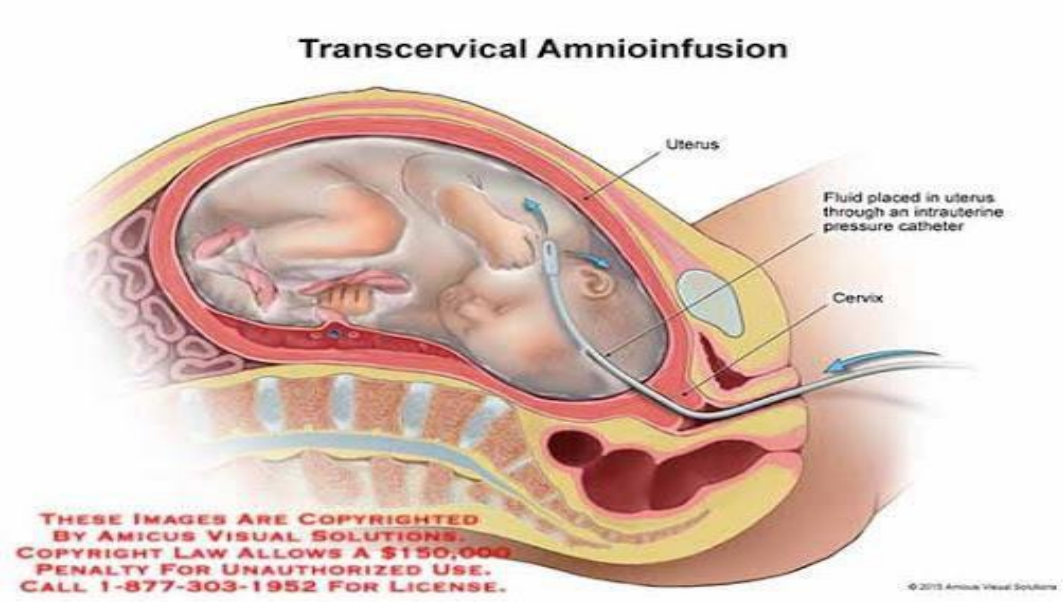


mnioinfusion.

Amnioinfusion is the addition of a sterile fluid into the uterus to supplement the amniotic fluid

.The technique neither shortens nor prolongs labor; it just prevents additional cord compression

- ❑a sterile catheter is introduced through the cervix into the uterus after rupture of the mem-branes
- ❑a solution of warmed normal saline or lactated Ringer's solution is rapidly infused. Initially, approximately 500 mL is infused
- ❑Throughout the procedure, urge a woman to lie in a lateral recumbent position to prevent supine hypotension syndrome.
- ❑ Continuously monitor FHR and uterine contractions internally during the infusion.
- ❑Record maternal temperature hourly to detect infection.
- ❑Be sure the solution is warmed to body temperature before the infusion, to prevent chilling of the woman and fetus.
- ❑This can be done by placing the bag of fluid on a radiant heat warmer or by using a blood/fluid warmer before administration. Because there will be a continuous flow of the infusing so-lution out of the woman's vagina during the procedure, change her bed frequently.
- ❑ Also assess that there is constant drainage. If vaginal leakage should stop, it usually means that the fetal head is firmly engaged and all fluid being infused is being held in the uterus. This is dangerous because it could lead to hydramnios (presence of excessive amniotic fluid) and possibly uterine rupture.



Multiple Gestation

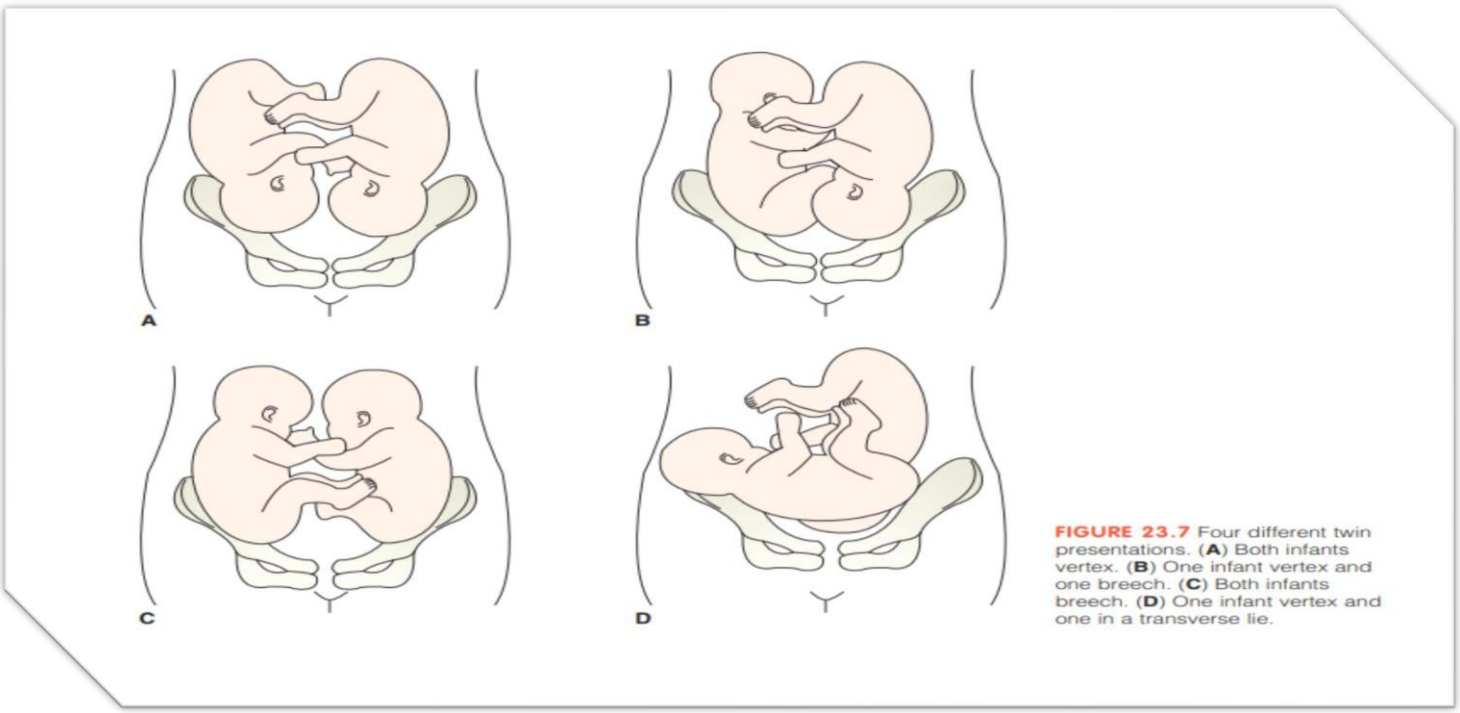


FIGURE 23.7 Four different twin presentations. (**A**) Both infants vertex. (**B**) One infant vertex and one breech. (**C**) Both infants breech. (**D**) One infant vertex and one in a transverse lie.

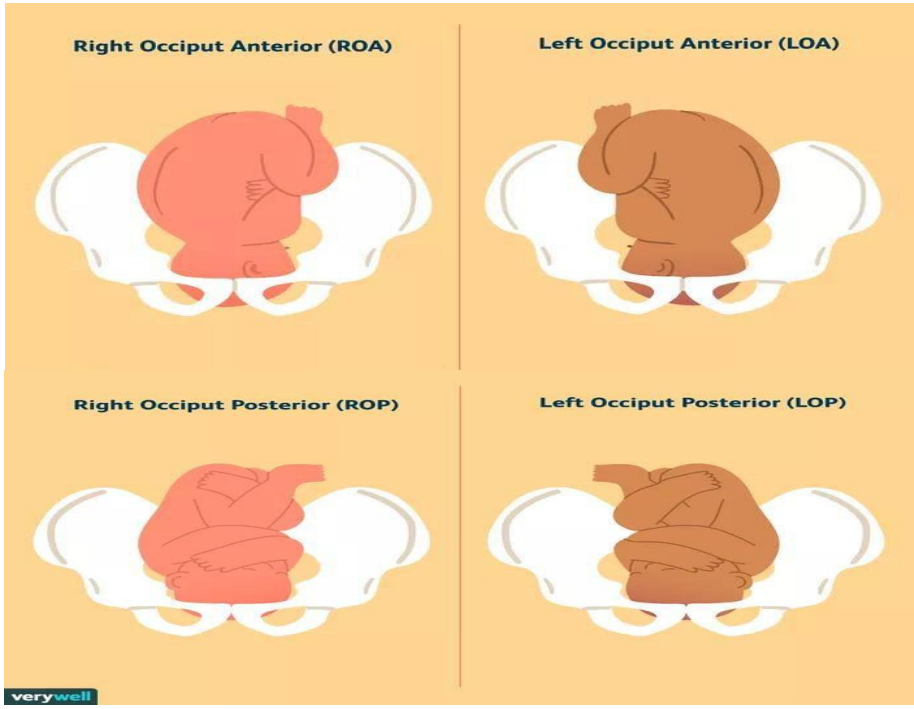
After the birth of the first child, the lie of the second fetus is determined by **external abdominal palpation** or **ultrasound**.

If the presentation is not vertex, external version may be attempted to make it so. If this is not successful, a decision for cesarean birth must be made .

If the infant will be born vaginally, an oxytocin infusion may be begun at this point to assist uterine contractions .

Problems With Fetal Position, Presentation, or Size

- Occipitoposterior Position
- Breech Presentation
- Face Presentation
- Brow Presentation
- Transverse Lie



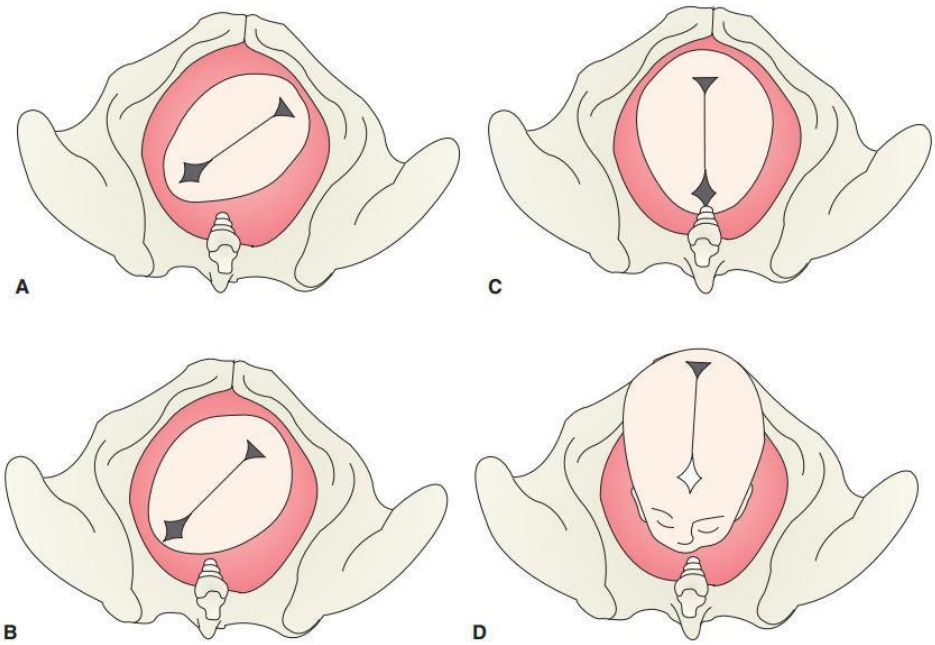


FIGURE 23.8 Left occipitoanterior (LOA) rotation. (**A**) A fetus in a cephalic presentation, LOA position. View is from the outlet. The fetus rotates 90 degrees from this position. (**B**) Descent and flexion. (**C**) Internal rotation complete. (**D**) Extension; the face and chin are born.

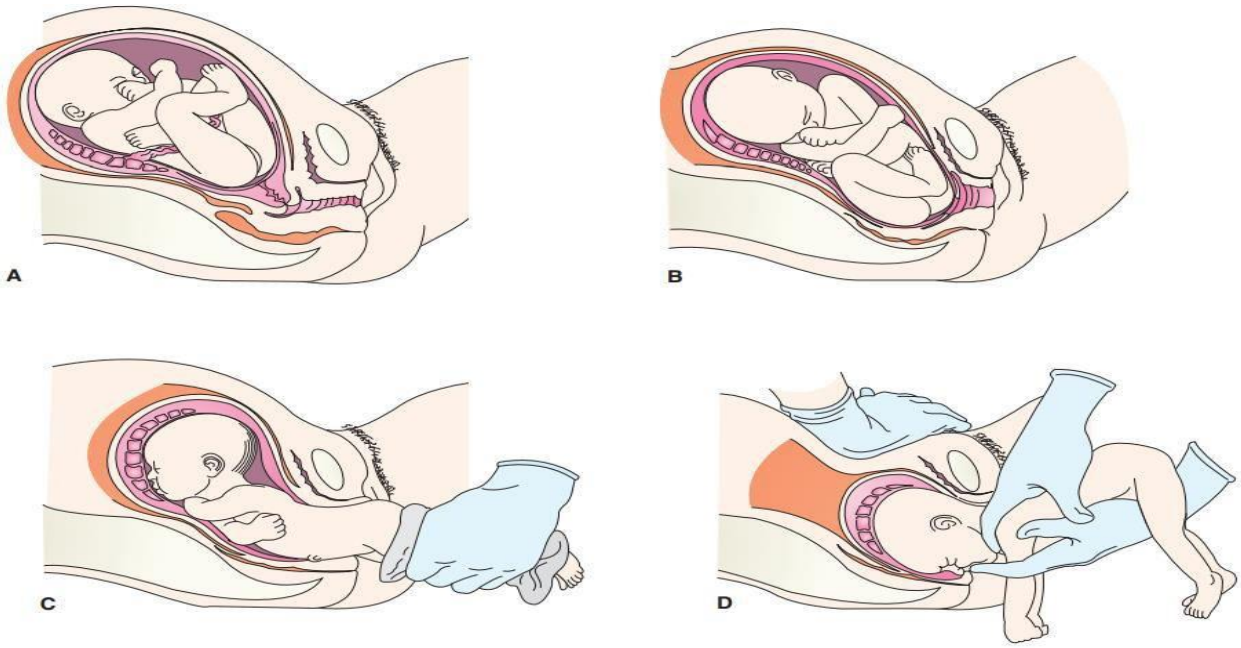
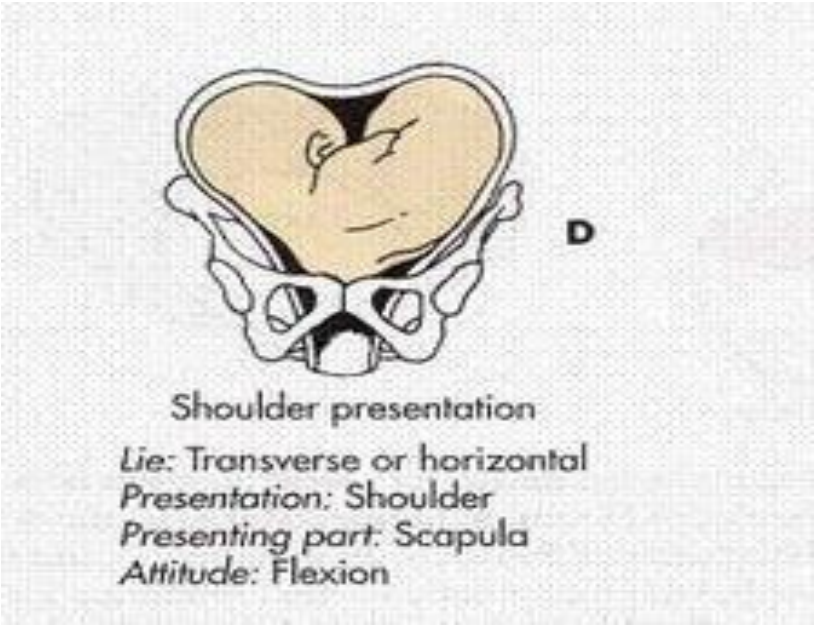


FIGURE 23.11 Breech birth. (**A**) Position before labor; left sacroposterior. (**B**) Descent and internal rotation. (**C**) Legs being born; the shoulders turn to present to the anteroposterior diameter. (**D**) The head is born. External rotation has put the anteroposterior diameter of the head in line with the anteroposterior diameter of the woman's pelvis. The head is born by gentle pressure to flex the head fully and by gentle traction to the shoulders upward and outward. Additional pressure might be applied by an assistant to the abdominal wall to ensure head flexion.



Oversized Fetus (Macrosomia)

weighs more than 4000 to 4500 g (approximately 9 to 10 lb). Babies of this size are most frequently born to women who enter **pregnancy with diabetes or develop gestational diabetes**

An oversized infant may cause uterine dysfunction during labor or at birth because of overstretching of the fibers of the myometrium. The wide shoulders may pose a problem at birth, because they can cause fetal pelvic disproportion or even uterine rupture from obstruction

If the infant is so oversized that he or she cannot be born vaginally, cesarean birth becomes the birth method of choice. The large size of a fetus may be missed in an obese woman, because the fetal contours are difficult to palpate and obesity does not necessarily indicate a larger-than-usual pelvis. Pelvimetry or ultrasound can be used to compare the size of the fetus with the woman's pelvic capacity.

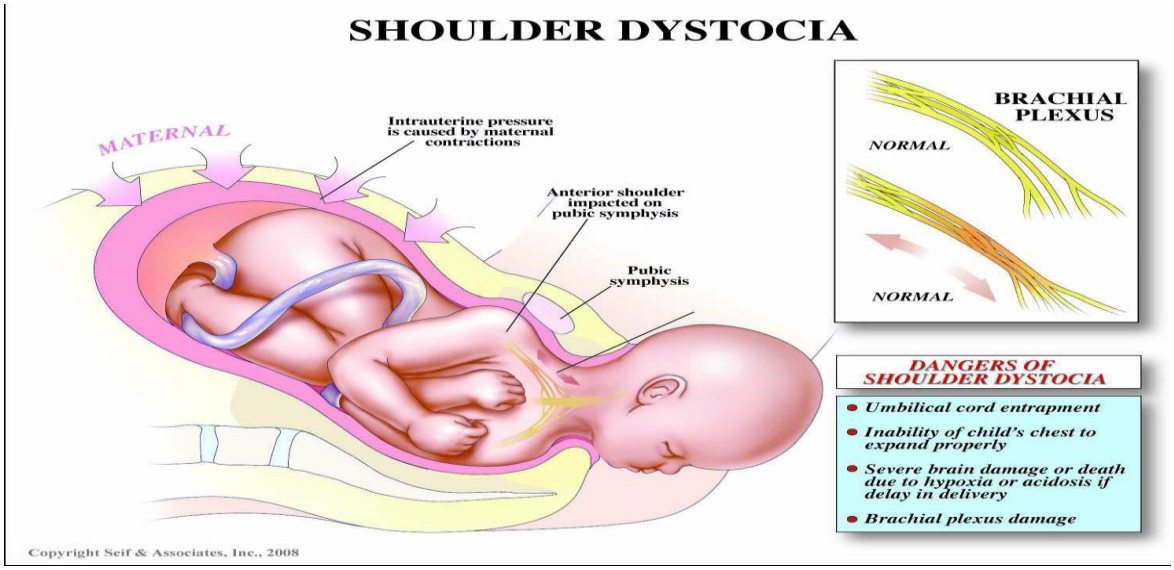
Shoulder Dystocia

The problem occurs at the second stage of labor, when the fetal head is born but the shoulders are too broad to enter and be born through the pelvic outlet. This is **hazardous to the woman because it can result in vaginal or cervical tears**.

It is hazardous to the fetus if the cord is compressed between the fetal body and the bony pelvis. The force of birth can result in a **fractured clavicle or a brachial plexus injury for the fetus**

Shoulder Dystocia

Is an obstetric emergency in which the anterior shoulder cannot pass under the pubic arch after the head is born



- Shoulder dystocia occur in
- women with diabetes
- in multiparas
- in post-date pregnancies.
- may be suspected earlier if the second stage of labor is prolonged
- if there is arrest of descent

- Although there is no evidence-based data, asking a woman to flex her thighs sharply on her abdomen (McRobert's maneuver) may widen the pelvic outlet and allow the anterior shoulder to be born. Applying suprapubic pressure may also help the shoulder escape from beneath the symphysis pubis and be born

Fetal Anomalies

Fetal anomalies of the head such as hydrocephalus (fluid-filled ventricles) or anencephaly (absence of the cranium) can also complicate birth because the fetal presenting part does not engage the cervix well

Problems with the Passage

➢ Inlet Contraction

is narrowing of the anteroposterior diameter to less than 11 cm, or of the transversediameter to 12 cm or less. It usually is caused by rickets in early life or by an inherited small pelvis.

➢ Outlet Contraction

➢ Trial Labor

❑Monitor fetal heart sounds, uterine contractions continuously, if possible, duringthis time.

❑Urge the woman to void every 2 hours so that her urinary bladder is as empty aspossible

❑if the fetal head is still high, there is an increased danger of prolapsed cord and anoxia to the fetus.

❑If after a definite period (6 to 12 hours) adequate progress in labor cannot be documented, or

❑if at any time fetal distress occurs, the woman will be scheduled for a cesarean birth.

External cephalic version

is the turning of a fetus from a breech to a cephalic position before birth. It may be done asearly as 34 to 35 weeks, although the usual time is 37 to 38 weeks of pregnancy

For the procedure

- ❑ FHR and possibly ultrasound are recorded continuously.
- ❑ A tocolytic agent may be administered to help relax the uterus.
- ❑ The breech and vertex of the fetus are located and grasped transabdominally by the examiner's hands on the woman's abdomen. Gentle pressure is then exerted to rotate the fetus in a forward direction to a cephalic lie

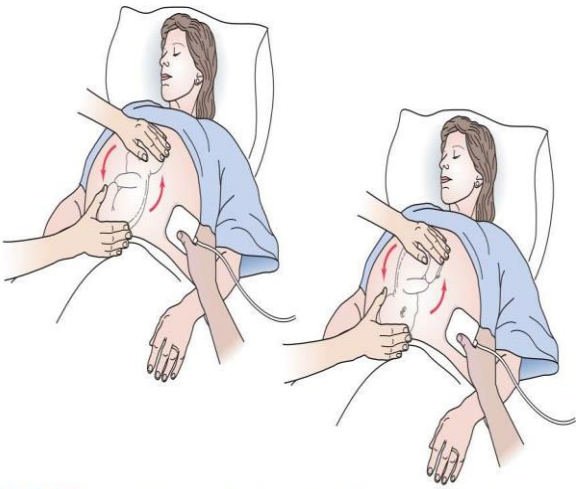


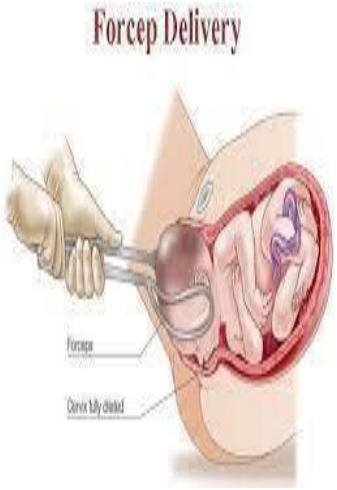
FIGURE 23.13 External cephalic version. The fetus is rotated by external pressure to a cephalic lie. An ultrasound helps guide a safe result.

Contraindications

to the procedure include multiple gestation, severe oligohydramnios, contraindications to vaginal birth, a cord that wraps around the fetal neck, and unexplained third-trimester bleeding, which might

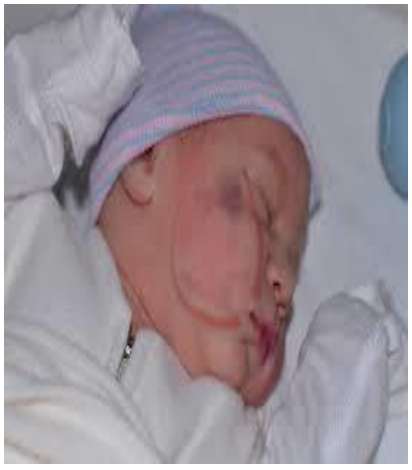
Forceps Birth

- are steel instruments constructed of two blades that slide together at their shaft to form a handle. One blade is slipped into the woman's vagina next to the fetal head, and then the other is slipped into place on the other side of the head



- **Forceps may be necessary**, if any of the following conditions occur:
- woman who has a spinal cord injury.
- Cessation of descent in the second stage of labor occurs.
- A fetus is in an abnormal position or is immature.
- A fetus is in distress from a complication such as a prolapsed cord.

❑ Before forceps are applied,
- Membranes must be ruptured.
- CPD must not be present.
- The cervix must be fully dilated.
- The woman's bladder must be empty.



✓assess FHR immediately after application.

✓assess laceration if occurred.

✓To rule out bladder injury, record the time and amount of the first voiding.

✓assess the newborn to be certain that no facial palsy or subdural hematoma exists.

✓A forceps birth may leave a transient erythematous mark on the newborn's cheek .This mark will fade in 1 to 2 days with no long-term effects.

vacuum extraction

a disk-shaped cup is pressed against the fetal scalp, over the posterior fontanelle. When vacuum pressure is applied, air beneath the cup is suctioned out and the cup then adheresso tightly to the fetal scalp that traction on the cord leading to the cup extracts the fetus

Vacuum extraction has advantages over forceps birth

- ✓little anesthesia is necessary
- ✓fewer lacerations of the birth canal

major disadvantage

- ✓causes a marked caput on the newborn head that may be noticeable as long as 7 days after birth.
- ✓A woman may need reassurance that the caput swelling is harmless to her infant and will decrease rapidly.
- ✓Moreover, vacuum extraction is not advantageous for preterm infants because of the softness of the preterm skull.

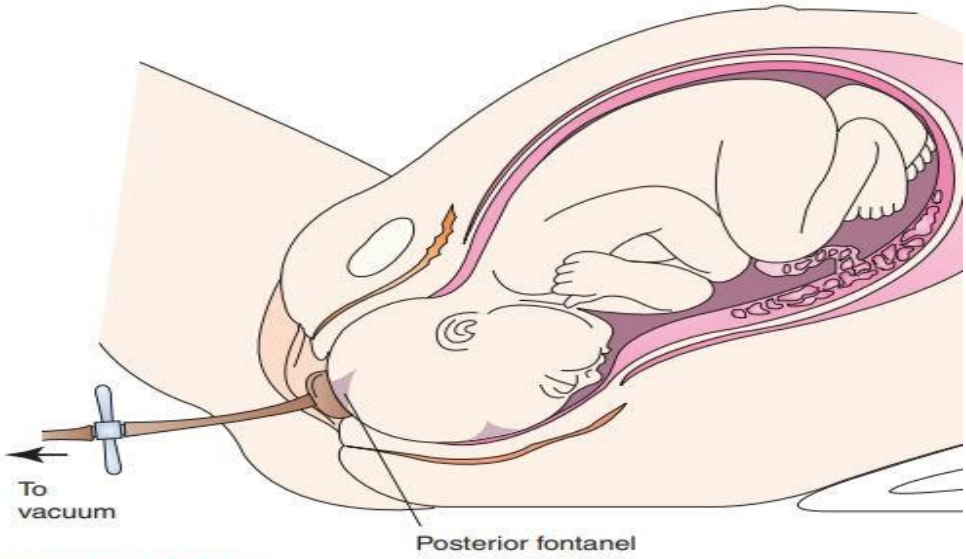
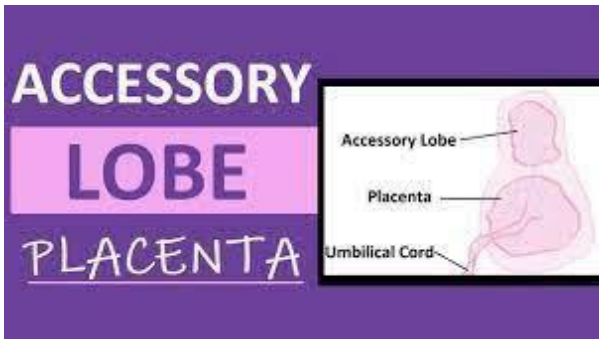


FIGURE 23.14 Vacuum extraction.

Anomalies of the Placenta

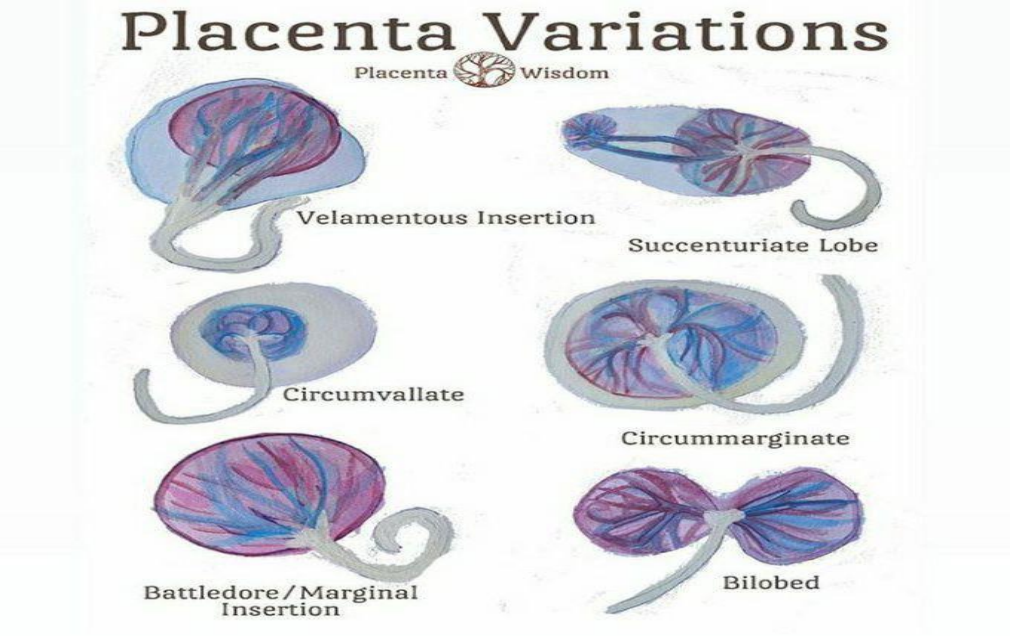
1. Placenta Succenturiata

is a placenta that has one or more accessory lobes connected to the main placenta by blood vessels. No fetal abnormality is associated with this type. However, it is important that it be recognized, because the small lobes may be retained in the uterus after birth, leading to severe maternal hemorrhage. On inspection, the placenta appears torn at the edge. The remaining lobes are removed from the uterus manually to prevent maternal hemorrhage from poor uterine contraction.



2. Placenta Circumvallata

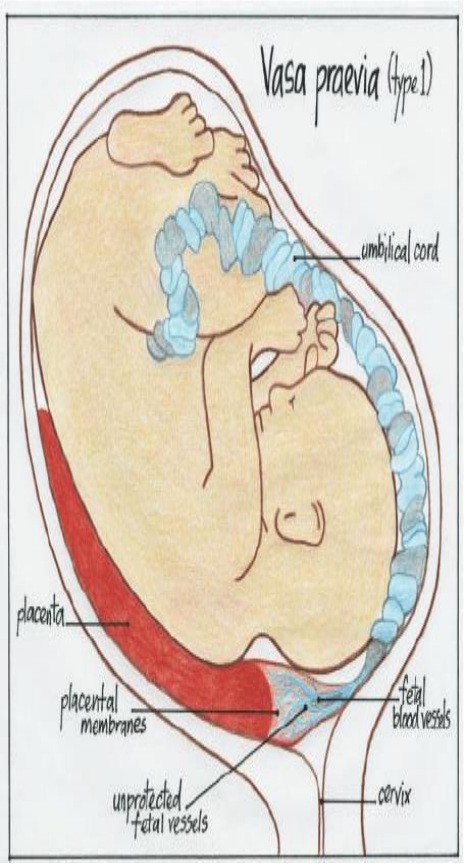
the fetal side of the placenta is covered to some extent with chorion . The umbilical cord enters the placenta at the usual midpoint, and large vessels spread out from there. They end abruptly at the point where the chorion folds back onto the surface, however. (In **placenta marginata,** the fold of chorion reaches just to the edge ofthe placenta.) Although no abnormalities are associated with this type of placenta, its presence should be noted.



3. Battledore Placenta

the cord is inserted marginally rather than centrally .This anomaly is rare and has no known clinical significance either.

4. Velamentous Insertion of the Cord is a situation in which the cord, instead of entering the placenta directly, separates into small vessels that reach the placenta by spreading across a fold of amnion. This form of cord insertion is most frequently found with multiple gestation. Because it may be associated with fetal anomalies, an infant born with this type of placenta should be examined carefully.



6. Placenta Accreta

is an unusually deep attachment of the placenta to the uterine myometrium so deeply the placenta will not loosen and deliver Attempts to remove it manually may lead to extreme hemorrhage because of the deep attachment. Hysterectomy or treatment with methotrexate to destroy the still-attached tissue may be necessary.

5. Vasa Previa: the umbilical vessels of a velamentous cord insertion cross the cervical os and therefore deliver before the fetus . The vessels may tear with cervical dilatation, just as a placenta previa may tear. Before inserting any instrument such as an internal fetal monitor, be certain to identify structures to prevent accidental tearing of a vasa previa as tearing would result in sudden fetal blood loss. If sudden, painless bleeding occurs with the beginning of cervical dilatation, either placenta previa or vasa previa is suspected. It can be confirmed by ultrasound. If vasa previa is identified, the infant needs to beborn by cesarean birth.

Anomalies of the Cord

1. Two-Vessel Cord A normal cord contains one vein and two arteries. The absence of one of the umbilical arteries is associated with congenital heart and kidney anomalies, because the insult that caused the loss of the vessel may have affected other mesoderm germ layer structures as well. Inspection of the cord as to how many vessels are present must be made immediately after birth, before the cord begins to dry, because drying distorts the appearance of the vessels. Document the number of vessels present conscientiously. An infant with only two vessels needs to be observed carefully for other anomalies during the newborn period.

2. Unusual Cord Length

- An unusually **short umbilical cord** can result in premature separation of the placenta or an abnormal fetal lie.
- An unusually **long cord** may be easily compromised because of its tendency to twist or knot. Occasionally, a cord actually forms a knot, but the natural pulsationsof the blood through the vessels and the muscular vessel walls usually keep the blood flow adequate. It is not unusual for a cord to wrap once around the fetal neck (**nuchal cord**) but, again, with no interference to fetal circulation

Lecture 8

Maternity and Neonate Health Nursing

POSTPARTUM (PUERPERIUM) PERIOD

Normal Physiological Changes
Psychological Adaptations
And
Complications of Postpartum Period and Nursing Management

University of Mosul/College of Nursing
Lecturer: Jwan Mohammed Hassan
2024-2025

OBJECTIVES

1-Discuss the mothers physiologic changes after the birth of her baby .
2- Describe the expected and unexpected emotional / behavioral changes in the new mother.
3-Discuss the possible post- partum complications of hemorrhage and puerperal infection , mastitis ,UTI and pulmonary embolism.

Normal postpartum (puerperium)

- The postpartum (puerperium) period begins after the delivery of the placenta and lasts approximately **6 weeks**.
- During this period the woman's body begins to return to its prepregnant state, and these changes generally resolve by the sixth week after giving birth.

* This lecture describes the major physiologic and psychological changes that occur in a woman after childbirth. Various systemic adaptations take place throughout the woman's body. This adaptation includes:

1. Physiological adaptation
2. Psychological adaptations

Maternal Physiological adaptation

❖ Reproductive System Adaptations

Uterus

The uterus returns to its normal size through a gradual process of involution, which involves retrogressive changes that return it to its non-pregnant size and condition.

Involution involves three retrogressive processes:

1) **Contraction** of muscle fibers to reduce those previously stretched during pregnancy
2) **Catabolism**, which reduces enlarged, individual myometrium cells.
3) **Regeneration of uterine epithelium** from the lower layer of the decidua after the upper layers have been sloughed off and shed during lochial discharge.

- The uterus, which weighs approximately 1,000 gm soon after birth.
- Approximately one week after birth, the uterus shrinks in size by 50% and weighs about **500gm, 300gm →→ 2 weeks after birth, 60 gm →→ At the end of 6 weeks**

- During the first few days after birth, the uterus typically (1 fingerbreadth) per day.

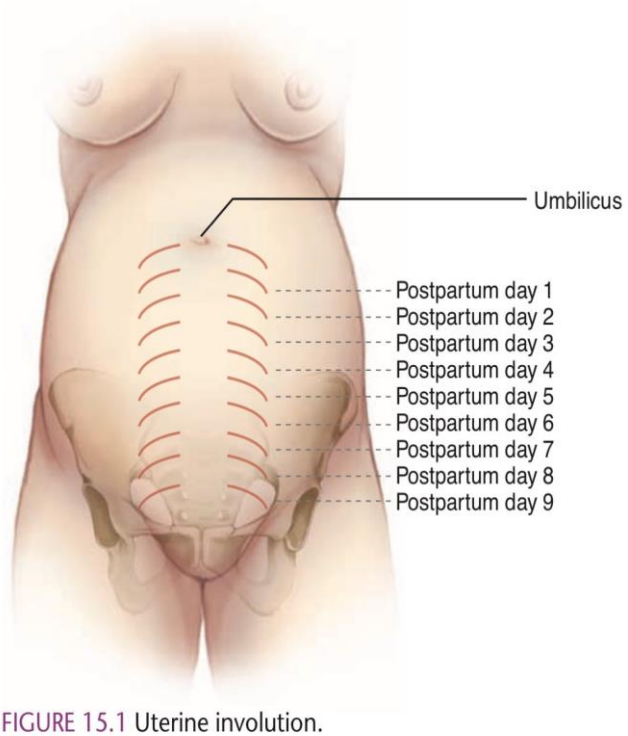


FIGURE 15.1 Uterine involution.

LOCHIA

Lochia is the vaginal discharge that occurs after birth. Immediately after childbirth, lochia is ***bright red*** and consists mainly of blood, decidual cells, mucus, red and white blood cells. The lochia from the uterus is alkaline but becomes acidic as it passes through the vagina.

It is roughly equal to the amount occurring during a heavy menstrual period. The average amount of lochial discharge is **240 to 270 mL**.

The uterine lining (called the endometrium when not pregnant and the decidua during pregnancy).

Lochia passes through three stages:

1. Lochia Rubra

Color**:**is a deep-red mixture of mucus, tissue debris & blood.
Duration: first 3 to 4 postpartum days
Flow: like a heavy period with small clots,
Pain: mild, period-like cramping

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2. Lochia Serosa

Color: pinkish brown discharge, contains leukocytes, decidual tissue, red blood cells, and serous fluid
Duration: It lasts for 4-10 days
Flow: thinner and more watery, moderate, with less clotting or no clotting.

3.Lochia Alba

Color: yellowish-white discharge, contains leukocytes, decidual tissue, red blood cells, and reduced fluid content.
Duration: It occurs from days **10 to 14** but can last **3 to 6** weeks postpartum in some women and still be considered normal
Flow: little to no blood (light flow or spotting) and no clot.

Lochia at any stage should have a fleshy smell; an offensive odor usually indicates an infection, such as **Endometritis**

The amount of lochia is described as follows:

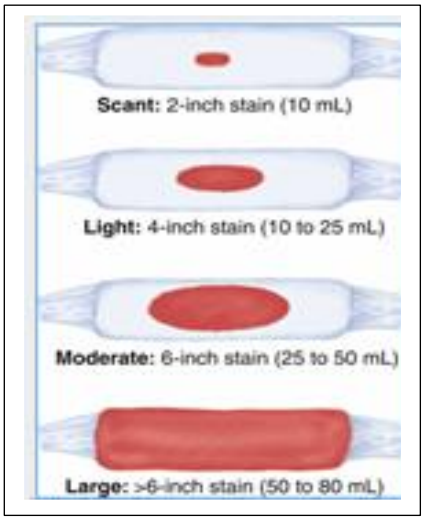
a. Scant: Less than a 5-cm (2-inch) stain

b. *Light:* Less than a 10-cm (4-inch) stain

c. *Moderate:* Less than a 15-cm (6-inch) stain

d. *Large or heavy:* Larger than a 15-cm stain or one pad saturated within 2 hours

e. *Excessive:* Saturation of a perineal pad within 15 minutes



AFTERPAINS

- Part of the involution process involves uterine contractions. Subsequently, many women are frequently bothered by painful uterine contractions termed **afterpains**.
- Afterpains are usually stronger during breast-feeding because oxytocin released by the

sucking reflex strengthens the contractions. Mild analgesics can reduce this discomfort.

- More common in multiparas ----------→ caused by contraction and relaxation of uterus , increased by oxytocin breastfeeding.

Cervix

- The cervix typically returns to its pre-pregnant state by week 6 of the postpartum period.
- Immediately after childbirth, the cervix is shapeless and edematous and is easily distensible for several days.
- The cervical os gradually closes and returns to normal by 2 weeks, whereas the external os widens and never appears the same after childbirth.
- The external cervical os is no longer shaped like a circle, but instead appears as a jagged slit-like opening, often described as a "fish mouth"

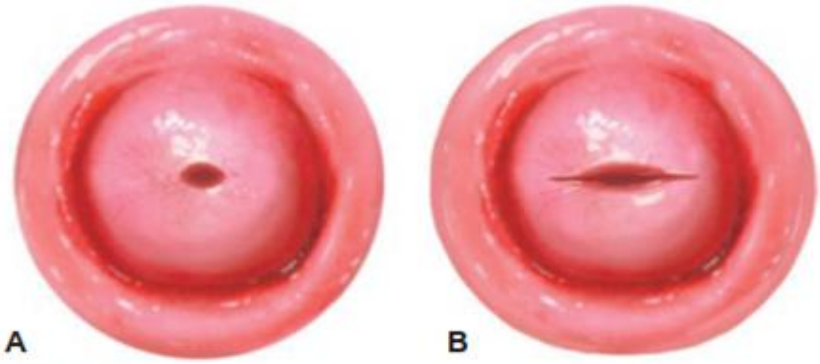


FIGURE 15.2 Appearance of the cervical os. (**A**) Before the first pregnancy. (**B**) After pregnancy.

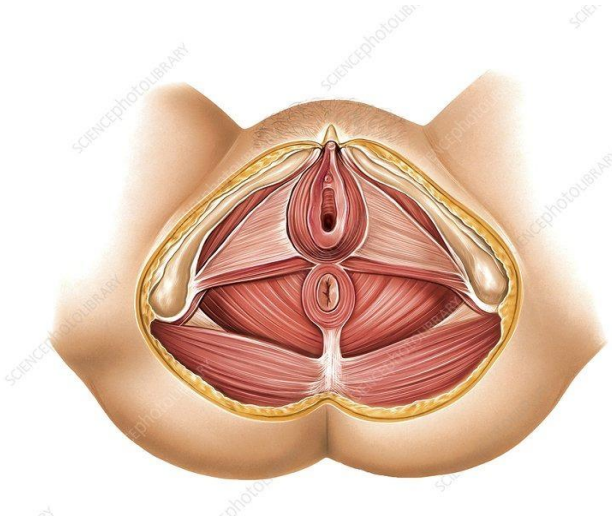
Vagina

- Shortly after birth, the vaginal mucosa is edematous and thin, with few rugae. As ovarian function returns and estrogen production resumes, the mucosa thickens and rugae return in approximately 3 weeks.
- The vagina gapes at the opening and is generally lax. The vagina returns to its approximate pre-pregnant size by 6 to 8 weeks postpartum but will always remain a bit larger than it had been before pregnancy.

- The vagina gradually decreases in size and regains tone over several weeks. By 3 to 4 weeks, the edema and vascularity have decreased. The vaginal epithelium is generally restored by 6 to 8 weeks postpartum.

Perineum

- The perineum is often edematous and bruised for the first day or two after birth. Supportive tissues of the pelvic floor are stretched during the childbirth process, and restoring their tone may take up to 6 months.
- If the birth involved an episiotomy or laceration, the edges should be approximated. Initial healing of the episiotomy or laceration occurs in 2 to 3 weeks after birth, although complete healing may take up to 4 to 6 months.



Female Perineum

❖ Cardiovascular System Adaptations

Cardiac Output and Blood Volume

Because of a 50% increase in blood volume during pregnancy, the woman tolerates the following normal blood loss at delivery:

• 200 to 500 mL in vaginal birth	**• 700 to 1000 mL in cesarean birth**

- Cardiac output remains high for the first few days postpartum and then gradually declines to non-pregnant values within 3 months of birth.

- Blood volume, which increases substantially during pregnancy, drops rapidly after birth and returns to normal within 4 weeks postpartum

- Blood plasma volume is further reduced through **diuresis** (increased excretion of urine, which may reach 3000 mL/day), which occurs during the early post-partum period.

- Tachycardia (heart rate above 100 bpm) in the post-partum woman warrants further investigation. It may indicate hypovolemia, dehydration, or hemorrhage.

- Blood pressure values should be similar to those obtained during the labor process. A significant increase accompanied by headache might indicate **preeclampsia** and requires further investigation. Decreased blood pressure may suggest an **infection or a uterine hemorrhage**

- Clotting factors that increased during pregnancy tend to remain elevated during the early postpartum period. these coagulation factors remain elevated for 2 to 3 weeks postpartum.

- Hemoglobin and hematocrit levels to decrease slightly in the first 24 hours. During the next 2 weeks, both levels rise slowly. The white blood count, which increases in labor, remains elevated for first 4 to 6 days after birth but then falls to 6,000 to 10,000/mm3.

❖ **Urinary System Adaptations**

Many women have difficulty feeling the sensation to void after giving birth if they received an anesthetic during labor (which inhibits neural functioning of the bladder) or if they received oxytocin to induce of labor (antidiuretic effect).

Following cessation of the oxytocin the woman will experience rapid bladder filling.

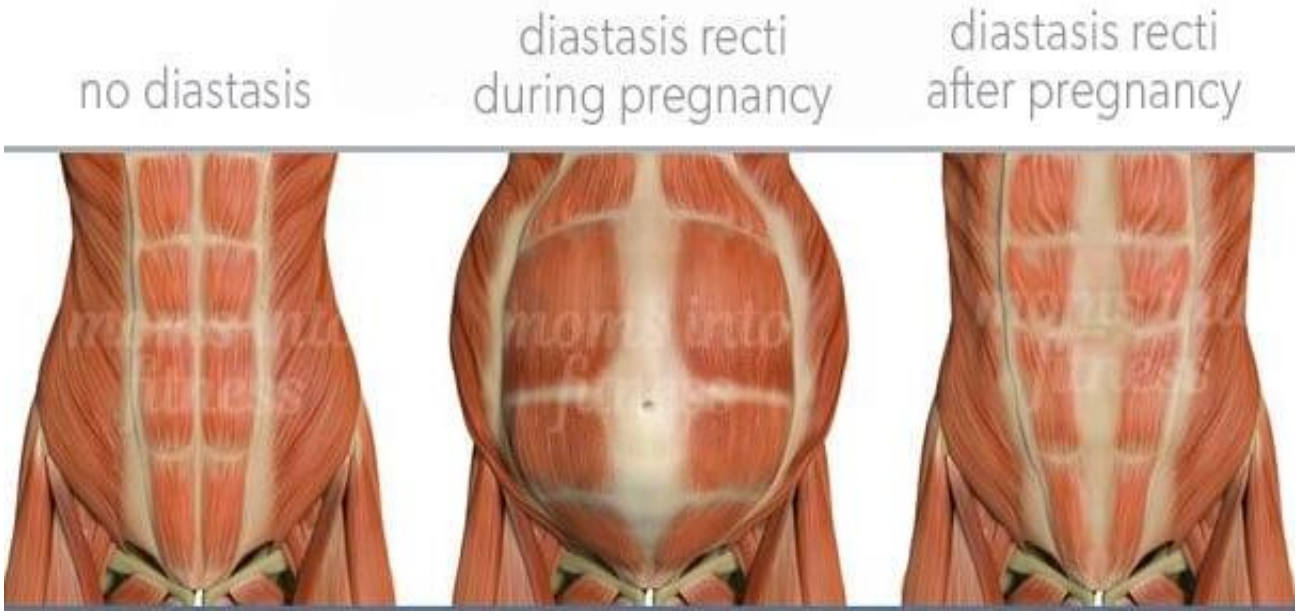
Urinary output increases during the early postpartum period (first 12 to 24 hours) because of ***puerperal diuresis***. Normal function return within a month after birth.

❖ **Gastrointestinal System Adaptations**

- The gastrointestinal system resumes normal activity shortly after birth, because the progesterone levels which caused relaxation of smooth muscle and diminished bowel tone , are **decreases**.
- The mother is usually hungry after the hard work and food deprivation during labor. Most women are hungry and thirsty after childbirth, commonly related to NPO restrictions and the energy expended during labor. Their appetite returns to normal immediately after giving birth.
- Constipation may occur during the postpartum period as a result of several factors:
    1. Abdominal muscles are stretched, making it more difficult for the woman to bear down to expel stool. A cesarean incision adds to this difficulty.
    2. Dehydration make the feces harder. 2MO -
    3. Hemorrhoids or soreness and swelling of the perineum.

❖ Musculoskeletal System Adaptations

- The effects of pregnancy on the muscles and joints vary widely. During pregnancy, the hormones relaxin, estrogen, and progesterone relax the joints.
- After birth, levels of these hormones decline, resulting in a return of all joints to their prepregnant state within **6 to 8 weeks**, with the exception of the woman's feet.
- During pregnancy, stretching of the abdominal wall muscles occurs to accommodate the enlarging uterus.
- After birth, muscle tone is diminished and the abdominal muscles are soft and flabby.
- Specific exercises are necessary to help the woman regain muscle tone. Fortunately, **diastasis recti** responds well to exercise, and abdominal muscle tone can be improved.



❖ Integumentary System Adaptations

- As estrogen and progesterone levels decrease, the darkened pigmentation on the abdomen (linea nigra), face (melasma), and nipples gradually fades.
- Striae gravidarum (stretch marks) that developed during pregnancy on the breasts, abdomen, and hips gradually fade to silvery lines. However, these lines do not disappear completely.
- The profuse diaphoresis (sweating) that is common during the early postpartum period especially at night during the first week.

- **This postpartum diaphoresis** is a mechanism to reduce the amount of fluids retained during pregnancy and restore prepregnant body fluid levels. Reassure the client that this is normal and encourage her to change her gown to prevent chilling.

❖ Respiratory System Adaptations

Respirations usually remain within the normal adult range of 16 to 24 breaths per minute. As the abdominal organs resume their nonpregnant position, the diaphragm returns to its usual position. All changes during pregnancy return to normal within 1 to 3 week.

Lactation

Lactation is the secretion of milk by the breasts. It is thought to be brought about by the interaction of progesterone, estrogen, prolactin, and oxytocin. Breast milk typically appears within 4 to 5 days after childbirth.

Breast milk production can be summarized as follows:

- Prolactin levels increase at term with a decrease in estrogen and progesterone levels.
- Estrogen and progesterone levels decrease after the placenta is delivered.
- Prolactin is released from the anterior pituitary gland and initiates milk production.
- Oxytocin is released from the posterior pituitary gland to promote milk let-down.
- Infant sucking at each feeding provides continuous stimulus for prolactin and oxytocin release.

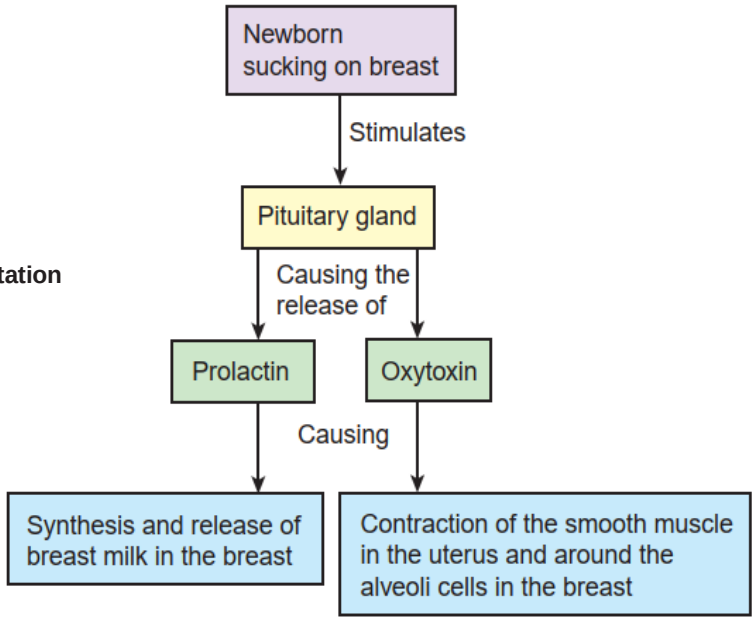


FIGURE : **Physiology of lactation**

Engorgement is swelling of the breast tissue as a result of an increase in blood and lymph supply as a precursor to lactation. Breast engorgement usually peaks in 3 to 5 days postpartum and usually subsides within the following 24 to 36 hours

Treatments to reduce the pain of breast engorgement include heat or cold applications, cabbage leaf compresses, breast massage and milk expression, Standing in a warm shower , breast pumping, and anti-inflammatory agents

Four major hormones are influential during the postpartum period: **estrogen, progesterone, prolactin, and oxytocin.**

1. **Estrogen** levels drop profoundly at birth and reach their lowest level a week into the postpartum period.

Progesterone : As with estrogen, progesterone levels decrease dramatically after birth and are undetectable 72 hours after birth. Progesterone levels are reestablished with the first menstrual cycle.

Oxytocin stimulates the uterus to contract during the breast-feeding session . Oxytocin also acts on the breast by causing the milk let-down reflex during breast-feeding.

Prolactin is also associated with the breast-feeding process by stimulating milk production.

- In women who breastfeed, prolactin levels remain elevated into the sixth week after birth.
- The levels of the hormone increase and decrease in proportion to nipple stimulation.
- High levels of prolactin have been found to delay ovulation by inhibiting ovarian response to follicle-stimulating hormone

The timing of first menses and ovulation after birth differs between women who are breast-feeding and women who are not breast-feeding

PSYCHOLOGICAL ADAPTATIONS

A. Parental Attachment Behaviors

- **Bonding** refers to a strong emotional tie that forms soon after birth between the parents and the newborn(that develops during the first 30 to 60 minutes after birth).

- **Attachment** is an affectionate tie that occurs through time as the newborn and caregivers interact.

- **Maternal attachment** has the potential to affect both child development and parenting.

The process of attachment is complex and is influenced by many factors including:

1. **Environmental circumstances**
2. **The newborn's health status**
3. **The quality of nursing care (kangaroo care, breast-feeding)**

B. Maternal Psychological Adaptations

Rubin's Psychological Adaptation of the Puerperium and Related Nursing Interventions

Psychological Adaptation	Nursing Interventions
Taking -In Phase	
Mother is passive and willing to let others do things for her. Has interest in newborn but prefers that others care for newborn. Has little interest in learning. Focus is on for food, fluid , rest and sleep This phase typically lasts 1 to 2 days.	*Provide opportunity for rest and appropriate nutrition. *Provide opportunity to discuss birth experience and share joys
Taking-Hold Phase	
Mother begins to initiate action and becomes interested in caring for newborn. May be critical about her abilities. Has increased concern about her body functions and assumes self-care needs. Is interested in learning how to care for self and baby. This phase typically starts on the second to third day postpartum and may last several weeks.	*Provide supportive atmosphere. *Identify support system of mother . *Reinforce self-care and newborn care taking abilities.
Letting-Go Phase	
Mothers and partners work through giving up their previous lifestyle to incorporate newborn. the woman reestablishes relationships with other people. She adapts to parenthood through her new role as a mother.	*Provide supportive atmosphere. *Reinforce newborn caregiving abilities.

Management of postpartum period

Nursing Assessment 2MO -

postpartum assessment includes

1. Vital signs

2. Physical assessment
3. Psychosocial assessments

Postpartum assessment typically is performed as follows:

- During the first hour: every 15 minutes
- During the second hour: every 30 minutes
- During the first 24 hours: every 4 hours
- After 24 hours: every 8 hours

Monitor Vital signs

- **Temperature** during the first 24 hr. are normal 37˚ c and sometime become 38˚c related to dehydration because of fluid loss during labor
- **Pulse rates** : Bradycardia rates of 50 to 70 beats per minute occur during first 6 to 10 days due to decreased blood volume. Increase pulse rate often indicates infection or hemorrhage .
- **Respiratory rates** in the postpartum woman should be within the normal range of 16 to 24 breaths per minute.
- **Blood pressures** is usually normotensive within 24 hr. of delivery .
- **Orthostatic hypotension** as indicated by feeling of faintness or dizziness immediately after standing up in women who have lost an appreciable amount of blood with birth.

Physical Assessment

Postpartum assessment **is BUBBLE-HE**:

Assessment	Variations and Deviations	Nursing Interventions
Breasts May be soft or engorged	Observe for reddened, tender areas, fissures, and sore nipples	Document and report any alteration; teach breast-feeding principles and assess progress; consult lactation nurse; possible breast massage
Uterus Observe firmness, height of fundus, and location	Check for bladder distention if fundus is not midline; massage a soft, boggy uterus	Document and report any alterations; teach expectations for descent of fundus; teach mother how to massage fundus; discuss afterpains
Bladder Observe for bladder distention and urination	Observe for burning or pain on urination	Document and report urine output and abdominal assessment for distended bladder
Bowels Observe for passage of flatus, bowel sounds, and defecation	Report constipation; distended hemorrhoids may be seen	Encourage fluids, ambulation, and fiber in diet; assist with sitz bath for hemorrhoids; possible use of stool softeners
Lochia Observe for character, amount, color, odor, and presence of clots	Observe for large clots and heavy pad saturation; watch for trickle of bright red blood	Document firm, midline fundus; report bleeding and large clots; count peripads saturated in 1 hour; teach the lochial changes to expect
Episiotomy Observe perineum	Observe for vulvar hematoma, perineal bruising; may see hemorrhoids	Document wound assessment in relation to REEDA (**r**edness, **e**dema, **e**cchymosis, **d**ischarge, **a**pproximation); teach pericare technique; apply cold packs as indicated; teach how to use sitz bath at home; pad seat area of chair for sitting comfort
Homans' sign Discomfort produced by passive dorsiflexion of the foot is considered a positive Homans' sign, indicative of thrombophlebitis	Report if Homans' sign is positive, and assess for other factors that may indicate thrombus formation, such as redness, tenderness, warmth, or increased circumference of the leg	The postpartum value of a positive Homans' sign is limited, because the postpartum woman may have a strained muscle from delivery positioning; clinical symptoms and venous ultrasound are more reliable diagnostic measures (Gabbe et al., 2017)
Emotions or bonding with newborn Evaluate family interaction, support, and physical contact with newborn	Observe for postpartum depression; observe for *en face* contact with newborn; teach handling and response to newborn needs; assess cultural practices; assess stage of postpartum adaptation	Teach parents about newborn behavior and appearance; teach newborn care; teach self-care and *listen* to patient; provide support, nutrition, and periods of rest to prevent fatigue; encourage skin-to-skin contact
Vital signs Bradycardia is common; respirations should be 12–20; vital signs should be stable	Abnormalities may be consistent with comorbidities; deviation in vital signs may also indicate woman is in pain; assess for shock, infection	Record and report tachypnea, elevated temperature, and blood pressure abnormalities; assess for pain, and provide medication as indicated; administer analgesics after breastfeeding to minimize exposure of newborn to the medication

*REEDA,***R**edness, **e**dema, **e**cchymosis, **d**rainage, **a**pproximation. An acronym that can help the nurse remember and organize the postpartum assessment is *BUBBLE-HE:***b**reast, **u**terus, **b**ladder, **b**owels, **l**ochia, **e**pisiotomy (perineum), **H**omans' sign, **e**motions or bonding.

The perineum should be assessed for normal healing and signs of complications. Use the REEDA acronym:

1. **Redness**. Redness without excessive tenderness is probably the normal inflammation associated with healing, but pain with the redness is more likely to indicate infection.

2. **Edema**. Mild edema is common, but severe edema interferes with healing.

3. **Ecchymosis (bruising).** A few small superficial bruises are common. Larger bruises interfere with

normal healing.

4. **Discharge**. No discharge from the perineal suture line should be present.

5. **Approximation** (intactness of the suture line). The suture line should not be separated.

Postpartum Danger Signs

a) Fever more than 100.4° F (38° C)
b) Foul-smelling lochia
c) Large blood clots, or bleeding
d) Severe headaches or blurred vision Visual changes, such as blurred vision.
e) Swelling, redness, or discharge at the episiotomy , or abdominal sites
f) Dysuria, burning, or incomplete emptying of the bladder.
g) Shortness of breath or difficulty breathing.
h) Depression or extreme mood swings.
i) Homans' sign (calf pain when the foot is passively dorsiflexed)

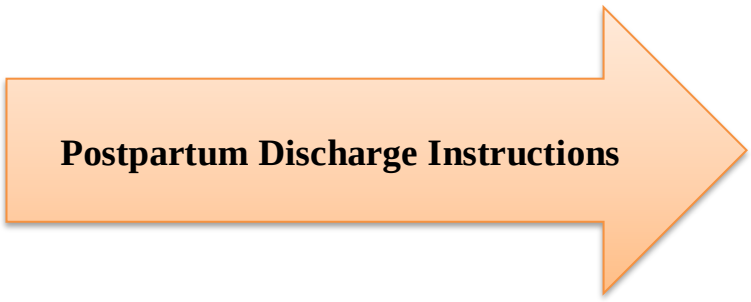
Promoting Maternal Nutrition

Nutrition recommendations for the postpartum woman include the following:

- Eat a wide variety of foods with high nutrient density.
- Eat meals that require little or no preparation.
- Avoid high-fat fast foods.
- Drink plenty of fluids daily—at least 2,500 mL
- Avoid fad weight-reduction diets and harmful substances
- Avoid excessive intake of fat, salt, sugar, and caffeine.
- Eat the recommended daily servings from each food group

Postpartum Discharge Instructions

1. Work
2. Rest
3. Exercise
4. Hygiene
5. Coitus
6. Vaccine
7. Contraception
8. Follow-up



Complications of Postpartum Period

Complications during postpartum period include

1. Physical complications
2. Psychological complications

Physical complications

1- Postpartum hemorrhage (PPH)

Postpartum hemorrhage is defined as a blood loss greater than 500 mL after vaginal birth or more than 1,000 mL after a cesarean birth.

Types of Postpartum hemorrhage

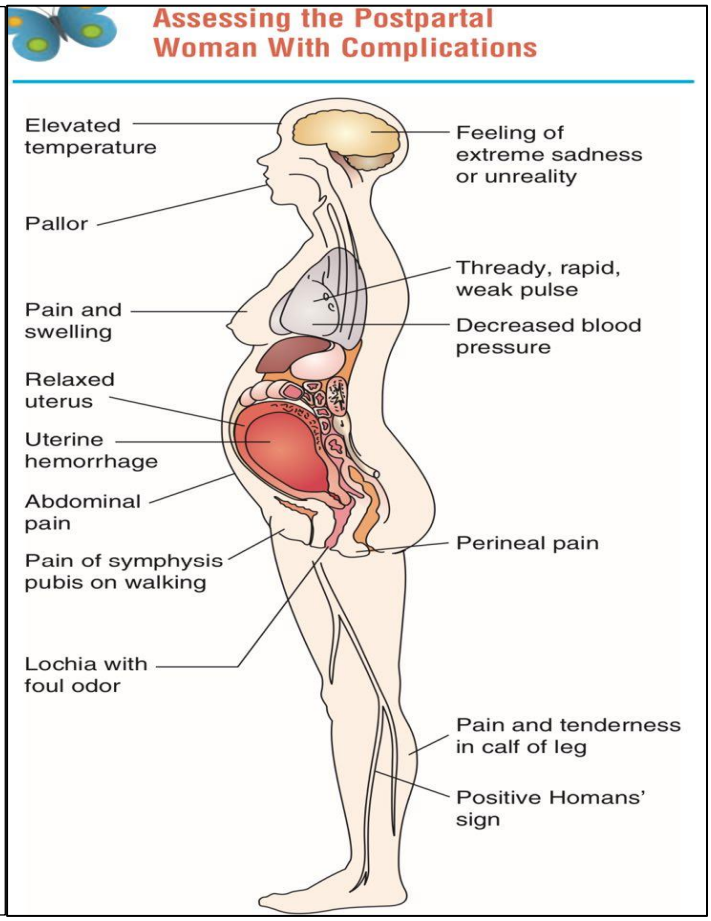
Primary (Early) Postpartum Hemorrhage is defined by the WHO as blood loss from genital tract more than 500 mL in the first 24 hours of delivery

Secondary (Late) Postpartum Hemorrhage

Excessive blood loss after 24 hours of delivery in postpartum period.

FIVE primary causes of PPH, the " 5 T's " namely:

- Tone (atonic uterus),
- Tissue (retained placenta),
- Trauma (cervical, or uterine injury)
- Thrombin (coagulation defects).
- **T**raction: causing uterine inversion



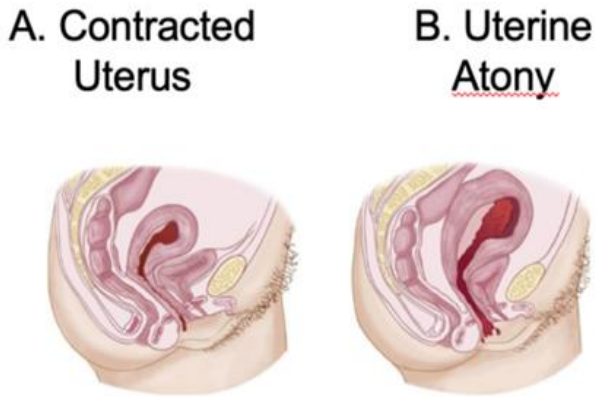
Underlying risk factors and causes of postpartum hemorrhage

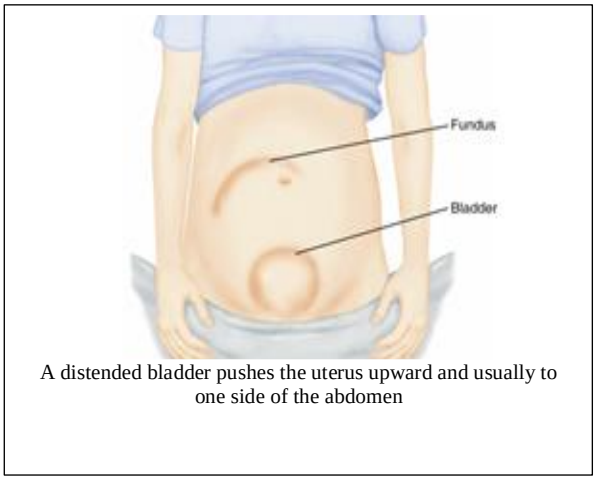
Causes of PPH	*Underlying risk factors*
1. Uterine atony—accounts for 70 % of cases of PPH	Prolonged labor / Very rapid labor Multiple pregnancies / Obesity age> 35 years / Previous H/O PPH Hypertension / Fibroid uterus Cesarean delivery / Uterine inversion Induced labor—use of high doses of oxytocin
2. Placenta related conditions	Retained placenta . H/O antepartum hemorrhage, Placenta previa Abnormally adhered: accreta,
3. Injury to genital tract	Extension of episiotomy / vaginal tears Cervical tears / Uterine rupture Vulval and vaginal hematoma
4.Coagulation defects	Preeclampsia , Intrauterine fetal death……etc
5. Anemia a.	Malnutrition/not taking iron supplement Thalassemia

1. Uterine atony

- Soft, high uterine fundus that is difficult to feel through woman's abdominal wall.

- Heavy lochia, often with large clots or sometimes a persistent moderate flow .
- Bladder distention that causes uterus to be high and usually displaces it to one side.
- Possible signs of hypovolemic shock(Confusion, Tachycardia, Restlessness, Lethargy, ↓ Bp…etc).
- Uterine atony allows the blood vessels at the placenta site to bleed freely and usually massively. Uterine overdistention, retained placental fragments, prolonged labor, Medications that relax uterus and Operative birth lead to relax the uterus may cause atony.





A distended bladder pushes the uterus upward and usually to one side of the abdomen

Medical management and nursing care

1. Identify the need for fundal massage. The uterus will be soft and usually higher than the umbilicus. A firm fundus does not need massage.
2. Place the woman in a supine position with the knees slightly flexed.
3. Place one hand on the abdomen just above the symphysis pubis. Place the other hand around the top of the fundus.
4. Locate and massage the uterine fundus with the flat portion of the fingers of the dominant hand in a firm, circular motion.
5. When the uterus is firm, gently push downward on the fundus, toward the vaginal outlet, to expel blood and clots that have accumulated inside the uterus
6. If a full bladder contributes to uterine relaxation, have the mother void. Catheterize her if she cannot void.
7. Give any prescribed medications, such as oxytocin, to maintain uterine contraction. if she is breastfeeding to stimulate the secretion of natural oxytocin. Methylergonovine increases blood pressure and should not be given to a woman with hypertension.
8. Maintain IV Infusion Check vital signs every 15 to 30 minutes.
9. Document the consistency and location of the fundus before and after massage
10. a hysterectomy is needed to remove the bleeding uterus that does not respond to any other measures.

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2. Lacerations of the Reproductive Tract

Lacerations of the perineum, vagina, cervix, or area around the urethra (periurethral lacerations) can cause postpartum bleeding. Trauma is more likely to occur if the woman has a rapid labor or if forceps or a vacuum extractor is used. Blood lost in lacerations is usually a brighter red than lochia and flows in a continuous trickle. Typically, the uterus is firm.

2MO -

Treatment

The health care provider should be notified if the woman has signs of a laceration, such as bleeding with a firmly contracted uterus. The injury is usually sutured in the delivery or operating room.

Nursing care

Signs and symptoms of a bleeding laceration should be reported. The woman should be kept on NPO status until further orders are received, because she may need a general anesthetic for repair of the laceration.

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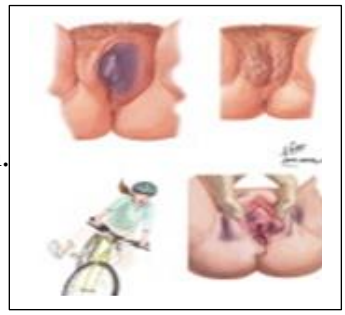
3. Hematomas of the Reproductive Tract



A **hematoma** is a collection of blood (25 to 500 ml) within the tissues

Hematomas resulting from birth trauma are usually on the vulva or inside the vagina.

They may be easily seen as a bulging bluish or purplish mass.

Treatment and Nursing Care

Small hematomas usually resolve without treatment. Larger ones may require incision and drainage of the clots under local anesthesia. Administer a mild analgesic as ordered for pain relief. Applying an ice pack. Check vital signs.

Subinvolution of the uterus

Involution is the return of the uterus to its non-pregnant condition after birth.

Subinvolution is a slower than expected return of the uterus to its non-pregnant condition. Infection and retained fragments of the placenta are the most common causes. Typical signs of subinvolution include the following:

a. Fundal height greater than expected for the amount of time since birth
b. Persistence of lochia rubra
c. Pelvic pain, heaviness, fatigue

Treatment and Nursing Care

1. Medical treatment is selected to correct the cause of the subinvolution. It may include the following:

a. Methylergonovine (Methergine) to maintain firm uterine contraction
b. Antibiotics for infection
c. Dilation of the cervix and curettage to remove fragments of the placenta from the uterine wall

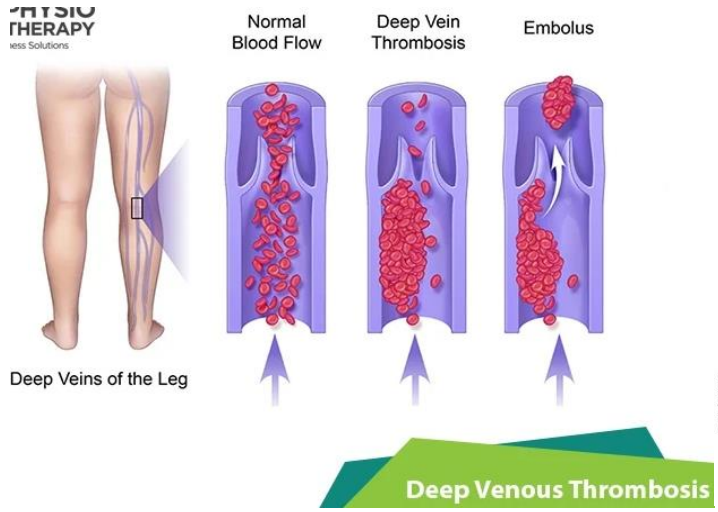
2. Assisting with medical therapy and providing analgesics
3. Teach The woman how to palpate the fundus and what normal changes to expect.

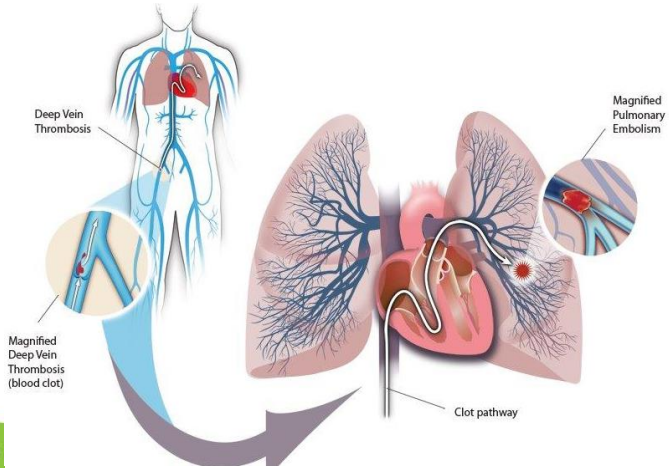
Thromboembolic disorders

Deep venous thrombosis (DVT) can involve veins from the feet to the femoral area and is characterized by pain, calf tenderness, leg edema, color changes, An increase in leg circumference greater than 2 cm

pain when walking, and a positive Homans' sign (pain when the foot is dorsiflexed).

Pulmonary embolism (PE) occurs when the pulmonary artery is obstructed by a blood clot that breaks off (embolizes) and lodges in the lungs. It may have dramatic signs and symptoms, such as sudden chest pain, cough, dyspnea (difficulty breathing), a decreased level of consciousness.





Treatment and Nursing Care

- Deep venous thrombosis is treated with administration of analgesics, and elevation of the legs to promote venous drainage. IV anticoagulation drugs, such as heparin.
- Early ambulation or range-of-motion exercises are valuable aids to preventing thrombus formation in the postpartum woman.
- The nurse should teach the woman how to put Antiembolic stockings on the properly.
- Avoiding sitting or standing in one position for prolonged periods.

POSTPARTUM INFECTION

Postpartum infection is defined as a fever of 100.4° F (38° C) or higher after the first 24 hours after childbirth, occurring on at least 2 of the first 10 days after birth.

Risk factors include : surgical birth, prolonged rupture of membranes, long labor with multiple vaginal examinations, extremes of client age, low socioeconomic status, and anemia during pregnancy

Metritis

Metritis is an infectious condition that involves the endometrium, decidua, and adjacent myometrium of the uterus. Extension of metritis can result in parametritis, which involves the broad ligament and possibly the ovaries and fallopian tubes. Due to bacteria as *E. coli,,* or *G. vaginalis.*

Treatment and Nursing Care

When *metritis* occurs, broad-spectrum antibiotics are used to treat the infection. Management also

includes measures to restore and promote fluid and electrolyte balance, provide analgesia, and provide emotional support. In most treated women, fever drops and symptoms cease within 48 to 72 hours after the start of antibiotic therapy.

Wound Infections

Any break in the skin or mucous membranes provides a portal for bacteria. In the postpartum woman, sites of wound infection include cesarean surgical incisions, the episiotomy site in the perineum, and genital tract lacerations. Wound infections are usually not identified until the woman has been discharged from the hospital because symptoms may not show up until 24 to 48 hours after birth

S & S: Edema, Erythema, Tenderness, Discomfort at the site, Maternal fever, Elevated white blood cell count, wound separation and purulent drainage.

Treatment and Nursing Care

- Management for *wound infections* involves recognition of the infection, followed by opening of the wound to allow drainage.
- vital signs assessment
- Aseptic wound management with sterile gloves and frequent dressing changes, good hand washing, frequent perineal pad changes, hydration, and ambulation to prevent venous stasis and improve blood circulation .
- Parenteral antibiotics are the mainstay of treatment.
- Analgesics are also important, because women often experience discomfort at the wound site.
- The acronym REEDA is frequently used for assessing a woman's perineum status.

Urinary Tract Infections

It occur in 2-4% of postpartum women

Risk Factors: urinary catheterization, frequent vaginal examinations, and genital trauma

Treatment and Nursing Care

1. antibiotic therapy , analgesia.
2. teaching include: monitor temp. , bladder function, appearance of urine, signs of potential complications & taking antibiotics as prescribed.
3. inform postpartum woman for proper perineal care, wiping from front to back after urinating or have bowel motion ,
4. increase fluid intake to prevent UTI

Mastitis:

A common problem that may occur within (2- 4) weeks postpartum is an inflammation of the breast, termed **mastitis**. An estimated 2% to 33% of breast- feeding women develop lactational mastitis. As well as causing significant discomfort. Flu-like symptoms are often the first symptoms experienced by the mother. Breasts are red, tender, and hot to the touch.

It can result from :

1. insufficient drainage of the breast
2. rapid weaning
3. oversupply of milk
4. pressure on the breast from a poorly fitting bra
5. a blocked duct
6. missed feedings
7. breakdown of the nipple via fissures, cracks, or blisters.

Treatment and nursing care :

Effective milk removal, pain medication, and antibiotic therapy have been the mainstays of treatment. counseling about prevention of cracked nipple supports of breasts, local cold, proper breastfeeding technique is preventive measure for cracked nipple.

** A breast abscess may develop if mastitis is not treated adequately

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POSTPARTUM AFFECTIVE DISORDERS

are commonly classified on the basis of their severity: "baby blues," postpartum depression, and postpartum psychosis

1. Postpartum or Baby Blues: The "blues" typically peak on postpartum days 4 and 5 and usually resolve by postpartum day 10.

2. Postpartum depression PPD: Usually has a gradual onset and becomes evident within the first 6 weeks postpartum

3. Postpartum Psychosis: Post- partum psychosis, an emergency psychiatric condition, can result in a significant increased risk for suicide and infanticide . It generally surfaces within 3 months of giving birth

Baby Blues	Postpartum Depression	Postpartum Psychosis
Mood swings	Loss of appetite	Confusion and disorientation
Anxiety	Insomnia	Hallucinations and delusions
Sadness	Intense irritability and anger	Paranoia
Irritability	Overwhelming fatigue	Attempts to harm yourself or your baby
Crying	Loss of interest in sex	
Decreased concentration	Lack of joy in life	
Trouble sleeping	Feelings of shame, guilt or inadequacy	
	Severe mood swings	
	Difficulty bonding with your baby	
	Withdrawal from family and friends	
	Thoughts of harming yourself or your baby	

Lecture 9

“Nursing care during Obstetrical Operation

OBJECTIVES

1. To Identify possible medical – surgical interventions labor : cesarean birth , induction and augmentation of labor , episiotomy . forceps & vacuum extractor

2. provide care for a client during labor and delivery . Induction of labor &augmentation of labor. Lacerations of the birth canal. Episiotomy & repair. Forceps delivery. Caesarian section.

Induction of labor &augmentation of labor.

- **Induction of labor** (IOL) is the intentional initiation of labor before it begins naturally.(artificially)
- **Augmentation** of labor is: the stimulation of contractions after they have begun naturally.(**for To strengthen and regulate UCs and To shorten the length of labor)**

Indications for Induction

1. Ruptured membranes without spontaneous onset of labor
2. Infection within the uterus
3. Post-term pregnancy
4. Medical problems during pregnancy, such as diabetes, hypertension
5. Fetal problems, prolonged pregnancy, or incompatibility between fetal and maternal blood types.
6. Fetal death

Contraindications to Induction

Labor is not induced in the following conditions

1. Placenta previa, Vasa previa
2. Umbilical cord prolapse
3. Abnormal fetal presentation ,transverse fetal lie
4. Abnormal FHR
5. A prior classic uterine incision
6. Vaginal bleeding with unknown cause
7. Abnormal size or structure of the mother's pelvis
8. Pelvic structure abnormality.

Method of induction of labor

A-Non-pharmacological Methods to Stimulate Contractions (Naturally)

1. Sexual activity
2. Nipple stimulation
3. Walking
4. Bath.
5. Castor oil
6. Cinnamon and curry

B-Pharmacological and Mechanical Methods to Stimulate Contractions

1-Cervical Ripening: Cervical ripening is the physical softening of the cervix that leads to effacement and dilation..

- dinoprostone gel (Prepidil) ripens the cervix and stimulates uterine muscle).
- Misoprostol (Cytotec) can used for both cervical ripening and induction of labor.

3- Amniotomy is the artificial rupture of membranes (AROM) by inserting a cervical hook (Amniohook) through the cervical os.

Risk of amniotomy

1. Umbilical cord prolapse
2. Maternal infection
3. Bleeding and women discomfort

4-Oxytocin : (normally produced in the hypothalamus and released by the posterior pituitary**.) Oxytocin causes the uterus to contract used to induce labor, strengthen labor contractions during childbirth, control bleeding after childbirth**

Oxytocin :is diluted in an(slow IV solution).

Complications of Augmentation of Labor

1. fetal compromise
2. uterine rupture
3. uterine hyperstimulation
4. postpartum hemorrhage
5. abruptio placenta
6. rapid labor, leading to laceration of cervix ,vagina, perineum, and fetal trauma

Nursing care during induction and augmentation of labor

1. Explain induction and augmentation to the client
2. Administer low-dose oxytocin and increasing the dose as recommended.
3. Assess cervical dilation
4. assesse and record Fetal heart and uterine contraction
5. assesse maternal vital signs
6. observe & check the rate of flow of infusion

((Lacerations of the birth canal))

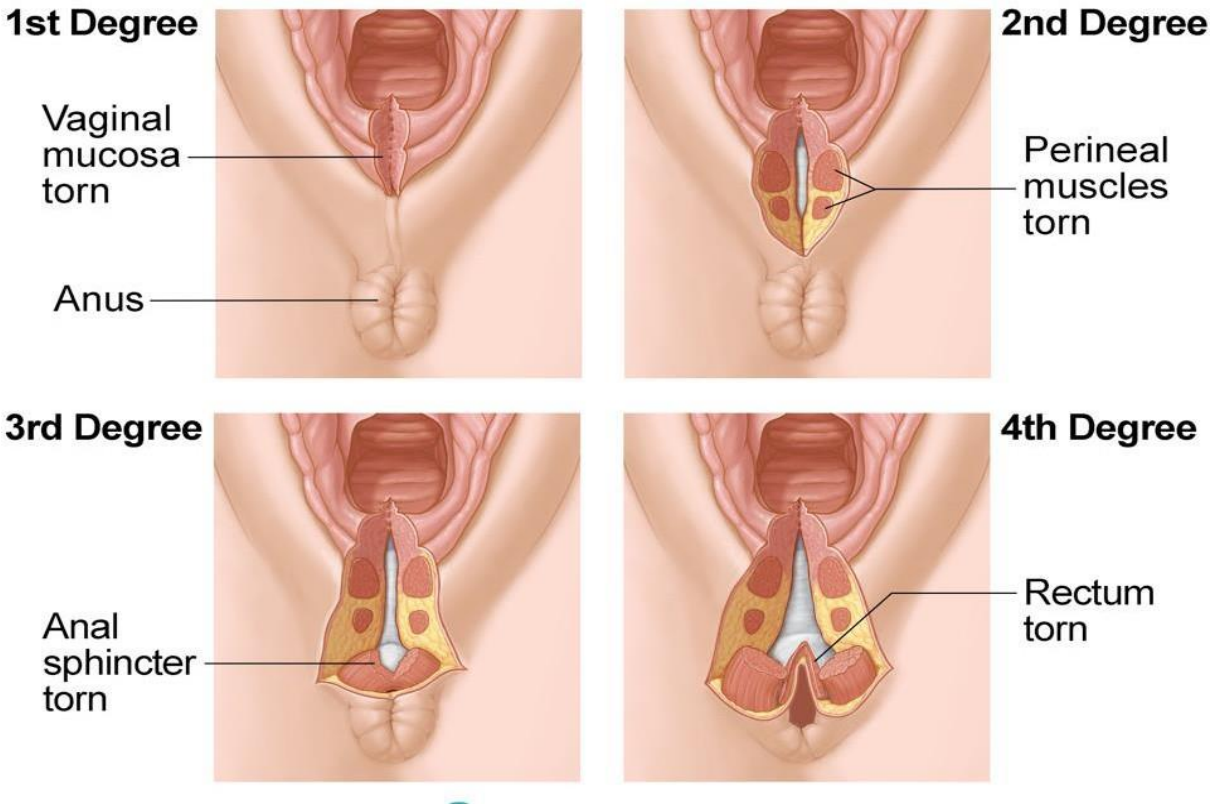
A laceration is an uncontrolled tear of the tissues that results in a jagged and irregularwound

1. laceration of cervix

- Laceration occurs in forceps delivery with incomplete cervical dilatation, or in rapid delivery of head in breech presentation, or Scar of cervix from previous injury may tear

2. Laceration of perineum & vaginaLaceration of 4 stages:

1) **First degree**: Involves the superficial vaginal mucosa or perineal skin
2) Second degree: Involves the vaginal mucosa, perineal skin, and deeper tissues of the perineum
3) Third degree: Same as second degree, plus involves the anal sphincter
4) Fourth degree: Extends through the anal sphincter into the rectal mucosa



Episiotomy is also known perinotomy

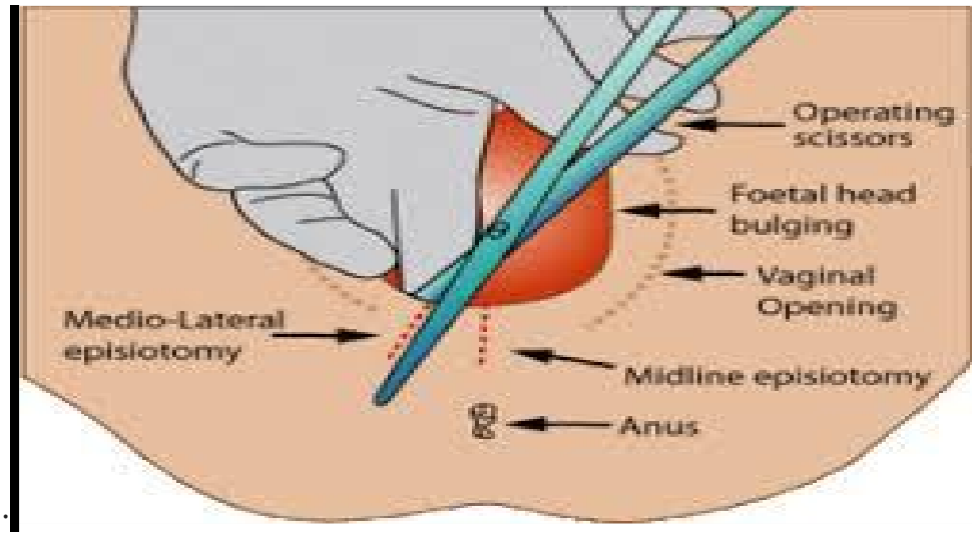
is a surgical incision of the perineum and the posterior vaginal wall during second stageof labor to quickly enlarge the opening for the baby to pass through.

Indications of episiotomy

1. When perineum threaten to tear: indicated in primigravida .
2. When there is delay in delivery.
3. Forceps delivery.
4. Breech delivery: to reduce risk of intracranial hemorrhage.
5. Fetal distress: when fetal distress at 2ndstage of delivery.
6. Mother exhaustion
7. Macrocosmic baby

Types of episiotomy

- Midline (median)—extending directly from the lower vaginal border toward the anus
- Mediolateral—extending from the lower vaginal border toward the mother's right or left(most common)
- lateral

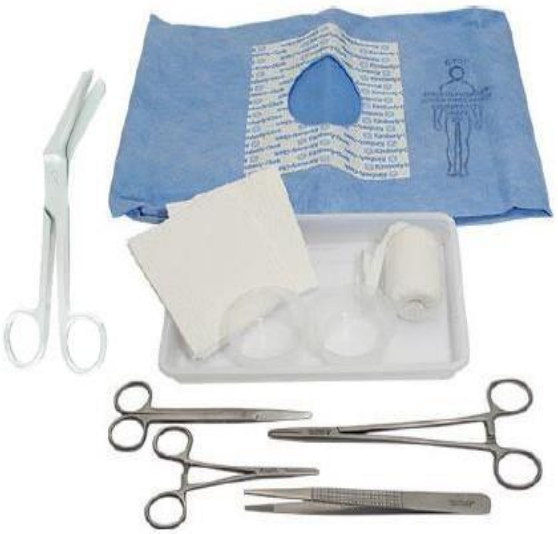


Procedure

1- Prepare the instrument used

Instruments used:

- Sterile drape
- Sterile gown and gloves
- Gauze swabs
- Needle holder
- Sponge holder
- Scissors ,10 ml syringe
- Toothed forceps
- Suture material
- 1% lignocaine



2-Incision done when head distending the perineum .

Layers of perineal repair:

1) Vaginal mucosa & submucosal tissue.
2) Perineal muscles.
3) Skin & subcutaneous tissue.

Repair of episiotomy:

1. Close the vaginal mucosa using continuous 1-0 absorbable suture.
2. Close the perineal muscle using interrupted 1-0 absorbable sutures.
3. Close the skin using interrupted (or subcuticular) 1-0 absorbable sutures

Management

- suture episiotomy in layers
- don't leave any space between layers to prevent hematoma
- daily bathing is advised
- keep the wound dry

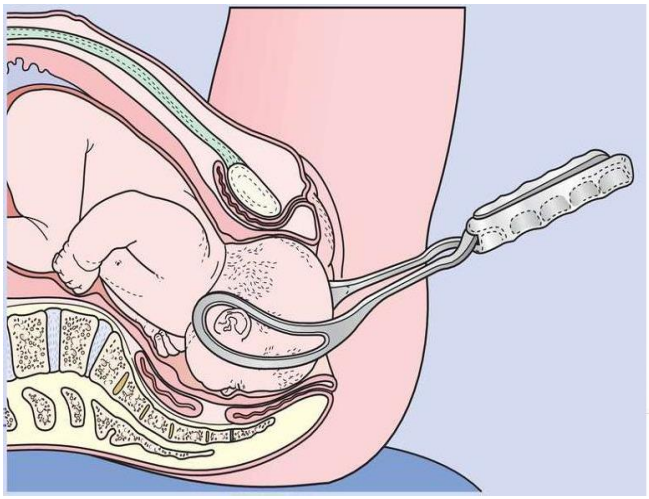
- antibiotic is given when there is a risk of infection
- analgesia is given when there is discomfort

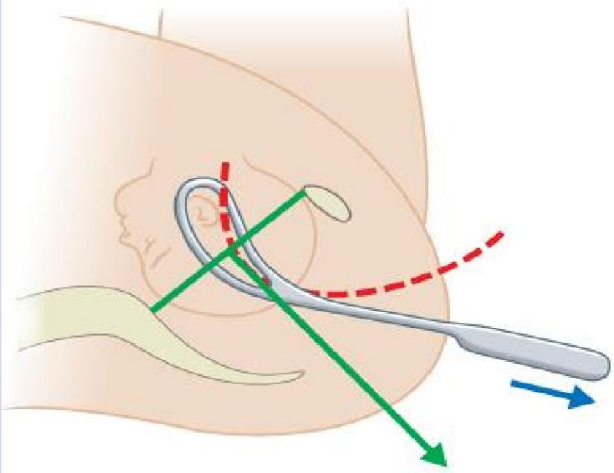
- If the bowel not acted by 4th day,glycerin suppository may be used
- A high-fiber diet and adequate fluids help to prevent constipation

{Forceps delivery}

Obstetric forceps is a double-bladed metal instrument used for extraction of foetal head. This instrument is applied to foetal head and then the operative uses traction to extract the foetus, typically during a contraction while the mother is pushing.

Forceps also used for extract the fetal head through the incision during cesarean birth.





Indication of forceps delivery

Maternal and fetal :

1. Prolonged second stage of labor.
2. Maternal exhaustion
3. Maternal illness such as heart disease, hypertension, or other conditions that make pushing difficult or dangerous.
4. . Fetal distress in second stage of labor
5. Post date gestation
6. Intra-partum infection
7. Passage of meconium

Complication

Maternal include:

1- lacerations of the cervix, vagina, or perineum;2- Hematoma
3- extension of the episiotomy incision into the anus4- Perineum wound infection.
5- Bladder injury

Newborn includes:

1- ecchymosis,
2- facial and scalp lacerations,
3- facial nerve injury(palsy),
4- Trauma to the eyes.
5- fetal skull fracture
6- Cephalohematoma (collection of blood between a baby's scalp and the skull)

Conditions to be fulfilled before applying forceps (prerequisites)

1. Full cervical dilatation.
2. The head must be engaged.(Engagement)
3. The bladder should be empty
4. Rupture membranes
5. The presentation must be suitable
6. Adequate pelvic outlet.
7. Lithotomy position
8. Episiotomy
9. The uterus should be contracting to help pushing the fetus.

((Caesarian Section))

- A cesarean birth is the delivery of the fetus through an incision in the abdomen and uterus.

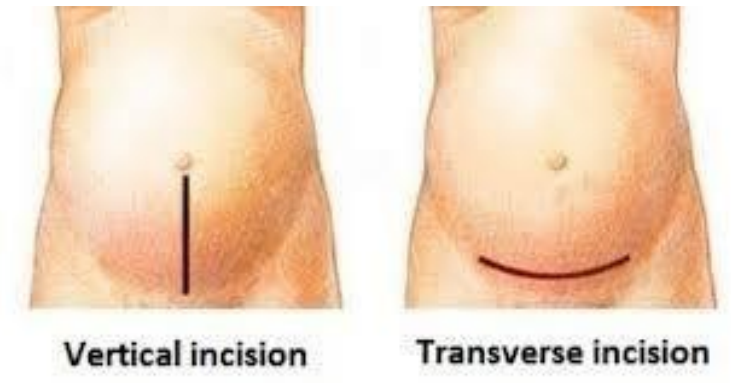
Classification:

Traditionally, caesarean sections have been classified as elective OR emergency

Types of uterine incisions:

1-A classic (vertical) incision

2- low transverse incision ; today, the low transverse incision is more common

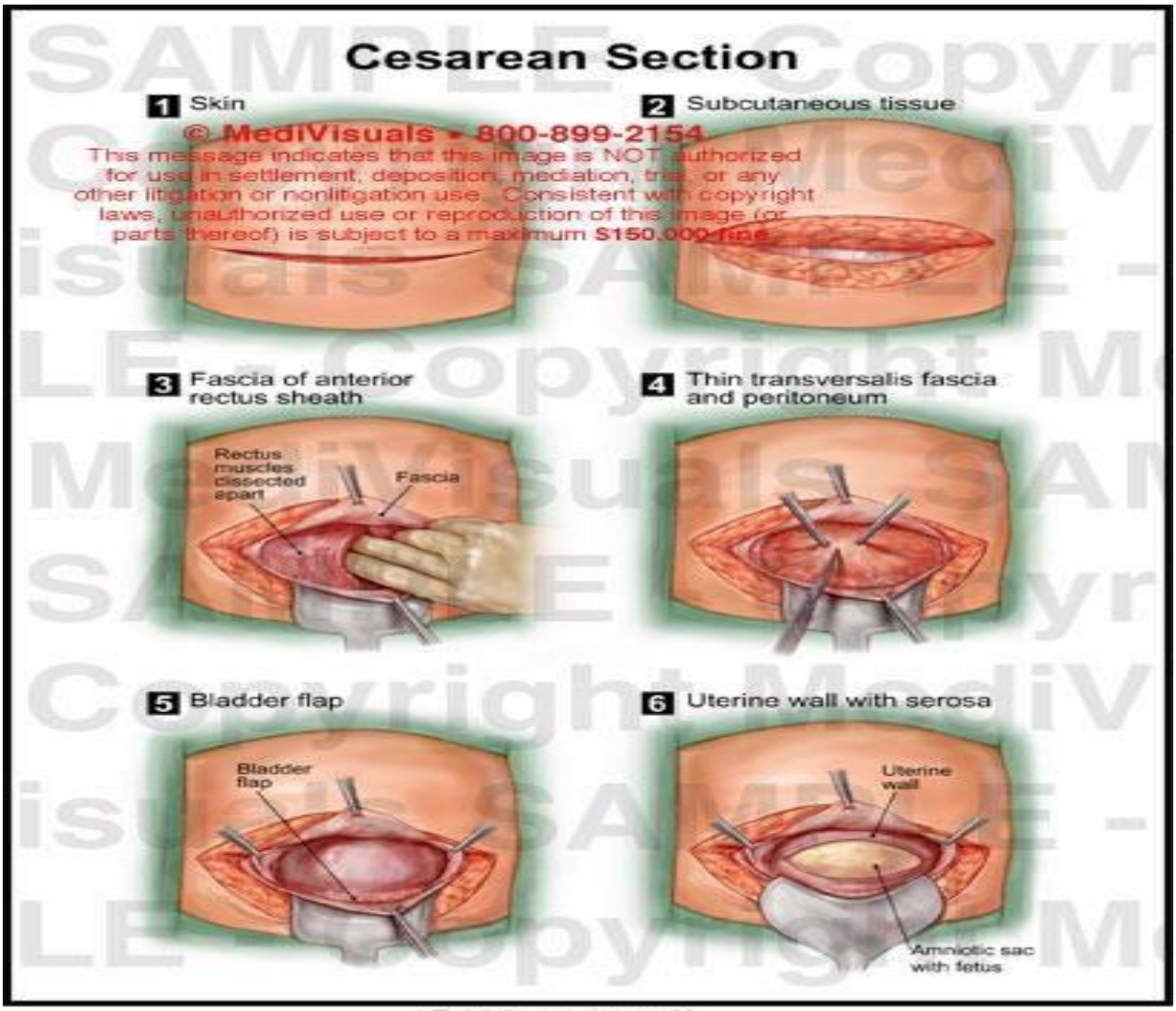


Indications of Caesarian section

1. Previous surgery on the uterus.
2. Faults in birth canal: Cervical or vaginal stenosis
3. Inability of the fetus to pass through the mother's pelvis: Cephalopelvic disproportion.
4. Fetal mal-presentation : (brow, breech) and transverse lie.
5. Umbilical cord prolapse.
6. Fetal distress.
7. Fetal size more than 4.5 kgm (Diabetic mother)
8. Placenta previa or abruption placenta
9. Infertility
10. Maternal indications: in cardiac or respiratory diseases, hypertension, diabetic.
11. Multiple pregnancy

Anatomical layers of the abdomen incised are:

1) Skin.
2) Fat.
3) Fascia, Rectus sheath.
4) muscle (Rectus abdomens).
5) Abdominal peritoneum.
6) Pelvic peritoneum.
7) Uterine muscle.



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Complication of S/C

1-Wound infection
2-Heamatoma. Hemorrhage
3-paralytic ileus
4-injury to the urinary tract.5-
blood clots
6-Respiratory complication7-
Pulmonary embolism
8-injury of the baby
9-socio-economic : cost
10-Scar tissue and difficulty with future deliveries.

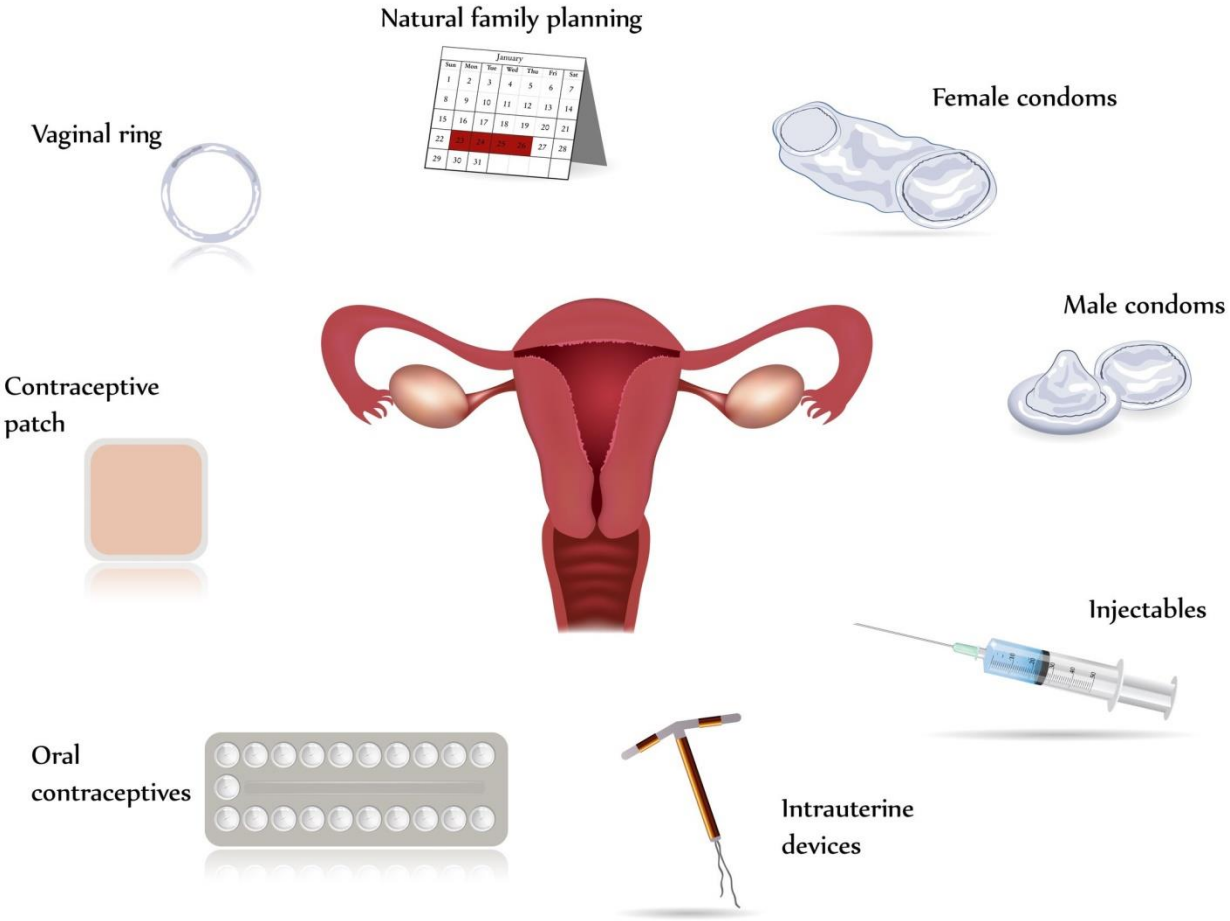
Pre-operative nursing care

1. Privacy, prepare and check the obstetric equipment.
2. Give psychological support, provides essential information about procedures; Personal hygiene
3. Removal of dentures, nail polish, and jewelry ,lenses
4. Assess the time of last oral intake and what was eaten
5. Assess for allergies (drug)
6. Laboratory test: CBP, blood clotting, cross-match.
7. Checking maternal vital signs.
8. Checking fetal heart.
9. Emptying urinary bladder by catheter.
10. Cannula: I.V glucose –saline drip is inserted.

Postoperative

1. Giving I.V fluid for 1st 24 hrs is given.
2. Assess maternal vital signs every 15 minutes the first hour, every 30 minutes the second hour.
3. Oxytocin is usually added to IV fluids to reduce the risk of postpartum hemorrhage related to uterine atony.
4. Palpate the uterus (firmness, location)
5. Monitor intake and output, presence of bowel sounds
6. Assess lochia for color, quantity , and presence of large clots, and PPH
7. Abdominal dressing for drainage.
8. Daily breast care is carried out & breast feeding is encouraged earlier..
9. Giving analgesic drug to let the mother comfortable & in rest.
10. Prophylactic antibiotic is given pre &post-operative.
11. Remove stitches at day 5-7 after operation.
12. Teach the woman to observe for signs of infection (foul-smelling lochia, elevated temperature, increased pain, redness and edema at the incision site

FAMILY PLANNING METHODS



Lecturer: Jwan Mohammed Hassan
University of Mosul/ College of Nursing

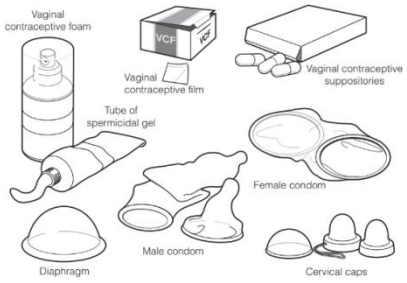
FAMILY PLANNING METHODS

OBJECTIVES

1. Identify the term of the family planning and contraceptive .
2. Describe the Objective of family planning in Iraq.
3. Identify the Contraception methods and mechanism of action.
4. Describe the advantages and disadvantages of each method of family planning.
5. Teaching the clients for using contraceptive methods

Family planning: the concept or a program of limiting the size of families through the spacing or prevention of pregnancies

Contraception: the intentional prevention of conception by artificial or natural means.



Objective of family planning in Iraq

1. Space pregnancy: increase child spacing.
2. Keep woman healthy and fit .
3. To control the frequent pregnancies which are burden on the mother.
4. Make balance between economic resources and increasing population.
5. They have the opportunity to get more education and get to find jobs.

Contraception methods

1. **Natural methods "Physiological"** (Abstinence, Fertility Awareness–Based Methods -safe period, coitus interruptus, lactational amenorrhea method LAM).
2. **Barrier methods and spermicides**(Condom "male and female" , vaginal diaphragm, cervical cap)
3. **Intrauterine devices(IUD) hormonal and non-hormal.**
4. **Hormonal contraceptive methods(**oral, IM, Implants, Vaginal ring, patches
5. **Surgical sterilization.(** ***Vasectomy*** , ***Tubal ligation*** **)**

6. **Emergency contraception** (EC) also called "morning-after pill" is a safe and effective means of preventing pregnancy after unprotected intercourse

Natural methods(Physiological)

1-Abstinence: have no sexual intercourse (failure rate: none, 100% STD protection).

2- Fertility awareness refers to any natural contraceptive method that does not require hormones, pharmaceutical compounds, barriers, or surgery to prevent pregnancy. Fertility awareness-based methods (FAMs) use physical signs and symptoms that change with hormone fluctuations throughout a woman's menstrual cycle to predict a woman's fertility. Observation of the "fertile" and the "safe" periods in a monthly menstrual cycle

Techniques used to determine fertility include:

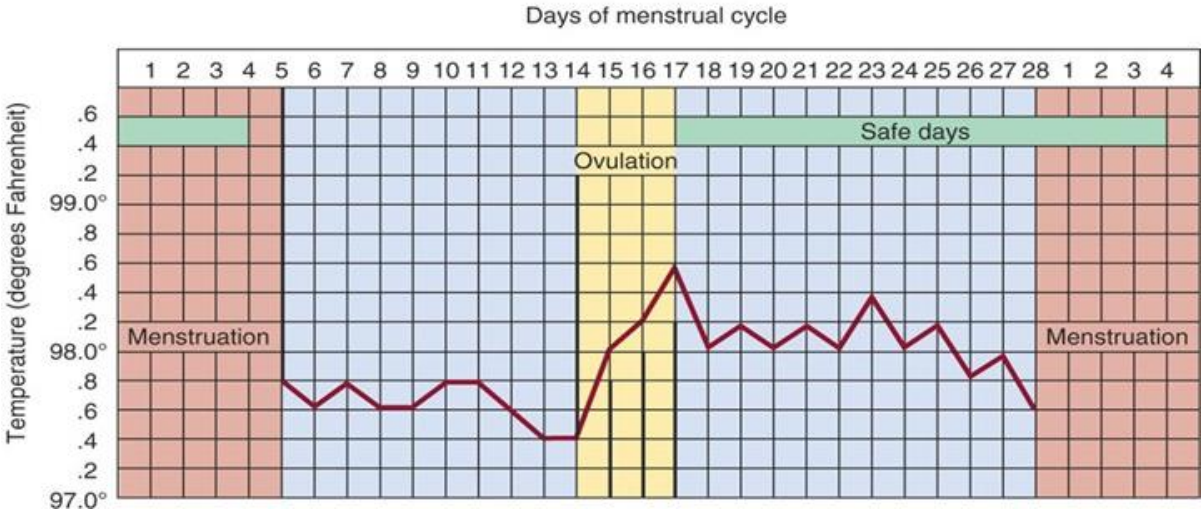
1. Calendar Rhythm Methods (CRM),
2. The basal body temperature method
3. Cervical mucus ovulation method.

Fertility awareness methods rely on the following assumptions:

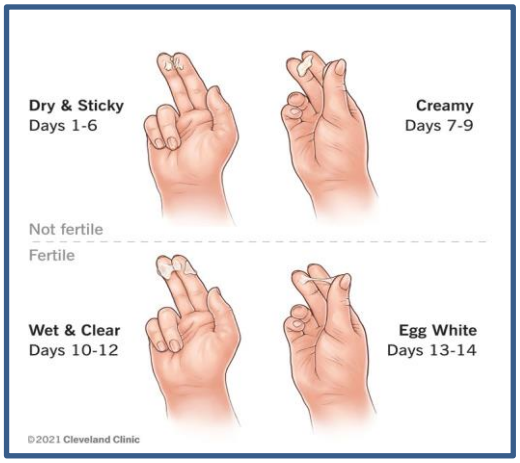
- A single ovum is released from the ovary 14 days before the next menstrual period. It lives approximately 24 hours.
- Sperm can live up to 5 days after intercourse. The "unsafe period" during the menstrual cycle is thus approximately 6 days: 3 days before and 3 days after ovulation. Because body changes start to occur before ovulation, the woman can become aware of them and not have intercourse on these days or use another method to prevent pregnancy.

A. Calendar rhythm method or safe period: (CRM)to calculate time of ovulation**.**

B. The basal body temperature method(BBT): Pre-ovulation temperatures are suppressed by estrogen, whereas post-ovulation temperatures are increased under the influence of heat-inducing progesterone (BBT ↑0.4-0.8 C) and remain elevated for several days.



C. **<u>Cervical mucus ovulation method</u>** (Billings methods)



As ovulation approaches, the mucus becomes more *abundant*, *clear*, *slippery*, and *smooth*; it can be stretched between two fingers without breaking Under the influence of estrogen, this mucus looks Like egg whites. It is called spinnbarkeit mucus

After ovulation, the cervical mucus becomes thick and dry under the influence of progesterone**.**

Advantage of fertility awareness methods:

1. Essentially free
2. No medical side effects
3. Does not interrupt sexual activity
4. Woman gains awareness about her body and natural cycles,
5. which can increase comfort w/sexuality

Advantage of fertility awareness methods

1. No STI protection, Failure rate 25%.
2. Requires some degree of discipline in order to keep track of calendar/charts.
3. Need to abstain from intercourse or use a backup method during fertile days

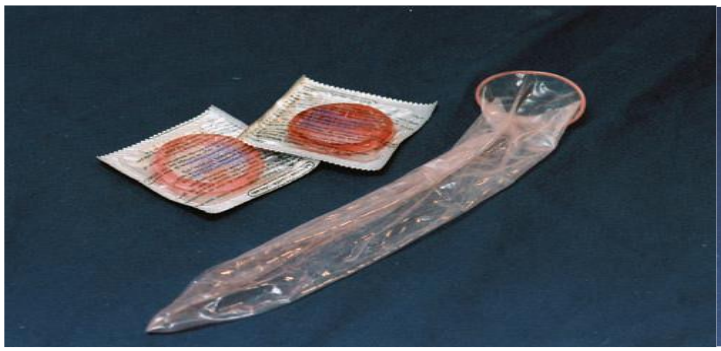
<u>3-Coitus interruptus, or withdrawal</u> of the penis from the vagina before ejaculation (Failure rate 27% , not protection against DTDs).

4-Lactational Amenorrhea Method (LAM): Breastfeeding inhibits ovulation and prevent pregnancy. Breastfeeding stimulates the hormone prolactin (↑prolactin→↓HCG), 1-2% chance of pregnancy in first 6 month.

2. Barrier methods and spermicides

a-Male condoms are latex sheaths placed over the erect penis before ejaculation to block sperm (F.R 15%). Safe, readily available, low cost, Act as protective measure against STD. Disadvantages: latex allergy, tear, spillage of sperm.

b- Female condom: is a polyurethane pouch inserted into the vagina. It consists of outer and inner flexible ring that is inserted vaginally. (F.R 21%)



Male condom

Female condom

c- Vaginal Diaphragm: The diaphragm is a latex dome surrounded by a spring or coil. The woman places spermicidal cream or gel into the dome and around the rim and then inserts the diaphragm over the cervix (covers the cervix and prevents passage of sperm).F.R 16%.

d-Cervical Cap is a smaller than diaphragm , soft, silicone cap that fits directly over the cervix acts as a barrier to sperm and used with a spermicidal jelly. F.R 24%.

Diaphragm

Cervical cap

Cervical Cap

Spermicide

- Chemicals kill sperm in the vagina
- Different forms: (foam, jelly)
- Only 76% effective (used alone), should be used in combination with another method i.e., condoms

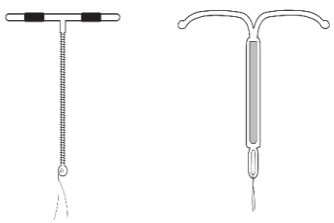
How to use:

- They are placed in the vagina no more than one hour before intercourse.
- leave them in place at least six to eight hours after intercourse.
- can use a spermicide in addition to a male condom, diaphragm, or cervical cap

Advantages	Disadvantages
Does not require a prescription May be discontinued at any time	1. May cause irritation in the vagina or on the penis 2. Can cause an allergic reaction 3. May interrupt sexual activity 4. Not recommended for preventing STIs

3. Intrauterine devices:

Is a small plastic T-shaped inserted into the uterine cavity, long-acting contraceptives, failure rate 1%.
There are two types of IUDs:
1- The Copper T 380 (ParaGard) IUD - contains copper
2-Hormonal IUD contains the hormone progestogene (Mirena)



Intrauterine devices (IUD). **(A)** ParaGard Copper T (TCu-380A). **(B)** Mirena (Levonorgestrel IUS).

HOW DOES IT WORK?

The hormones or the copper stop the sperm reaching the egg. reach the egg (fertilization) so the IUD stops the egg from attaching to the wall

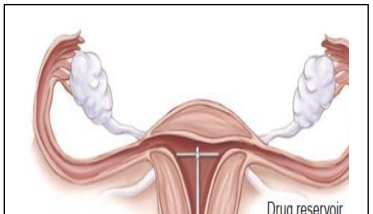
The Cooper-covered (ParaGard) is approved for 10 years of use and non-hormonal. produces a spermicidal intrauterine environment by the release of copper ions into the uterus. This makes the uterus inhospitable to sperm transport and viability.

Mirena is provided for 3- 5 years. It releases a low dose of progestin causing the lining of uterus (the endometrium) to become atrophic and thickening of cervical mucus that is " hostile or unfriendly" to sperm. Produces a spermicidal intrauterine environment.

Contraindications for Intrauterine Device (IUD) Use

2MO -

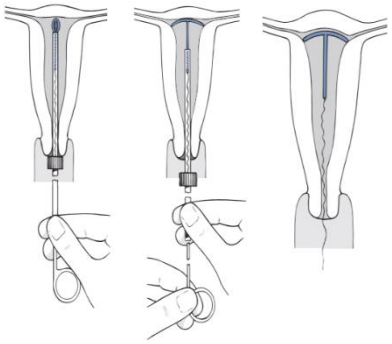
- Known or suspected pregnancy.
- Undiagnosed abnormal vaginal bleeding.
- Acute cervical, uterine infection.



- Copper allergy (for ParaGard only).
- History of ectopic pregnancy.
- History of pelvic inflammatory disease.
- Current menorrhagia or dysmenorrhea (for ParaGard only).
- Nullipara.
- Uterine fibroid.
- Uterine anomalies that interfere with proper insertion

Possible side effects and Complication for Intrauterine Device (IUD)

- Feel pain, cramps or dizziness, spotting ,Irregular periods after insertion the IUD.
- Perforation
- Expulsion of device
- Infection
- Menorrhgia (increase bleeding during menses
- Dysmenorrhea (painful menstruation
- Ectopic pregnancy.
- Missed IUD.
- Vaginal discharge



4. Hormonal contraceptive methods

Hormonal contraceptives are the most commonly used reversible means of preventing pregnancy, and consist of combined (estrogen and progesterone) and progesterone-only methods.

-Combined hormonal methods are available in oral, transdermal patches, and vaginal ring, whereas progesterone-only methods are available in oral, injectable, implantable, and intrauterine forms.

A. Combination Oral Contraceptives (COCs) Called birth control pills.

Estrogen and progestin combinations (COCs) are the most common OCs. COCs prevent pregnancy by:

1-Estrogen: Inhibits ovulation via suppression of (GnRH, FSH, LH, and LH surge)

2-Pregesterone: 1-Thickening of cervical mucus, and not penetrated by sperm.

2- Making endometrium unfavorable site for implantation.

3-tubal motility is slowed and unfavorable for oocyte transport.

The combination pill containing both estrogen and progestin is taken for the first 21 days out of a 28-day monthly cycle. During the last 7 days of the cycle, a placebo pill(contain iron) or no pill is taken. (F.R 8%)

Advantages of COCs

1-Easy,cheap, available
2-High rate of effectiveness
3-Regulates menstrual cycle and reduce dysmenorrhea, menstrual blood loss.
4- Reduce anemia
5-↓ incidence of benign breast disease
6-↓ ectopic pregnancy
7-↓ incidence of ovarian, endometrial cancer.

Disadvantages of COCs

1-Offer no protection against STDs
2-User must remember to take pill daily.
3-Nausea, vomiting
4- Spotting
5-Breakthrough bleeding
6-Breast tenderness
7-Headache. depressive mood
8-Deep vein thrombosis.
9-Weight gain: mainly due to salt and water retention.
10-Skin pigmentation (Chloasma).
11. Increased risk for myocardial infarction, hypertension for women who smoke

Contraindication of Oral Contraceptives

- **Cardiovascular disease**
- Deep Vein Thrombosis (DVT)
- Hypertension.
- pregnancy
- Lactation
- Diabetes longer than 20 years.
- breast cancer
- Liver impairment
- undiagnosed abnormal vaginal bleeding

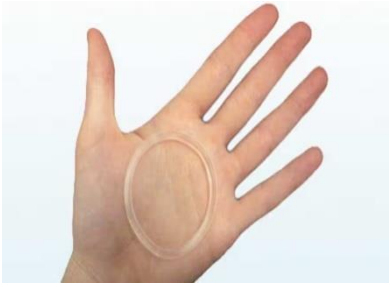
Transdermal Estrogen and Progestin Hormonal Contraception—Ortho Evra

- patch (Ortho Evra), that are absorbed through the skin when placed on the lower abdomen, upper outer arm, buttocks, or upper torso (avoiding the breasts).

- The patch is applied weekly for 3 weeks, followed by a patch-free week during which withdrawal bleeding occurs. The patch delivers continuous levels of progesterone and estrogen. F.R 8%

Vaginal Estrogen and Progestin Hormonal Contraception-NuvaRing

Vaginal ring (NuvaRing),, is a flexible, soft, transparent ring that is inserted by the user for a 3-week period of continuous use followed by a ring-free week to allow withdrawal bleeding . F.R 8%.



B. Progesterone-only contraception

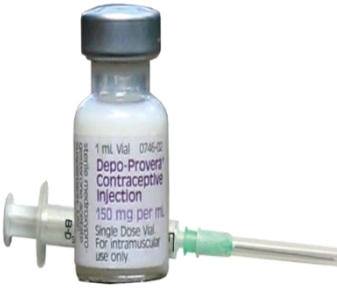
Progesterone-only contraception consists of oral, injectable, implantable, and intrauterine options (the Mirena). These all function primarily using the same mechanisms: Thickening of cervical mucus, and not penetrated by sperm. Making endometrium unfavorable site for implantation. tubal motility is slowed and unfavorable for oocyte transport.

Progestin-Only Oral Contraception Pills (The Minipill) POP

Progestin-only pills (POPs): cause thickening the cervical mucus to prevent penetration of the sperm and make the endometrium unfavorable for implantation. Progestin-only pills must be taken at a certain time every 24 hours. **Used for lactating women.** F.R 8%

Injectable Progesterone-Only Contraception—Depo-Provera

- Depo-Provera (medroxyprogesterone acetate; DMPA) Depo-Provera works by suppressing ovulation and the production of FSH and LH by the pituitary gland, by increasing the viscosity of cervical mucus and causing endometrial atrophy and reducing tubal motility

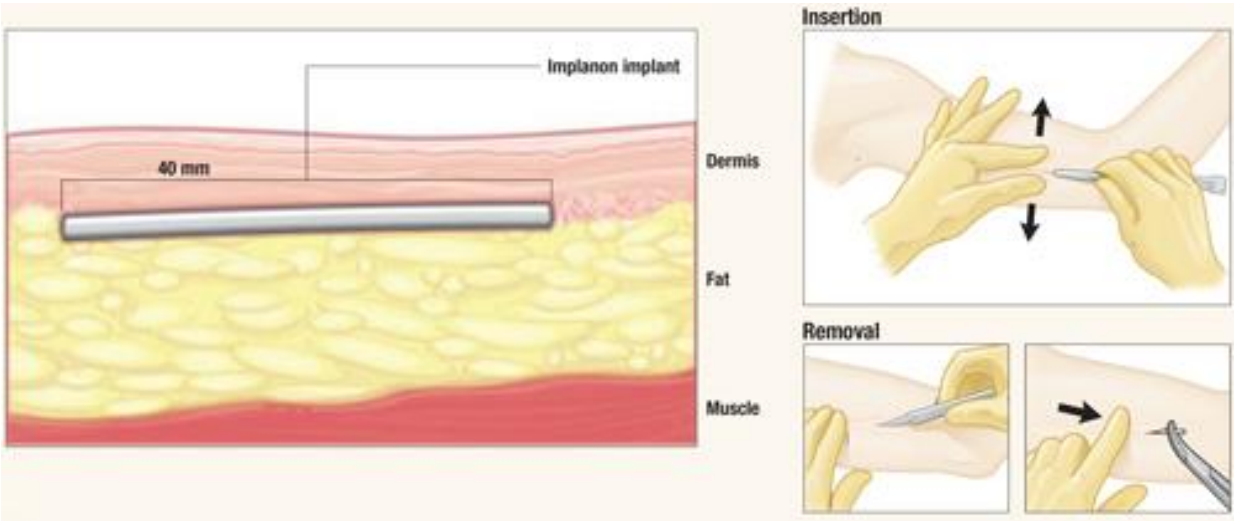


- A single injection of 150 mg " IM" intramuscular , acts like other progestin-only products to prevent pregnancy for 3 months at a time. The side effect of Depo-Provera is Menstrual irregularities, breakthrough bleeding, and amenorrhea. F.R 6%.

- The contraceptive implant Nexplanon is a single rod implant that is implant resides beneath the dermis but above the subcutaneous fat of the upper inner arm with the use of a local anesthetic.

- It remains palpable but invisible, releasing about 60 µg of etonogestrel per day for 3 years. It is 2 mm thick and 4 cm (1.6 in) long .

- It acts to inhibit ovulation, thickens cervical mucus to prevent sperm penetrability, and thins out the endometrium making it unfavorable for implantation.



5. Emergency contraception

Emergency contraception (EC) also called "morning-after pill" is a safe and effective means of preventing pregnancy after unprotected intercourse or in the case of contraceptive failure. It is used within 72 hours of unprotected intercourse to prevent pregnancy.

TABLE 4.5 EMERGENCY POSTCOITAL CONTRACEPTION OPTIONS

Product	Dosage (Within 72 Hr)	Comments
Combined estrogen & progestin pills (Yuzpe regimen)	OCSs are taken in various formulations to prevent conception.	Interfere with the cascade of events that result in ovulation and fertilization
Plan B One-Step	1.5 mg pill taken	Can cause nausea & vomiting
Intrauterine		
Copper-bearing IUS (ParaGard-TCu-380A)	Inserted within 5 days after unprotected sexual episode	Can be left in for long-term contraception (10 yr)

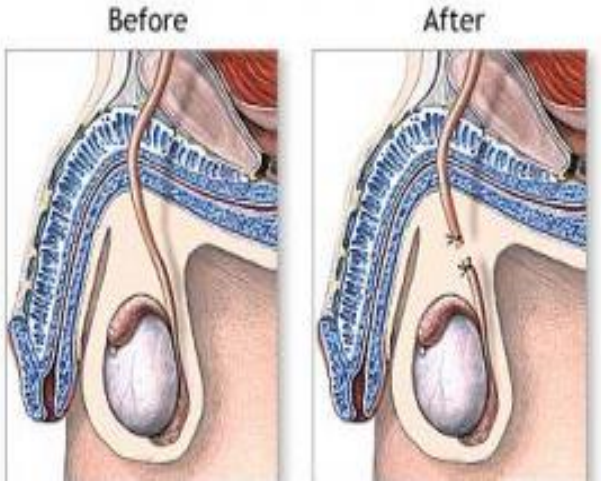
6. Surgical sterilization

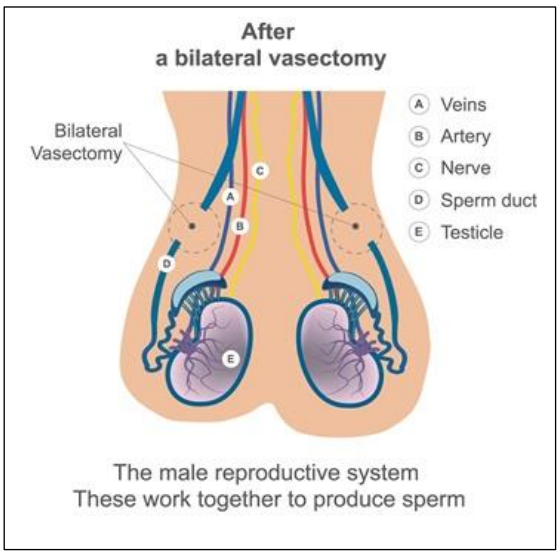
Sterilization refers to surgical procedures intended to render the person infertile. Sterilization is a safe and effective form of permanent birth control

1-***Vasectomy*** ♂: is used to provide permanent contraception for men. It involves cutting and sealing the vasa deferens (the tubes that carry sperm from the testes).

The surgery takes about 20 minutes and is performed on an outpatient basis with a local anesthetic. There is some pain, bruising, and swelling after the surgery. Rest, a mild analgesic, and the application of an ice pack are comfort measures.

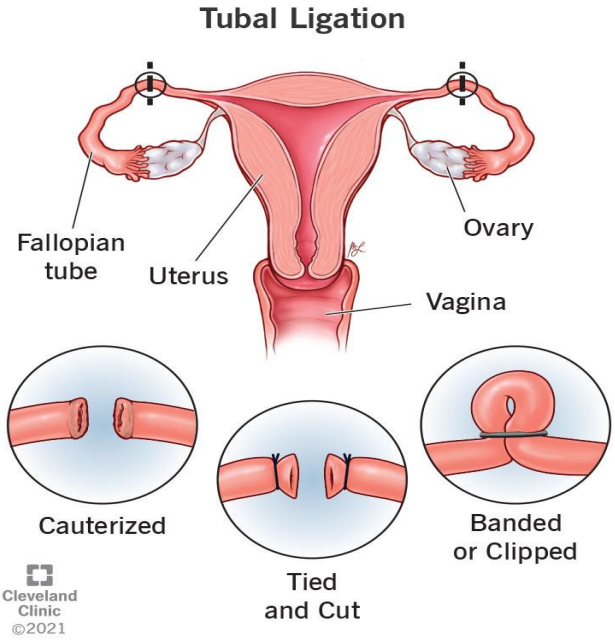
Failure is less than 1%.





Vasectomy

2- Tubal ligation ♀ : ligation of the fallopian tubes that by preventing passage of ova from the ovaries to the uterus serves as a method of female sterilization. F.R 1%.
If the procedure fails and a pregnancy occurs (this is rare), there is an increased risk that it will be an **ectopic pregnancy** .
There is no effect on your normal hormonal rhythms or periods.



Lecture 9

Lecture 13

Nursing Care of a Family With a High-Risk Newborn

- apnea
- apparent life-threatening event
- appropriate for gestational age (AGA)
- brown fat
- caudal regression syndrome
- developmental care
- dysmature
- extracorporeal membrane oxygenation (ECMO)
- fetal alcohol syndrome
- gestational age
- hemorrhagic disease of the newborn
- hydrops fetalis

- hyperbilirubinemia
- intrauterine growth restriction
- large for gestational age (LGA)
- low-birth-weight infant
- macrosomia
- ophthalmia neonatorum
- periodic respirations
- periventricular leukomalacia
- postterm syndrome
- preterm infants
- retinopathy of prematurity
- shoulder dystocia
- small for gestational age (SGA)

Mr. and Mrs. Atkins are the parents of a 34- week-gestation, 2-lb baby boy born last night after a short,
4-hour labor. Their baby took a few gasping respirations at birth but then stopped breathing. He was resuscitated by the neonatal nurse practitioner and respiratory therapist and then trans- ported to the intensive care nursery.
Mr. Atkins was not present for the birth because he was out of town on busi- ness. You notice Mrs. Atkins has not

After mastering the contents of this chapter, you should be able to:

1. Define the following terms—small-for-gestational-age infant, term infant, large-for-gestational-age infant, preterm infant, and postterm infant—and describe common illnesses that occur in these and other high-risk newborns.
2. Identify National Health Goals related to high-risk newborns nurses can be instrumental in helping the nation achieve.
3. Use critical thinking to analyze the special crisis imposed on fami- lies when alterations of newborn development or neonatal illness occur to make nursing family centered.
4. Assess a high-risk newborn to determine whether safe transition to extrauterine life has occurred.
5. Formulate nursing diagnoses related to a high-risk newborn.
6. Identify expected outcomes for a high-risk newborn and family.

7. Plan nursing care focused on priorities to stabilize a high-risk newborn's body systems.
8. Implement nursing care for a high-risk newborn such as monitoring body temperature.
9. Evaluate expected outcomes for achievement and effectiveness of care.
10. Identify areas related to the care of high-risk newborns that could benefit from additional nursing research or application of evidence- based practice.
11. Integrate knowledge of the needs of a high-risk newborn with nursing process to achieve quality maternal and child health nursing care.

visited the intensive care nursery to see her son. She also refused to sign the birth certificate because she could not decide on a name. She said, "I don't want to give him our favorite name because he might die." Mr. Atkins called early this morning and acted more upset the baby was born than relieved the baby was receiving intensive care. You hear him ask his wife, "What did you do to cause this?" Previous chapters described the birth of well newborns and care of newborns who are well at birth. This chapter adds information on care of newborns who are ill or have a significant variation in gestational age or weight. Learning to recognize these infants at birth and organizing care for them can be instrumental in helping protect both their present and future health.

What type of help do the Atkinses need to better accept what has happened to them?

During pregnancy, screening women for risk factors that could lead to illness in a newborn such as younger or older than average maternal age, concurrent disease conditions such as diabetes or human immunodeficiency virus (HIV) infec- tion, pregnancy complications such as placenta previa, or an unhealthy maternal lifestyle such as drug abuse is essential to identify infants who may need greater-than-usual care at birth (Pinheiro, 2007). Unfortunately, not all instances of high risk can be predicted. Even a newborn from a "perfect" pregnancy may require specialized care or develop a problem over the first few days of life necessitating special interventions. Any infant who is born dysmature (before term or postterm, or who is underweight or overweight for gestational age) is also at risk for complications at birth or in the first few days of life. Parents need thorough education about their baby's health because these problems may require rehospitalization or additional fol- low-up at home. National Health Goals related to the high- risk newborn are shown in Box 26.1.

Being able to predict an infant is at high risk allows for advanced preparation so that specialized, skilled health care personnel can be present at the child's birth to perform nec- essary interventions, such as resuscitating a newborn who has difficulty establishing respirations. Immediate, skilled handling of any problems that occur may help to save the newborn's life and also prevent future problems, such as neurologic disorders (Saigal & Doyle, 2008).

Nursing Process Overview
For the Family of a High-Risk Newborn

Assessment

All infants need to be assessed at birth for obvious con- genital anomalies and gestational age (number of weeks they remained in utero). Both determinations can be done by the nurse who first examines an infant. Be certain these assessments are made with an infant under a prewarmed radiant heat warmer to guard against heat loss.

Continuing assessment of high-risk infants involves the use of instrumentation such as cardiac, apnea, and blood pressure monitoring. However, no matter how many monitors are used, they never replace the role of fre- quent, close, common-sense observation. Carefully evalu- ate comments from fellow nurses that an infant "isn't himself" or "breathes oddly." These comments, although not scientific, are the same observations that parents who know their baby well report at health visits. A nurse who knows an infant well from having cared for a baby consis- tently over time often senses changes before a monitor or other equipment begins to put a quantitative measure- ment on the factor.

Nursing Diagnosis

To establish nursing diagnoses for high-risk infants, it is important to be aware of the normal assessment parame- ters of newborns. Nursing diagnoses generally center on the nine priority areas of care for any newborn:

- Ineffective airway clearance related to presence of mucus or amniotic fluid in airway
- Ineffective cardiovascular tissue perfusion related to breathing difficulty
- Risk for deficient fluid volume related to insensible water loss
- Ineffective thermoregulation related to newborn status and stress from birth weight variation
- Risk for imbalanced nutrition, less than body require- ments related to lack of energy for sucking
- Risk for infection related to lowered immune response in newborn
- Risk for impaired parenting related to illness in newborn at birth
- Deficient diversional activity (lack of stimulation) related to illness at birth
- Readiness for developmental care to decrease overstimu- lation easily caused by necessary life-saving procedures

Outcome Identification and Planning

Be certain when establishing expected outcomes that they are consistent with a newborn's potential. A goal that im- plies complete recovery from a major illness, for example, may be unrealistic for one newborn but completely ap- propriate for another. Plan care that is individualized

considering a newborn's developmental as well as physi- ologic strengths, weaknesses, and needs. This helps to ensure that parents as well as the health care team un- derstand the newborn's particular care priorities and po- tential. Many families of high-risk newborns will need continued support to care for their infants at home. They may need referral to a home health care or other agency. Helpful Internet sites to use for referring par- ents are the Web sites of the March of Dimes (http://www.marchofdimes.com), American Sudden Infant Death Syndrome Institute (http://www.sids.org), and Newborn Individualized Developmental Care and Assistance Program (http://www.nidcap.org).

Implementation

Interventions for any high-risk newborn are best carried out by a consistent caregiver and should focus on con- serving the baby's energy and providing a thermoneutral environment to prevent exhaustion and chilling. Painful procedures should be kept to a minimum to help the in- fant achieve a sense of comfort and balance. Assisting par- ents to participate in care such as bathing or feeding their infant may help make the child real to them for the first time and start the bonding process.

Outcome Evaluation

High-risk newborns need long-term follow-up so any con- sequences of their birth status, such as minimal neurologic injury, can be identified and arrangements for special schooling or counseling can be made. Examples of expected outcomes include:

- Infant maintains a patent airway.
- Infant tolerates all procedures without accompanying apnea.
- Infant demonstrates growth and development appro- priate for gestational age, birth weight, and condition.
- Infant maintains body temperature at 98.6° F (37.0° C) in open crib with one added blanket.
- Parents visit at least once and make three telephone calls to neonatal nursery weekly.
- Parents demonstrate positive coping skills and behav- iors in response to newborn's condition.

❧

NEWBORN PRIORITIES IN FIRST DAYS OF LIFE

All newborns have eight priority needs in the first few days of life:

1. Initiation and maintenance of respirations
2. Establishment of extrauterine circulation
3. Control of body temperature
4. Intake of adequate nourishment
5. Establishment of waste elimination
6. Prevention of infection
7. Establishment of an infant–parent relationship
8. Developmental care, or care that balances physiologic needs and stimulation for best development

These are also the priority needs of high-risk newborns. Because of small size or immaturity or illness, fulfilling these

needs, however, may require special equipment or care mea- sures. Not all newborns will be able to achieve full wellness because of extreme insults to their health at birth or difficulty adjusting to extrauterine life. Indications that a newborn is having difficulty making the transition from intrauterine to extrauterine life may be apparent during the intrapartum pe- riod, at birth, or at initial assessment

because of a low Apgar score (see Chapter 18).

Initiating and Maintaining Respirations

Ultimately, the prognosis of a high-risk newborn depends primarily on how the first moments of life are managed. Most deaths occurring during the first 48 hours after birth re- sult from the newborn's inability to establish or maintain ad- equate respirations (National Vital Statistics System [NVSS], 2009). An infant who has difficulty accomplishing effective respiratory action in the first hours of life and yet survives may experience residual neurologic difficulties because of cerebral hypoxia. Prompt, thorough care is necessary for ef- fective intervention.

Most infants are born with some degree of respiratory aci- dosis. However, this is rapidly corrected by the spontaneous onset of respirations. If respiratory activity does not begin immediately, respiratory acidosis will increase. The blood pH and bicarbonate buffer system will fail. Newborn defense mechanisms are inadequate to reverse the process. Therefore, the effort to establish respirations must be started immedi- ately after birth. By 2 minutes, the development of severe aci- dosis is already well under way (Thilo & Rosenberg, 2008). Any infant who sustains some degree of asphyxia in utero, such as could occur from cord compression, maternal anes- thesia, placenta previa, or preterm separation of the placenta, may already be experiencing acidosis at birth and may have
difficulty before the first 2 minutes of life.

Resuscitation

Factors that commonly predispose infants to respiratory diffi- culty and so may require resuscitation are shown in Box 26.2. If breathing is ineffective, circulatory shunts, particularly the

ductus arteriosus, can fail to close. Because left-side heart pressure is stronger than right-side pressure, blood circulates through a patent ductus arteriosus left to right or from the aorta to the pulmonary artery, creating ineffective pump ac- tion in the heart. Struggling to breathe and circulate blood, an infant uses available serum glucose quickly and may be- come hypoglycemic, compounding the initial problem.

For all these reasons, resuscitation becomes important for infants who fail to take a first breath or have difficulty main- taining adequate respiratory movements on their own.

Resuscitation follows an organized process: (a) establish and maintain an airway, (b) expand the lungs, and (c) initi- ate and maintain effective ventilation. If respiratory depres- sion becomes severe, a newborn's heart will fail. Resuscitation then must also include cardiac massage (American Heart Association [AHA], 2008).

Airway

For a well term newborn, usually bulb syringe suction, which removes mucus and prevents aspiration of any mucus and amniotic fluid present in the mouth or nose with the first breath, is all that is necessary to help establish a clear airway (see Chapter 18).

If a newborn does not draw in a first breath spontaneously, suction the infant's mouth and nose with a bulb syringe again and rub the back to see if skin stimulation initiates respira- tions. Be certain an infant is dry, including the hair and head, to prevent chilling. If a newborn has to attempt to raise body temperature because of chilling, this will increase the need for oxygen, which the baby cannot supply because breathing has not yet been initiated. Warmed, blow-by oxygen by face mask or positive-pressure mask may be administered.

If a newborn's amniotic fluid was meconium stained, do not stimulate an infant to breathe by rubbing the back or ad- ministering air or oxygen under pressure as doing so could push meconium down into an infant's airway, further com- promising respirations. Give oxygen by mask without pres- sure. Wait for a laryngoscope to be passed and the trachea to be deep suctioned before giving oxygen under pressure.

If deeper suctioning than by a bulb syringe is required, place an infant on the back and slide a folded towel or pad under the shoulders to raise them slightly so the head is in a neutral position. Slide a catheter (8F to 12F) over the infant's tongue to the back of the throat (Fig. 26.1). Do not suction for longer than 10 seconds at a time (count seconds as you suction) to avoid removing excessive air from an infant's lungs. Use a gentle touch. Bradycardia or cardiac arrhythmias can occur because of vagus stimulation (at the posterior oropharynx) from vigorous suctioning. In most newborns, this degree of resuscitation will initiate responsive respira- tions and a strong heartbeat. Color, muscle response, and re- flexes will improve.

An infant who still makes no effort at spontaneous respi- rations requires immediate laryngoscopy to open the airway. Once a laryngoscope has been inserted, deep tracheal suc- tioning can be performed. After deep suctioning, an endo- tracheal tube can be inserted and oxygen administered by a positive-pressure bag and mask with 100% oxygen at 40 to 60 breaths per minute.

In the first few seconds of life, a newborn this severely de- pressed may take several weak gasps of air and then almost immediately stop breathing; the heart rate begins to fall.

FIGURE 26.1 Suctioning a newborn with mechanical suction controlled by a finger valve. Suction is applied as the catheter is withdrawn. If the catheter is rotated as it is withdrawn, the risk of traumatizing membrane is reduced.

This period of halted respirations is termed primary apnea. After 1 or 2 minutes of apnea (a pause in respirations longer than 20 seconds with accompanying bradycardia), an infant again tries to initiate respirations with a few strong gasps. However, a newborn cannot maintain this effort longer than 4 or 5 minutes. After this, the respiratory effort will become weaker again and the heart rate will fall further until the newborn stops the gasping effort altogether. The infant then enters a period of secondary apnea. Although usually a phe- nomenon that occurs after birth, both types of apnea may occur in utero.

During the period of first gasps, resuscitation attempts are generally successful. Once a newborn is allowed to enter a secondary apnea period, however, resuscitation measures be- come difficult and may be ineffective. Because it is impossi- ble to distinguish between the two periods simply by obser- vation, resuscitation must always be started as if secondary apnea were occurring.

An obstetrician, pediatrician, neonatologist, anesthesiolo- gist, or neonatal nurse practitioner skilled in laryngoscope and endotracheal tube insertion should be present at the birth of all infants identified as high risk so a laryngoscope can be quickly passed (Raab, 2007). Laryngoscope insertion is easy in theory; in practice, the wide variation in the size of infants' posterior pharynx and trachea and the emergency conditions present make it difficult (Fig. 26.2).

Laryngoscopes are equipped with different-size blades. Size 0 or 1 is used with newborns. The endotracheal tube fits inside the laryngoscope. Infants under 1000 g need a 2.5-mm endotracheal tube; those over 3000 g need a 4.0- mm tube. Because preterm infants are prone to hemorrhage because of capillary fragility, gentle care during insertion is crucial.

Lung Expansion

Once an airway has been established, a newborn's lungs need to be expanded. Well newborns inflate their lungs adequately

FIGURE 26.2 Intubation. Place the head in a neutral position with a towel under the shoulders. The blade of the laryngo- scope is inserted to reveal the vocal cords. An endotracheal tube for ventilation is then passed into the trachea, past the laryngoscope.

with a first breath. The sound of the baby crying is proof that lung expansion is good because the vocal sounds are pro- duced by a free flow of air over the vocal cords.

An infant who breathes spontaneously but then cannot sustain effective respirations may need oxygen by bag and mask to aid lung expansion. The mask should cover both the mouth and the nose to be effective. It should not cover the eyes, because it can cause eye injury mechanically from the mask or drying of the cornea from oxygen administra- tion. Administer 100% oxygen by face mask and pressure bag at a rate of 40 to 60 compressions per minute. To pre- vent cooling, oxygen should be administered both warmed

(between 89.6° and 93.2° F, or 32° and 34° C) and humid-
ified (60%–80%).

The pressure needed to open lung alveoli for the first time is approximately 40 cm H_2O. After that, pressures of 15 to 20 cm H_2O are generally adequate to continue inflating alve- oli (Thilo & Rosenberg, 2008). The pressure from anesthe- sia bags is controlled solely by the pressure of a hand against the bag. Other types of bags such as the Ambu-bag can be set with a blow-off valve that limits the pressure in the appara- tus (Fig. 26.3).

It is important not to let oxygen levels in a newborn fluc- tuate, as fluctuation can cause bleeding from immature cra- nial vessels. In addition, no pressure above what is necessary should be used because excessive force can rupture lung alve- oli. On the other hand, if adequate insufflation is not achieved, a newborn stands little chance of survival. To be certain oxygen is reaching the lungs with resuscitation, mon- itor the newborn's oxygen level with pulse oximetry in addi- tion to auscultating the chest for the sound of breathing (Shiao & Ou, 2007).

Be certain to listen to both lungs to be sure both lungs are being aerated. If air can be heard on only one side or sounds are not symmetric, the endotracheal tube is probably at the bifurcation of the trachea and blocking one of the main-stem bronchi. Drawing it back half a centimeter will usually free it and allow oxygen to flow to both lungs.

When oxygen is given under pressure to a newborn this way, the stomach also quickly fills with oxygen. If the re- suscitation continues for over 2 minutes, inserting an oro- gastric tube and leaving the distal end open will help deflate the stomach and decrease the possibility that vomiting and aspiration of stomach contents from overdistention will occur.

Drug Therapy

Stimulants have little place in newborn resuscitation unless an infant's respiratory depression appears to be related to the

A

B

FIGURE 26.3 Types of ventilation bags used in neonatal resuscitation. (A) The flow-inflating (anesthesia) bag requires a compressed gas source for inflation but is able to deliver 100% oxygen. (B) The self-inflating (Ambu) bag remains inflated at all times and is not dependent on a compressed gas source. It is limited to delivering oxygen concentration of 40%, which may be inadequate for resuscitation at birth.

administration of a narcotic such as morphine or meperidine (Demerol) to the mother during labor. In these instances, a narcotic antagonist such as naloxone (Narcan) injected into an umbilical vessel or intramuscularly into a thigh will relieve the depression (Box 26.3). The dose of naloxone is determined by institutional policy but is usually 0.01 to 0.1 mg/kg body weight (Karch, 2009). If there is suspicion of maternal drug abuse, naloxone is used cautiously because it might cause acute withdrawal in the neonate. Other drug therapies in addition to naloxone are shown in Boxes 26.4 and 26.5.

Ventilation Maintenance

To allow a newborn to adjust to and maintain cardiovascular changes, effective ventilation (continued respirations) must be maintained. Healthy newborns accomplish this task on their own. All infants, especially those who had difficulty establish- ing respirations at birth, should be carefully observed in the next few hours to be certain respirations are maintained.

BOX 26.4 ✻ Focus on Pharmacology

Drugs Used in Resuscitation

Drugs commonly used in newborn resuscitation include:

Atropine: Reduces bronchial secretions, keeping the airway clear during resuscitation. Reduces vagus nerve effects, relieving bradycardia.

Calcium chloride: Increases heart contractility.

Dopamine: Increases systemic blood perfusion by increasing blood pressure through beta-agonist action.

Epinephrine: Strengthens or initiates cardiac contractions; increases heart rate and blood pressure.

Lidocaine: Counteracts ventricular arrhythmias by decreasing automaticity of ventricular cells.

Sodium bicarbonate (NaHCO3) or tromethamine: Corrects metabolic acidosis. Caution: Do not give ventilation is adequate or acidosis can be increased by retained CO2.

Many preterm infants have such respiratory distress at birth that they need continued therapy, including:

Surfactant: All preterm infants weighing less than 1500 g receive surfactant administered by endotracheal tube at birth (see Box 26.5). Some newborns need administration of additional surfactant to prevent symptoms of respiratory distress syndrome.

Nitric oxide: Nitric oxide is a potent vascular dilator. Because it dilates the capillaries next to alveoli, it reduces the pulmonary resistance and therefore increases oxygenation and lung function (Barrington & Finer, 2009).

Liquid ventilation: Liquid ventilation is the instillation of liquid fluorocarbon (Perflubron) into the lungs. It fills and clings to alveoli. Perflubron is not absorbed by the body but instead leaves the lungs by evaporation. Although studies in young infants are few in number, liquid ventilation has the potential to reduce lung disease (Davies & Sargent, 2009). It acts as an anti- inflammatory and reduces oxygen toxicity and perhaps infection because bacteria cannot live in the these agents unless medium. Adverse effects may be pneumothorax and mucus plugging.

An increasing respiratory rate in a newborn is often the first sign of obstruction or respiratory compromise. If the respiratory rate is increased, undress the baby's chest and look for retractions (inward sucking of the anterior chest wall on inspiration). Retractions of this type reflect the difficulty the newborn is having in drawing air (tugging so hard to inflate the lungs that the anterior chest muscles are drawn inward).

A newborn who is having difficulty with maintaining respirations should be placed under an infant warmer and have the weight of clothing removed from the chest. Keeping the infant warm is important to prevent acidosis. Positioning an infant on the back with the

head of the mattress elevated approxi- mately 15 degrees allows the abdominal contents to fall away from the diaphragm, offering additional breathing space.

If secretions are accumulating in the respiratory tract, they must be suctioned. If the newborn has an endotracheal tube in place, perform tracheal suctioning. “Bagging” an infant for a minute before suctioning can improve the infant’s oxygen level and prevent it from dropping to dangerous levels during suc- tioning. Use pulse oximetry or transcutaneous oxygen moni- toring to monitor oxygen level if available (see Chapter 40). The cause of the respiratory distress must be determined and appropriate interventions undertaken to correct the difficulty (see Chapter 40).

Establishing Extrauterine Circulation

Although establishing respirations is the usual priority at a high-risk infant’s birth, lack of cardiac function may be present concurrently or may develop if respiratory function cannot be quickly initiated and maintained. If an infant has no audible heartbeat, or if the cardiac rate is below 80 beats per minute, closed-chest massage should be started. Hold an infant with fingers supporting the back and depress the sternum with two fingers (see Chapter 41). Depress the sternum approximately one third of its depth (1 or 2 cm) at a rate of 100 times per minute (AHA, 2008). Lung ventilation at a rate of 30 times per minute should be continued and interspersed with the car- diac massage at a ratio of 1:3.

Continue to monitor transcutaneous oxygen or pulse oximetry to evaluate respiratory function and cardiac effi- ciency. If the pressure and the rate of massage are adequate, it should be possible, in addition, to palpate a femoral pulse. If heart sounds are not resumed above 80 beats per minute after 30 seconds of combined positive-pressure ventilation and car- diac compressions, 0.1 to 0.3 mL/kg epinephrine (1:10,000) may be sprayed into the endotracheal tube to stimulate cardiac function (AHA, 2008). Newborns who have difficulty main- taining cardiac function need to be transferred to a transitional or high-risk nursery for continuous cardiac surveillance.

Maintaining Fluid and Electrolyte Balance

After an initial resuscitation attempt, hypoglycemia (de- creased blood glucose) may result from the effort the newborn expended to begin breathing. Dehydration may result from increased insensible water loss from rapid respirations. Infants with hypoglycemia are treated initially with 10% dextrose in water to restore their blood glucose level. Fluids such as Ringer’s lactate or 5% dextrose in water are commonly used to maintain fluid and electrolyte levels. Electrolytes (particu- larly sodium and potassium) and glucose are added as neces- sary, depending on electrolyte analysis.

The rate of fluid administration must be carefully moni- tored because a high fluid intake can lead to patent ductus ar- teriosus or heart failure. When using a radiant warmer, there is an increase in water loss from convection and radiation. A newborn on a warmer, therefore, will require more fluid than if he or she were placed in a double-walled incubator.

Dehydration may be monitored by urine output and urine specific gravity measures. An output less than 2 mL/kg/hr or a specific gravity greater than 1.015 to 1.020 suggests inade- quate fluid intake. Elevated specific gravity may also be caused by inappropriate antidiuretic hormone secretion or kidney failure because of a primary illness.

If an infant has hypotension without hypovolemia, a vaso- pressor such as dopamine may be given to increase blood pres- sure and improve cell perfusion. If hypovolemia is present, the cause is usually fetal blood loss from a condition such as pla- centa previa (see Chapter 21) or twin-to-twin transfusion. With hypovolemia, typically tachypnea, pallor, tachycardia, decreased arterial blood pressure, decreased central venous pressure, and decreased tissue perfusion of peripheral tissue, with a progressively developing metabolic acidosis, will be present. The hematocrit may be normal for some time after acute blood loss because blood cells present are in proportion to plasma. Normal saline or Ringer’s lactate may be adminis- tered to increase blood volume. Control the rate carefully to prevent heart failure, patent ductus arteriosus, or intracranial hemorrhage from fluid pressure overload.

✔5heckpoint Question F6.1

Baby Atkins was given a drug at birth to reverse the effects of a narcotic given to his mother in labor. What drug is commonly used for this?

a.	Sodium chloride
b.	Morphine sulfate
c.	Penicillin G
d.	Naloxone (Narcan)

Regulating Temperature

All high-risk infants may have difficulty maintaining a nor- mal temperature. This is because, in addition to stress from an illness or immaturity, the infant’s body is often exposed during procedures such as resuscitation and blood drawing.

It is important to keep newborns in a neutral-temperature environment, one that is neither too hot nor too cold, as doing so places less demand on them to maintain a minimal metabolic rate necessary for effective body functioning. If the environment is too hot, they must decrease metabolism to cool their body. If it is too cold, they must increase metabo- lism to warm body cells. The increased metabolism required calls for increased oxygen; without this oxygen available, body cells become hypoxic. To save oxygen for essential body functions, vasoconstriction of blood vessels occurs. If this process continues for too long, pulmonary vessels be- come affected and pulmonary perfusion becomes decreased. An infant’s PO2 level falls and PCO2 increases. The decreased PO2 level may open fetal right-to-left shunts again. Surfactant production may halt, which may further interfere with lung function. To supply glucose to maintain increased metabo- lism, an infant begins anaerobic glycolysis, which pours acid into the bloodstream. An infant

becomes acidotic, and with acidosis comes the increased risk of kernicterus (invasion of

brain cells with unconjugated bilirubin) as more bilirubin- binding sites are lost and more bilirubin is free to pass out of the bloodstream into brain cells. In short, because of becom- ing chilled, heart action, breathing, and electrolytic balance are all affected. To prevent a newborn from becoming chilled after birth, wipe an infant dry, cover the head with a cap, and place the baby immediately under a prewarmed radiant warmer or in a warmed incubator (Fig. 26.4) or skin-to-skin against the mother. Additional measures are the use of plastic wrap, plas- tic shields, or warmed mattresses. Air, incubator, or radiant warmer temperatures should be kept regulated to maintain an infant's axillary temperature at 97.8° F (36.5° C). Be cer- tain that during procedures an infant is placed on a radiant heat warmer or a chemical warming pad, not placed directly on cool x-ray tables, scales, or an unheated radiant warmer to prevent heat loss (Box 26.6).

Radiant Heat Sources

Radiant heat warmers are open beds that have an overhead ra- diant heat source. Such units have servocontrol probes, which when placed on an infant's skin continually monitor his or her temperature. Abdominal skin temperature, when mea- sured this way, should be 95.9° to 97.7° F (35.5° to 36.5° C). If an infant's temperature falls below this level, an alarm will sound. Be certain to tape the probe or disk onto the infant's abdomen between the umbilicus and the xiphoid process. Do

FIGURE 26.4 Neutral thermal environment. (A) A neonate in the intensive care bed with overhead radiant warmer can be examined periodically with ease. (B) Use of an incubator allows maintenance of a neutral thermal environment for neonates not requiring minute-to-minute intervention.

not tape it under an infant or it will register a falsely high reading. Be sure it is not over the rib cage, where the thin sub- cutaneous tissue will not allow an accurate reading. Also do not place it over the liver, because increased metabolism may lead to falsely high readings. A plastic bridge or shield placed over the child will better preserve heat by reducing convection and radiation losses; plastic wrap placed over an infant will produce this same effect. When performing care or leaning over an infant, be careful your head does not block the heat from an overhead source and keep it from reaching the baby. An additional warming pad placed under an infant may be necessary for very preterm infants or for lengthy procedures to maintain body heat.

Incubators

After an initial resuscitation attempt, newborns may be cared for in incubators. The temperature of incubators varies with the amount of time portholes remain open and the tempera- ture of the area in which the incubator is placed. Placing it in direct sunlight or near a warm radiator can increase the in- ternal temperature markedly. For this reason, a newborn's temperature must be checked at frequent intervals when in an incubator to be certain the temperature level designated is being maintained. Use of an additional acrylic shield inside the incubator helps prevent radiation and convection heat loss when portholes are opened for care.

Similar to radiant warmers, some incubators have servo- control mechanism units that monitor the infant's tempera- ture and automatically change the temperature of the incu- bator as needed. Portholes must remain closed to keep the servocontrol operating efficiently.

As infants' conditions improve, they can be weaned from an incubator. Dress the infant as if he or she were going to be in a bassinet, then set the incubator about 2° F (1.2° C) below the infant's temperature. After a half-hour, assess whether the infant is able to maintain body temperature. If so, lower the in- cubator temperature another 2° F and continue until room temperature is reached. If an infant cannot maintain adequate temperature as the incubator temperature level is lowered, the infant is not yet ready for room-temperature air, and the wean- ing process needs to be slowed or stopped until the baby is more mature or better able to self-regulate temperature.

Skin-to-Skin Care

Originally referred to as kangaroo care, skin-to-skin care is the use of skin-to-skin contact to maintain body heat. Provide a quiet setting with lights dimmed. Undress the in- fant except for a diaper and perhaps a cap. Assist the parent to sit comfortably in a chair and hold the infant snugly against his or her chest, skin to skin (Moore, Anderson, & Bergman, 2009). Place a blanket over the infant for added warmth. This method of care not only supplies heat but also encourages parent–child bonding.

Establishing Adequate Nutritional Intake

Infants who experienced severe asphyxia at birth usually re- ceive intravenous fluids so they do not become exhausted from sucking or until necrotizing enterocolitis (NEC) has been ruled out, as this could result from the temporary reduction in oxygen to the bowel (see Chapter 45 for a discussion of NEC). If an infant's respiratory rate remains rapid and NEC has

FIGURE 26.5 Infants who are ill at birth often need supple- mental feedings by nasogastric or gastrostomy tube.

been ruled out, gavage feeding may be introduced (Fig. 26.5). Preterm infants should be breastfed if possible because of the immune protection this offers. If breastfeeding is not possi- ble because the infant is too immature to suck effectively, a mother can manually express breast milk or use a breast pump to initiate and continue her milk supply until the time the in- fant is mature enough or otherwise ready for effective sucking. Her expressed breast milk can be used in the infant's gavage feeding (Jones & Spencer, 2007). Be sure when bottled breast milk is supplied by parents that it is well marked with the infant's name or breast milk errors can occur the same as medication errors (Drenckpohl, Bowers, & Cooper, 2007). It should be stored in nonshiny plastic bags or bottles to avoid the infant being exposed to polycarbonate, which can leech into stored milk and possibly cause chromosomal aber- rations (Raloff, 2007).

Preterm infants reveal hunger by the same signs as term infants, such as rooting and crying and sucking motions. All babies who are gavage fed and need oral stimulation from non- nutritive sucking seem to enjoy a pacifier at feeding times and, in immature infants, this may help them develop an effective sucking reflex. Exceptions are infants too immature to have a sucking reflex and infants who must not swallow air, such as those with a tracheoesophageal fistula awaiting surgery. The techniques of gavage feeding, intravenous feeding, and gas- trostomy feeding are discussed in Chapter 37.

Establishing Waste Elimination

Although most immature infants void within 24 hours of birth, they may void later than term newborns because, as a re- sult of all the procedures that may be necessary for resuscita- tion, their blood pressure may not be adequate to optimally supply their kidneys. Carefully document any voidings that occur during resuscitation. This is proof that hypotension is improving and the kidneys are being perfused. Immature in- fants also may pass stool later than the term infant because meconium has not yet reached the end of the intestine at birth.

Preventing Infection

Contracting an infection could drastically complicate a high- risk newborn's ability to adjust to extrauterine life. Infection, like chilling, increases metabolic oxygen demands, which the

stressed newborn may not be able to meet. In addition, infec- tion stresses the immature immune system and already stressed defense mechanisms of a high-risk newborn. Infections may have prenatal, perinatal, or postnatal causes. In some instances, such as preterm rupture of the membranes, it is an infection such as pneumonia or skin lesions that place the infant in a high-risk category (Herbst & Kallen, 2007).

Common viruses that affect infants in utero are cy- tomegalovirus and toxoplasmosis virus. An infant with either of these infections may be born with congenital anomalies from the virus invasion (see Chapter 12). The most prevalent perinatal infections are those contracted from the vagina dur- ing birth. Early-onset sepsis is most commonly caused by group B streptococcus, E. coli, Kelbsiella, and Listeria mono- cytogenes. Late-onset, or nosocomial, infections are more commonly caused by Staphylococcus aureus, Enterobacter, and Candida. These late-onset infections are probably most com- monly spread to newborns from health care personnel. For this reason, all persons coming in contact with or caring for infants must observe good handwashing technique and stan- dard precautions to reduce the risk of infection transmission. Health care personnel with infections have a professional and moral obligation to refrain from caring for newborns.

Establishing Parent–Infant Bonding

It is helpful if all women who are diagnosed as having a high- risk pregnancy are offered a tour of a neonatal intensive care unit (NICU) during pregnancy so if their infant should be admitted to a NICU, they will be more comfortable in the high-tech environment.

Be certain that the parents of a high-risk newborn are kept informed of what is happening during resuscitation at birth. They should be able to visit the special nursing unit to which the child is admitted as often as they choose, and, after wash- ing and gowning, hold and touch their child. This helps to make the child's birth real to them. Should a child not sur- vive an initial illness, these interactions can help make the death more real. Only when both birth and death seem real can parents begin to work through their feelings and accept these events.

All parents handle newborn babies tentatively until they have "claimed" them or have become better acquainted. It may be months before the parents of a child who has been ill since birth can handle their baby comfortably and confi- dently. Urge parents to spend time with their infant in the intensive care nursery as the infant improves. Be certain that parents have access to health care personnel after discharge to help them care confidently for the child at home.

If an infant dies despite newborn resuscitation attempts, parents need to see the infant without being covered by a myriad of equipment. This is a time for parents to reassure themselves their newborn was a perfect baby in every other way except lung function or whatever was the infant's fatal disorder. Thinking this way can give them confidence to plan for other children or simply to continue their lives after such a stressful experience.

Anticipating Developmental Needs

High-risk newborns need special care to ensure that the amount of pain they experience during procedures is limited to the least

amount possible and that they receive adequate stim-

ulation for growth. Most high-risk infants enjoy “catch-up” growth once they stabilize from the trauma of birth or what- ever caused them to be classified as high risk. They quickly move to playing with age-appropriate toys. Some parents may need support before and after their infants are discharged home to begin to view them as well and capable of doing all the things they are now capable of doing. Anticipatory guid- ance helps them to be ready for the next developmental step.

Follow-up of High-Risk Infants at Home

Each time parents visit a high-risk nursery, assess their level of knowledge about their child’s condition and development. Thorough education and referral to a home care agency may be necessary to help parents continue with the level of care that is required when their infant is discharged home (see Chapter 4). Before discharge, the safety of their home for the care of such a small infant needs to be evaluated. Transporting a preterm infant in a car requires special care, including a blanket or commercial head support, because a very small in- fant does not fit securely in a standard infant car seat.

Although not well documented regarding when or why it occurs, some preterm infants experience episodes of oxygen desaturation, apnea, or bradycardia when seated in standard car safety seats (DeGrazia, 2007). To detect if this will occur, the American Academy of Pediatrics (AAP, 2009) recom- mends that all preterm infants be assessed for cardiorespira- tory stability in their car seat prior to discharge—the “car seat challenge.”

High-Risk Infants and Child Abuse

When a child is ill or born preterm, the expected reaction of the parents would be to protect the child even more than the average child so no further harm can result. In reality, par- ticularly in reference to preterm children, the opposite may occur. Preterm children are at high risk for abuse (Sirotnak & Krugman, 2008). This is probably because of the separa- tion of the child from the family at birth, which interferes with bonding. Child abuse is discussed in Chapter 55.

G2aS i),,, Mrs. Atkins is about to visit her preterm new- born for the first time and states, “I’m so scared. He’s so tiny and frail. How can I even hold him?” How should you respond to this new mother to make her
visit easier?

THE NEWBORN AT RISK BECAUSE OF ALTERED GESTATIONAL AGE OR BIRTH WEIGHT

Infants need to be evaluated as soon as possible after birth to determine their weight and gestational age as classification by growth charts and gestational history is important to deter- mine immediate health care needs and to help anticipate pos- sible problems. Birth weight is normally plotted on a growth chart such as the Colorado (Lubchenco) Intrauterine Growth Chart (see Appendix E). Infants born after the beginning of week 38 and before week 42 of pregnancy (calculated from the first day of the last menstrual period) are classified as term

infants. Approximately 90% of all live births are term. Infants born before term (less than the full 37th week of pregnancy) account for approximately 7% to 19% of all births and are classified as preterm infants, regardless of their birth weight. Infants born after the onset of week 43 of pregnancy are clas- sified as postterm, dysmature, or postmature (Fortner, Althaus, & Gurewitsch, 2007).

Normally, birth weight varies for each gestational week of age. Infants who fall between the 10th and 90th percentiles of weight for their age regardless of gestational age are con- sidered appropriate for gestational age (AGA). Infants who fall below the 10th percentile of weight for their age are con- sidered small for gestational age (SGA). Those who fall above the 90th percentile in weight are considered large for gestational age (LGA). Infants weighing under 2500 g are low-birth-weight infants. Those weighing 1000 to 1500 g are very-low-birth-weight infants (VLB). Those born weighing 500 to 1000 g are considered extremely very-low-birth-weight infants (EVLB). Preterm infants may be AGA, SGA, LGA, low birth weight, VLB, or EVLB.

All such infants have immediate needs that are different from or more pronounced than the needs of term newborns. Each of these categories carries its own set of potential risks.

The Small-for-Gestational-Age Infant

An infant is SGA if the birth weight is below the 10th per- centile on an intrauterine growth curve for that age. SGA in- fants may be born preterm (before week 38 of gestation), term (between weeks 38 and 42), or postterm (past 42 weeks). SGA infants are small for their age because they have experienced intrauterine growth restriction (IUGR) or failed to grow at the expected rate in utero (Rahimian & Varner, 2007). This characteristic makes them distinctly different from infants whose weight is low but who are average for gestational age.

Etiology

A woman’s nutrition during pregnancy plays a major role in fetal growth, so lack of adequate nutrition may be a major contributor to IUGR. Pregnant adolescents have a high inci- dence of SGA infants. Because adolescents must meet their own nutritional and growth

needs, needs of a growing fetus can be compromised. However, the most common cause of IUGR is a placental anomaly: either the placenta did not ob- tain sufficient nutrients from the uterine arteries or it was in- efficient at transporting nutrients to the fetus. Placental dam- age, such as partial placental separation with bleeding, limits placental function because the area of placenta that separated becomes infarcted and fibrosed, reducing the placental sur- face available for nutrient exchange. A developmental defect in the placenta can also prevent it from functioning properly. Women with systemic diseases that decrease blood flow to the placenta, such as severe diabetes mellitus or pregnancy- induced hypertension (both are diseases in which blood ves- sel lumens are narrowed), are at higher risk for delivering SGA babies than others. Women who smoke heavily or use narcotics also tend to have SGA infants (Rahimian & Varner, 2007).

In other instances, the placental supply of nutrients is ad-
equate but an infant cannot use them because the infant has contracted an intrauterine infection such as rubella or toxo- plasmosis or has a chromosomal abnormality.

Assessment

The SGA infant may be detected in utero when fundal height during pregnancy becomes progressively less than ex- pected. However, if a woman is unsure of the date of her last menstrual period, this discrepancy can be hard to substantiate. A sonogram can then demonstrate the decreased size. A bio- physical profile including a nonstress test, placental grading, amniotic fluid amount, and ultrasound examination can pro- vide additional information on placental function. If poor placental function is apparent from such determinations, it can be predicted the infant will do poorly during labor be- cause of periods of relative hypoxia during contractions may result. Cesarean birth is the birth method of choice in such circumstances.

Appearance. Generally, an infant who suffers nutritional de- privation early in pregnancy, when fetal growth consists pri- marily of an increase in the number of body cells, is below av- erage in weight, length, and head circumference. An infant who suffers deprivation late in pregnancy, when growth con- sists primarily of an increase in cell size, may have only a re- duction in weight. Regardless of when deprivation occurs, an infant tends to have an overall wasted appearance. The child may have a small liver, which can cause difficulty regulating glucose, protein, and bilirubin levels after birth. The infant also may have poor skin turgor and generally appear to have a large head because the rest of the body is so small. Skull su- tures may be widely separated from lack of normal bone growth. Hair is dull and lusterless. The abdomen may be sunken. The umbilical cord often appears dry and may be stained yellow. In contrast, because an infant's age is more advanced than the weight implies, a child may have better-developed neuro- logic responses, sole creases, and ear cartilage than expected for a baby of that weight. The skull may be firmer, and the infant may seem unusually alert and active for that weight. The SGA infant needs careful assessment for possible con- genital anomalies occurring as a result of the poor nutritional intrauterine environment.

Laboratory Findings. Blood studies at birth usually show a high hematocrit level (less than normal amounts of plasma in proportion to red blood cells are present because of a lack of fluid in utero) and an increase in the total number of red blood cells (polycythemia). The increase in red blood cells occurs because anoxia during intrauterine life stimulates the development of red blood cells. The polycythemia that re- sults causes increased blood viscosity, a condition that puts extra work on the infant's heart because it is more difficult to effectively circulate thick blood. As a consequence, acro- cyanosis (blueness of the hands and feet) may be prolonged and persistently more marked than usual. If the poly- cythemia is extreme, vessels may actually become blocked and thrombus formation can result. If the hematocrit level is more than 65% to 70%, an exchange transfusion to dilute the blood may be necessary.

Because SGA infants have decreased glycogen stores, one of the most common problems is hypoglycemia (decreased blood glucose, or a level below 45 mg/dL). Such infants may need intravenous glucose to sustain blood sugar until they are able to suck vigorously enough to take sufficient oral feedings.

Nursing Diagnosis: Ineffective breathing pattern re- lated to underdeveloped body systems at birth

Outcome Evaluation: Newborn maintains respirations at a rate of 30 to 60 breaths per minute after resusci- tation at birth.

Birth asphyxia is a common problem for SGA infants, both because they have underdeveloped chest mus- cles and because they are at risk for developing meco- nium aspiration syndrome as a result of anoxia during labor. Fetal hypoxia causes a reflex relaxation of the anal sphincter and increased intestinal movement. When gasping for breath in utero, the fetus draws meco- nium that was discharged from the intestine into the am- niotic fluid down into the trachea and bronchi. Acting as a foreign substance, this blocks airflow into the alveoli, leading to hypoxemia, acidosis, and hypercapnia. For this reason, many SGA infants require resuscitation at birth. Closely observe both respiratory rate and charac- ter in the first few hours of life. Underdeveloped chest muscles can make SGA infants unable to sustain the rapid respiratory rate of a normal newborn.

Nursing Diagnosis: Risk for ineffective thermoregula- tion related to lack of subcutaneous fat

Outcome Evaluation: Infant's temperature is main- tained at 36.5° C (97.8° F) axillary.

SGA infants are less able to control body temperature than other newborns because they lack subcutaneous fat. A carefully controlled environment is essential to keep the infant's body temperature in a neutral zone (see Chapter 18).

Nursing Diagnosis: Risk for impaired parenting related to child's high-risk status and possible cognitive or neurologic impairment from lack of nutrients in utero

Outcome Evaluation: Parents express interest in infant and ask questions about what the child's care needs will be at home.

Although SGA infants may gain weight and appear to thrive in the first few days of life, their cognitive devel- opment may have been impaired because of lack of oxygen and nourishment in utero. Babies who were growing normally in utero but whose gestation was in- terrupted preterm (true preterm babies) usually gain weight and height so rapidly that by the end of the first year of life they are near the 50th percentile on growth charts. SGA infants, in contrast, may always be below usual on standard growth charts. This inability to reach normal levels of growth and development may interfere with bonding because a child does not meet the parents' expectations. Eventually, it can interfere with the child's self-esteem if the child is never able to meet parental expectations or reach full height.

An SGA infant needs adequate stimulation during the infant period to reach normal growth and develop- mental milestones. Encourage parents to provide toys suitable for their child's chronologic age, not physical

size. Because an infant tires easily in the first few weeks of life, urge them to space play periods with rest peri- ods or hypoglycemia or apnea can occur. All infants with IUGR need continued follow-up after hospital dis- charge as they may have neurologic deficits that will in- terfere with learning at school age (Leitner et al., 2007).

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The Large-for-Gestational-Age Infant

An infant is LGA (also termed macrosomia) if the birth weight is above the 90th percentile on an intrauterine growth chart for that gestational age. Such a baby appears deceptively healthy at birth because of the weight, but a gestational age examination will reveal immature development. It is impor- tant that LGA infants be identified immediately so that they can be given care appropriate to their gestational age rather than being treated as term newborns (Lawrence, 2007).

Etiology

Infants who are LGA have been subjected to an overproduc- tion of growth hormone in utero. This happens most often to infants of women with diabetes mellitus or women who are obese (Strehlow et al., 2007). Extreme macrosomia oc- curs in fetuses of diabetic women whose symptoms are poorly controlled, because these fetuses are exposed to high glucose levels. Multiparous women are also prone to have large babies because with each succeeding pregnancy, babies tend to grow larger. Other conditions associated with LGA infants include transposition of the great vessels, Beckwith syndrome (a rare condition characterized by overgrowth), and congenital anomalies such as omphalocele.

Assessment

A fetus is suspected of being LGA when a woman's uterus is unusually large for the date of pregnancy. Abdominal size can be deceptive, however—because a fetus lies in a flexed fetal po- sition, he or she does not occupy significantly more space at 10 lb than at 7 lb. If a fetus does seem to be growing at an abnormally rapid rate, a sonogram can confirm the suspicion. A nonstress test to assess the placenta's ability to sustain a large fetus during labor may be performed. To see if an LGA fetus is mature, lung maturity may be assessed by amniocentesis.

If an infant's large size was not detected during pregnancy, it may be first recognized during labor when the baby cannot descend through the pelvic rim. If this happens, cesarean birth may be necessary to avoid shoulder dystocia (the wide fetal shoulders cannot pass through the outlet of the pelvis).

Appearance. At birth, LGA infants may show immature reflexes and low scores on gestational age examinations in relation to their size. They may have extensive bruising or a birth injury such as a broken clavicle or Erb-Duchenne

paralysis from trauma to the cervical nerves if they were born vaginally (see Chapter 51). Because the head is large, it may have been exposed to more than the usual amount of pressure during birth, causing a prominent caput succeda- neum, cephalhematoma, or molding.

An LGA newborn requires the same cautious care neces- sary for a preterm infant. Specific criteria for initial or con- tinuing assessment are shown in Table 26.1.

Cardiovascular Dysfunction. Observe LGA infants closely for signs of hyperbilirubinemia (increased serum bilirubin level), which may result from absorption of blood from bruising and polycythemia. Polycythemia has been caused by an infant's system attempting to fully oxygenate all body tis- sues. This effort puts extra stress on the heart, so the heart rate of LGA infants should be carefully observed. If cyanosis is present, it may be a sign of transposition of the great ves- sels, a serious heart anomaly associated with macrosomia (see Chapter 41).

Hypoglycemia. LGA infants also need to be carefully as- sessed for hypoglycemia in the early hours of life because in- fants require large amounts of nutritional stores to sustain their weight. If the mother had diabetes that was poorly con- trolled, the infant will have

had an increased blood glucose level in utero causing the infant to produce elevated levels of insulin. After birth, these increased insulin levels will con- tinue for up to 24 hours of life, possibly causing rebound hypoglycemia.

Nursing Diagnosis: Ineffective breathing pattern related to possible birth trauma in LGA newborn
Outcome Evaluation: Newborn initiates breathing at birth; maintains normal newborn respiratory rate of 30 to 60 breaths per minute.

Some LGA infants have difficulty establishing respira- tions at birth because of birth trauma. Increased in- tracranial pressure from birth of the larger-than-usual head could have led to pressure on the respiratory center. This, in turn, can cause a decrease in respira- tory function. A diaphragmatic paralysis may occur because of cervical nerve trauma as the head is bent sideways to allow for birth of the large shoulders. This prevents active lung motion on the affected side. If an infant was born by cesarean birth, transient fluid can remain in the lungs and interfere with effective gas ex- change. Careful observation is needed to detect these conditions. Care of an infant with transient lung fluid is discussed later in this chapter.
Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to additional nutrients needed to maintain weight and prevent hypoglycemia
Outcome Evaluation: Infant's weight follows percentile growth curve; skin turgor is good; specific gravity of urine is 1.003 to 1.030; serum glucose is above 45 mg/dL.
As a rule, an LGA infant needs to be breastfed imme- diately to prevent hypoglycemia. The infant may need supplemental formula feedings after breastfeeding to supply enough fluid and glucose for the larger-than- normal size for the first few days. Newborns who are offered bottles often have more difficulty than do oth- ers learning to breastfeed. Offer both the mother and baby support to overcome this hurdle.
Do not overestimate LGA infants' ability to suck ef- fectively at birth. Such infants may seem as if they should be able to suck well because they are already the size of a 2-month-old. However, the infant is an in- experienced newborn, so sucking may not be effec- tive enough to obtain the larger-than-usual amount of milk needed.
Nursing Diagnosis: Risk for impaired parenting related to high-risk status of large-for-gestational-age infant

Outcome Evaluation: Parents hold infant; speak of the child in positive terms; state accurately why their infant needs to be closely observed in postna- tal period.
Parents may underestimate this infant's needs be- cause of the child's large size. He or she seems so big and healthy; parents may be confused about why their infant needs careful watching. They may read more into the child's condition than is present (he or she must be sick in some way they are not being told about), and so bonding does not happen as instinctively as it might. If a woman sustained a cer- vical or perineal tear or required a cesarean birth, she may need some time to air any resentment she may feel toward the infant for causing her extra pain. Otherwise, her perception that her infant is the cause of her additional distress may interfere with her ability to bond with the child.
An LGA infant needs the same developmental care as all infants. Singing or talking to the baby, stroking the child's back, and rocking the baby are all impor- tant for the large infant's development. Encourage parents to treat their baby as a fragile newborn who needs warm nurturing of this type, not as a tough big infant who has grown past that stage. Also remind parents an infant's birth weight is not a correlation of the child's projected adult size. Otherwise, parents may fear their infant may grow to be a larger-than- usual adult.

A Preterm Infant
A preterm infant is traditionally defined as a live-born infant born before the end of week 37 of gestation; another crite- rion used is a weight of less than 2500 g (5 lb 8 oz) at birth. Preterm birth occurs in approximately 7% of live births of white infants. In African American infants, the rate is dou- bled to approximately 14% (Thilo & Rosenberg, 2008). When a preterm infant is recognized by a gestational age as- sessment, observe closely for the specific problems of prema- turity, such as respiratory distress syndrome, hypoglycemia, and intracranial hemorrhage.

All preterm infants need intensive care from the moment of birth to give them their best chance of survival without neurologic after- effects. A lack of lung surfactant makes them extremely vulnerable to respiratory distress syndrome (Thilo & Rosenberg, 2008).
The maturity of a newborn is determined by physical findings such as sole creases, skull firmness, ear cartilage, and neurologic findings that reveal gestational age, as well as the mother's report of the date of her last menstrual period and sonographic estimations of gestational age.
Preterm babies, regardless of their weight, need to be dif- ferentiated at birth from SGA babies (who also may have a low birth weight). The two conditions result from different situations and therefore will cause different problems in ad- justment to extrauterine life. A preterm infant is immature and small but well proportioned for age. Unlike the SGA in- fant, this baby appears to have been doing well in utero. For an unexplained reason, however, the trigger that initiates labor was activated too early and birth resulted, even

though the baby is immature. Preterm infants are invariably low- birth-weight infants. Characteristics of SGA and preterm in- fants are compared in Table 26.2.

Etiology

Preterm infant deaths account for 80% to 90% of infant mortality in the first year of life (NVSS, 2009). Infant mor- tality could be reduced dramatically if the causes of preterm birth could be discovered and corrected and all pregnancies brought to term. However, the exact cause of premature labor and early birth is rarely known.

There is a high correlation between low socioeconomic level and early termination of pregnancy. In women from middle and upper socioeconomic groups, only 4% to 8% of pregnancies are terminated early. However, in women from low socioeconomic levels, as many as 10% to 20% end be- fore term. The major influencing factor in these instances ap- pears to be inadequate nutrition before and during preg- nancy, as a result of either lack of money for or lack of knowledge about good nutrition. Additional factors that seem to be related to preterm birth are shown in Box 26.7. Iatrogenic (health care–caused) issues, such as elective ce- sarean birth and inducing labor according to dates rather

TABLE 26.2 ✻ Differences Between Small-for-Gestational-Age and Preterm Infants

Characteristic	Small-for-Gestational-Age Infant	Preterm Infant
Gestational age	24–44 wk	<37 wk
Birth weight	<10th percentile	Normal for age
Congenital malformations	Strong possibility	Possibility
Pulmonary problems	Meconium aspiration, pulmonary	Respiratory distress syndrome
Hyperbilirubinemia	hemorrhage, pneumothorax Possibility	Very strong possibility
Hypoglycemia	Very strong possibility	Possibility
Intracranial hemorrhage	Strong possibility	Possibility
Apnea episodes	Possibility	Very strong possibility
Feeding problems		
Weight gain in nursery	Most likely because of accompanying problem such as hypoglycemia	
Rapid	Small stomach capacity; immature sucking reflex	
Slow		
Future restricted growth	Possibly always be <10th percentile because of poor organ development	Not likely to be restricted in growth as “catch-up” growth occurs

FIGURE 26.6 An immature infant. Notice the lax position of limbs because of immature muscle development.

than fetal maturity, also result in preterm births. Testing fetal maturity by amniocentesis or ultrasound is used to avoid these problems. The increasing use of assisted fertility methods such as in vitro fertilization that results in multiple births leads to an increased preterm rate as more multiple pregnancies result in preterm birth than term pregnancies (Goldenberg et al., 2008).

Assessment 2MO -

Although a detailed pregnancy history may sometimes reveal the reason for a preterm birth, the pregnancy history is often normal up to the beginning of labor.

When interviewing parents of a preterm infant, be careful not to convey disapproval of reported pregnancy behaviors such as cigarette

smoking or working a 12-hour shift that may have contributed to preterm birth. Once an infant is born, a new mother needs a high level of self-esteem and all of her inner resources to sustain her through the crisis. Being overburdened by guilt may be detrimental to her attempts to bond with her infant. A good answer to her direct inquiries about causes is, “No one really knows what causes prematu- rity.” Teaching about better pregnancy practices can wait until she is ready for a second pregnancy.

In many instances, preterm labor might have been halted had a woman been able to recognize she was in true labor and not having Braxton Hicks contractions. In a first labor, this can easily occur because a woman does not know how true labor feels. Television shows often depict women in labor as having agonizingly painful contractions or the opposite, sim- ply announcing, “This is it,” and then proceeding to give birth within the 30-minute show. In reality, a first-time

mother does not realize that labor usually begins with subtle signs and mild contractions, not with a dramatic announce- ment. With preterm labor, often a woman reports that she thought she was having intestinal cramps. Because each labor proceeds differently, even a multipara may miss the signs of early labor until it is too far advanced to be reversed. Reassure a woman it is understandable she did not realize what was happening until cervical dilatation had occurred and labor could not be reversed.

On gross inspection, a preterm infant appears small and un- derdeveloped (Fig. 26.6). The head is disproportionately large (≥3 cm greater than chest size). The skin is generally unusu- ally ruddy because there is little subcutaneous fat beneath it; veins are easily noticeable, and a high degree of acrocyanosis may be present. The preterm neonate, 24 to 36 weeks, typi- cally is covered with vernix caseosa. However, in very preterm newborns (less than 25 weeks’ gestation), vernix is absent be- cause it is not formed this early in pregnancy. Lanugo is usu- ally extensive, covering the back, forearms, forehead, and sides of the face, because this amount is present until late in preg- nancy. Both anterior and posterior fontanelles are small. There are few or no creases on the soles of the feet.

Physical findings and reflex testing are used to differenti- ate between term and preterm newborns (Fig. 26.7). The eyes of most preterm infants appear small. Although difficult to elicit, pupillary reaction is present. Ophthalmoscopic ex- amination is extremely difficult and often uninformative be- cause the vitreous humor may be hazy. A preterm infant has varying degrees of myopia (nearsightedness) because of lack of eye globe depth.

The ears appear large in relation to the head. The cartilage of the ear is immature and allows the pinna to fall forward. The level of the ears should be carefully inspected to rule out chromosomal abnormalities (see Chapter 7).

Neurologic function in the preterm infant is often diffi- cult to evaluate as the neurologic system is still so immature. The observation of spontaneous or provoked movements may yield findings as important as reflex testing. If tested, re- flexes such as sucking and swallowing will be absent if an in- fant’s age is below 33 weeks; deep tendon reflexes such as the Achilles tendon reflex are also markedly diminished. During an examination, a preterm infant is much less active than a mature infant and rarely cries. If the infant does cry, the cry is weak and high-pitched.

Laboratory values for a preterm infant are compared with those of the term infant in Appendix F.

Potential Complications

Because of immaturity, preterm infants are prone to several specific conditions.

Anemia of Prematurity. Many preterm infants develop a normochromic, normocytic anemia (normal cells, just few in number). The reticulocyte count is low because the bone marrow does not increase its production until approximately 32 weeks. The infant will appear pale and may be lethargic and anorectic. The fault appears to be immaturity of the hematopoietic system combined with destruction of red blood cells because of low levels of vitamin E, which nor- mally protects red blood cells against oxidation. Excessive blood drawing for electrolyte or blood gas analysis can po- tentiate the problem. For this reason, keep a record of the amount of blood drawn for analysis.

Red blood cell production can be stimulated by the ad- ministration of DNA recombinant erythropoietin. In addi- tion, an infant may need blood transfusions to supply needed red blood cells and vitamin E and iron, which can be sup- plemented (Thilo & Rosenberg, 2008).

Kernicterus. Kernicterus is destruction of brain cells by invasion of indirect bilirubin (Symons & Mahoney, 2008). This invasion results from the high concentrations of indi- rect bilirubin in the blood from excessive breakdown of red blood cells. Preterm infants are more prone to the condi- tion than term infants because with the acidosis that occurs from poor respiratory exchange, brain cells are more susceptible to the effect of indirect bilirubin than usually. Preterm infants also have less serum albumin available to bind indirect bilirubin and inactivate its effect. Because of this, kernicterus may occur at lower levels (as low as

Premature Infant Full-term Infant

A

RESTING POSTURE The premature infant is characterized by very little, if any, flexion in the upper extremities and only partial flexion of the lower extremities. The full-term infant exhibits flexion in all four extremities.

Premature Infant, 28–32 Weeks
B

Full-term Infant

WRIST FLEXION The wrist is flexed, applying enough pressure to get the hand as close to the forearm as possible. The angle between the hypothenar eminence and the ventral aspect of the forearm is measured. (Care must be taken not to rotate an infant's wrist.) The premature infant at 28–32 weeks' gestation will exhibit a 90-degree angle. With the full- term infant it is possible to flex the hand onto the arm.
FIGURE 26.7 Examples of physical examination findings and reflex tests used to judge gestational age. (A) Resting posture. (B) Wrist flexion. (continued)

Premature Infant Full-term Infant
C

Response in Premature Infant Response in Full-term Infant

RECOIL OF EXTREMITIES Place an infant supine. To test recoil of the legs (1) flex the legs and knees fully and hold for 5 seconds (shown in top photographs), (2) extend the legs fully by pulling on the feet, (3) release. To test the arms, flex fore- arms and follow same procedure. In the premature infant response is minimal or absent (bottom left); in the full-term infant extremities return briskly to full flexion (bottom right).

Premature Infant Full-term Infant
D

SCARF SIGN Hold the baby supine, take the hand, and try to place it around the neck and above the opposite shoulder as far posteriorly as possible. Assist this maneuver by lifting the elbow across the body. See how far across the chest the elbow will go. In the premature infant the elbow will reach near or across the midline. In the full-term infant the elbow will not reach the midline.
FIGURE 26.7 (continued) (C) Recoil of extremities (legs). (D) Scarf sign. (continued)

Premature Infant Full-term Infant
E

HEEL TO EAR With the baby supine and the hips positioned flat on the bed, draw the baby's foot as near to the ear as it will go without forcing it. Observe the distance between the foot and head as well as the degree of extension at the knee. In the premature infant very little resistance will be met. In the full-term infant there will be marked resistance; it will be im- possible to draw the baby's foot to the ear.

Premature Infant Full-term Infant
F

SOLE (PLANTAR) CREASES The sole of the premature infant has very few or no creases. With the increasing gestation age, the number and depth of sole creases multiply, so that the full-term baby has creases involving the heel. (Wrinkles that occur after 24 hours of age can sometimes be confused with true creases.)

Premature Infant Full-term Infant
G

BREAST TISSUE In infants younger than 34 weeks' gestation the areola and nipple are barely visible. After 34 weeks the areola becomes raised. Also, an infant of less than 36 weeks' gestation has no breast tissue. Breast tissue arises with in- creasing gestational age because of maternal hormonal stimulation. Thus, an infant of 39–40 weeks will have 5–6 mm of breast tissue, and this amount will increase with age.
FIGURE 26.7 (continued) (E) Heel to ear. (F) Plantar creases. (G) Breast tissue. (continued)

Premature Infant, 34–36 Weeks Full-term Infant
H

EARS At fewer than 34 weeks' gestation infants have very flat, relatively shapeless ears. Shape develops over time so that an infant between 34 and 36 weeks has a slight incurving of the superior part of the ear; the term infant is characterized by incurving of two thirds of the pinna; and in an infant older than 39 weeks the incurving continues to the lobe. If the ex- tremely premature infant's ear is folded over, it will stay folded. Cartilage begins to appear at approximately 32 weeks so that the ear returns slowly to its original

position. In an infant of more than 40 weeks' gestation, there is enough ear carti- lage so that the ear stands erect away from the head and returns quickly when folded. (When folding the ear over during examination, be certain that the surrounding area is wiped clean or the ear may adhere to the vernix.)

Premature Male Full-term Male
I

MALE GENITALIA In the premature male the testes are very high in the inguinal canal and there are very few rugae on the scrotum. The full-term infant's testes are lower in the scrotum and many rugae have developed.

Premature Female Full-term Female
J

FEMALE GENITALIA When the premature female is positioned on her back with hips abducted, the clitoris is very promi- nent and the labia majora are very small and widely separated. The labia minora and the clitoris are covered by the labia majora in the full-term infant.
FIGURE 26.7 (continued) (H) Ears. (I) Male genitalia. (J) Female genitalia. (© Caroline Brown, RNC, MS, DEd.)

12 mg per 100 mL of indirect bilirubin) in these infants. If jaundice occurs, phototherapy or exchange transfusion can be initiated to prevent excessively high indirect bilirubin levels.

Persistent Patent Ductus Arteriosus. Because preterm infants lack surfactant, their lungs are noncompliant, so it is more difficult for them to move blood from the pul- monary artery into the lungs. This condition leads to pul- monary artery hypertension, which may interfere with closure of the ductus arteriosus. Administer intravenous ther- apy cautiously to preterm infants to avoid increasing blood pressure and further compounding this problem. Either indomethacin or ibuprofen may be administered to close the patent ductus arteriosus (Donze, Smith, & Bryowsky, 2007). A side effect of indomethacin is oliguria, so urine output needs to be monitored closely if this is used.

Periventricular/Intraventricular Hemorrhage. Preterm infants are prone to periventricular hemorrhage (bleeding into the tissue surrounding the ventricles) or intraventricu- lar hemorrhage (bleeding into the ventricles); these condi- tions occur in as many as 50%

of infants of very low birth weight (Thilo & Rosenberg, 2008). This occurs be- cause preterm infants have both fragile capillaries and immature cerebral vascular development. When there is a rapid change in cerebral blood pressure, such as with hypoxia, intravenous infusion, ventilation, or pneumotho- rax, capillaries rupture. An infant experiences brain anoxia distal to the rupture. Hydrocephalus may occur from bleeding into the aqueduct of Sylvius with resulting clotting and obstruction of the aqueduct. Preterm infants often have a cranial ultrasound performed after the first few days of life to detect if a hemorrhage has occurred. An infant's prognosis is guarded until it can be shown that de- velopment in an infant is progressing normally after an intracranial bleed.

Other Potential Complications. Preterm infants are partic- ularly susceptible to several illnesses in the early postnatal period, including respiratory distress syndrome, apnea, retinopathy of prematurity (all discussed later in this chapter), and necrotizing enterocolitis (discussed in Chapter 45).

Because a preterm infant has few body resources, both physiologic and psychological stress must be re- duced as much as possible and interventions initiated gently to prevent depletion of resources. Close obser- vation and analysis of findings are essential to man- aging problems quickly.

Nursing Diagnosis: Impaired gas exchange related to immature pulmonary functioning

Outcome Evaluation: Newborn initiates breathing at birth after resuscitation; maintains normal newborn respirations of 30 to 60 breaths per minute free of as-

sisted ventilation; exhibits oxygen saturation levels of at least 90% as evidenced by arterial blood gases (ABGs).

Many preterm babies, particularly those under 32 weeks of age, have an irregular respiratory pattern (a few quick breaths, a period of 5 to 10 seconds without respiratory effort, a few quick breaths again, and so on). There is no bradycardia with this irregular pattern (sometimes termed periodic respirations). Although the pattern is seen in term infants as well, it seems to be intensified by immaturity. With true apnea, the pause in respirations is more than 20 seconds and bradycardia does occur. True apnea is discussed in more detail later in this chapter.

Preterm infants have great difficulty initiating respi- rations at birth because pulmonary capillaries are still so immature. Lung surfactant does not form in ade- quate amounts until about the 34th to 35th week of pregnancy. Inadequate lung surfactant leads to alve- olar collapse with each expiration. This condition forces an infant to use maximum strength to inflate lung alveoli each time. It is very difficult for infants to maintain effective expirations under these conditions. In addition, because a fetus usually turns to a vertex presentation late in pregnancy, a preterm infant may still be in a breech position at birth. Breech-born in- fants are apt to expel meconium into the amniotic fluid. If the fetus aspirates either vaginal secretions or meconium, the respiratory problem can be aggra- vated by inflammation or pneumonia.

Cesarean birth, although it has the advantage of re- ducing pressure on the immature head, may lead to additional respiratory complications because of re- tained lung fluid. Giving the mother oxygen by mask during the birth can help provide a preterm infant with optimal oxygen saturation at birth (85%–90%). Keeping maternal analgesia and anesthesia to a min- imum also offers an infant the best chance of initiating effective respirations.

Even term infants experience temporary respiratory acidosis until they take a first breath. Once respira- tions are established, however, this condition quickly clears. Because preterm infants cannot initiate effec- tive respirations as quickly as mature infants, they are susceptible to irreversible acidosis. Birthing room teams need to be prepared with preterm-size laryn- goscopes, endotracheal tubes, suction catheters, and synthetic surfactant to be administered by the endo- tracheal tube so resuscitation can be accomplished within 2 minutes. Infants must be kept warm during re- suscitation procedures so they are not expending extra energy to increase metabolic rate to maintain body temperature. All procedures must be carried out gently; a preterm infant's tissues are extremely sensi- tive to trauma and can be damaged or bruised easily by an oxygen mask. When blood from bruising is re- absorbed, this could lead to hyperbilirubinemia, yet another problem.

Giving 100% oxygen to preterm infants during re- suscitation or to maintain respirations presents two additional dangers: pulmonary edema and retinopa- thy of prematurity (blindness of prematurity; see dis-

cussion later in this chapter) may develop. The devel- opment of both of these conditions depends on satu- ration of the blood with oxygen (PO_2 of more than 100 mm Hg, which usually occurs when oxygen is admin- istered at a concentration over 70%). Although a new- born's oxygen saturation level should be continually monitored, as long as an infant is cyanotic, the blood saturation level of oxygen is likely to be low or well be- neath this level.

The soft rib cartilage of a preterm infant tends to cre- ate respiratory problems because it collapses on expi- ration. The accessory muscles of respiration may be underdeveloped as well, leaving preterm infants with no backup muscles to use when they become fatigued from trying to maintain respirations. Because of this, preterm infants may need continued oxygen adminis- tration after resuscitation to allow them to effectively maintain respirations.

Nursing Diagnosis: Risk for deficient fluid volume re- lated to insensible water loss at birth and small stom- ach capacity

Outcome Evaluation: Plasma glucose is between 40 and 60 mg per 100 mL; specific gravity of urine is maintained at 1.003 to 1.030; urine output is main- tained at a minimum of 1 mL/kg/hr; electrolyte levels are within normal limits.

A preterm newborn experiences a high insensible water loss because of a large body surface relative to total body weight. Preterm

infants also cannot con- centrate urine well because of immature kidney func- tion. Because of this, a high proportion of body fluid is excreted. All these factors make it important for a preterm baby to receive up to 160 to 200 mL of fluid per kilogram of body weight daily (higher than the term infant).

Intravenous fluid administration typically begins within hours after birth to fulfill this fluid requirement and provide glucose to prevent hypoglycemia. Intravenous fluid should be given via a continuous in- fusion pump to ensure a constant infusion rate and prevent accidental overload. Intravenous sites must be checked conscientiously because if infiltration should occur, the lack of subcutaneous tissue places a preterm newborn at risk for damaged tissue. Specially designed 27-gauge needles are available for use on small veins. However, many preterm infants lack adequately sized peripheral veins for even this small a needle. Therefore, they need to receive intra- venous fluid by an umbilical venous catheter.

Monitor the baby's weight, urine output and spe- cific gravity, and serum electrolytes to ensure ade- quate fluid intake. Too little fluid and calories can lead to dehydration and starvation, acidosis, and weight loss. Overhydration may lead to nonnutritional weight gain, pulmonary edema, and heart failure.

Most preterm infants void and pass meconium within 24 hours after birth, although this is delayed in very small infants. Measure urine output by weighing diapers rather than using urine collection bags, as disposable collection bags can lead to skin irritation and breakdown from frequent changing and leaking.

The amount of urine output for the first few days of life in preterm babies is high in comparison with that of the term baby because of poor urine concentration: 40 to 100 mL per kg per 24 hours, compared with 10 to 20 mL per kg per 24 hours. The specific gravity is low, rarely more than 1.012 (normal term babies may con- centrate urine up to 1.030). Also, test urine for glucose and ketones. Hyperglycemia caused by the glucose infusion may lead to glucose spillage into the urine and an accompanying diuresis. If too little glucose is being supplied and body cells are using protein for metabo- lism, ketone bodies will appear in urine.

Blood glucose determinations every 4 to 6 hours help to determine hypoglycemia or hyperglycemia (increased serum glucose). Blood glucose should range between 40 and 60 mg/dL. Because of the nu- merous blood tests performed, be certain to keep a record of all blood drawn so an infant does not be- come hypovolemic from the amount removed. Check for blood in stools to evaluate possible bleeding from the intestinal tract. This is helpful in determining the possible cause of hypovolemia if it occurs.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to additional nutrients needed for maintenance of rapid growth, possible sucking difficulty, and small stomach

Outcome Evaluation: Infant's weight follows percentile growth curve; skin turgor is good; specific gravity of urine is maintained between 1.003 and 1.030; infant has no more than 15% weight loss in first 3 days of life and continues to gain weight after this point.

Nutrition problems can arise with a preterm infant be- cause the infant's body is attempting to continue to maintain the rapid rate of intrauterine growth. Because of this, a preterm newborn requires a larger amount of nutrients than the mature infant. If these nutrients are not supplied, an infant can develop hypocalcemia (decreased serum calcium) or azotemia (low protein level in blood). Delayed feeding and a resultant de- crease in intestinal motility may also add to hyper- bilirubinemia, a problem an infant already is at high risk of developing when fetal red blood cells begin to be destroyed.

Digestion and absorption of nutrients in a preterm infant's stomach and intestine may be immature. Nutrition problems are further compounded by a preterm infant's immature reflexes, which make swal- lowing and sucking difficult. Increased activity that oc- curs from ineffective sucking may increase the meta- bolic rate and oxygen requirements. This increases the caloric requirements even more. In addition, the preterm infant's stomach capacity is small, possibly limiting adequate intake. If a small stomach is dis- tended from a full feeding, this puts pressure on the diaphragm and can lead to respiratory distress. An immature cardiac sphincter (between the stomach and esophagus) allows regurgitation to occur readily. The lack of a cough reflex may lead an infant to aspi- rate regurgitated formula.

Feeding Schedule. With the early administration of in- travenous fluid to prevent hypoglycemia and supply fluid, feedings may be safely delayed until an infant has stabilized his or her respiratory effort from birth. Preterm infants may be fed by total parenteral nutrition until they are stable enough for other means. Breast, gavage, or bottle feedings are begun as soon as an infant is able to tolerate them to prevent deterioration of the intestinal villi. Most preterm infants have a chest radiograph taken before a first feeding. The presence of air in the stomach shows that the route to the stom- ach is clear.

A preterm infant needs 115 to 140 calories per kilogram of body weight per day, compared with 100 to 110 needed by a term infant. Protein requirements are 3 to 3.5 g per kilogram of body weight, com- pared with 2.0 to 2.5 for a term newborn. Because preterm infants have a smaller stomach capacity than term neonates, they cannot take large feedings and so must be fed more frequently with smaller amounts. Feedings may be as small as 1 or 2 mL every 2 to 3 hours.

Gavage Feeding. A gag reflex is not intact until 32 weeks' gestation. Although a sucking reflex is present earlier, the ability to coordinate sucking and swallow- ing is inconsistent until approximately 34 weeks' ges- tation. Infants who are born before 32 to 34 weeks' gestation and those who are ill or experiencing respi- ratory distress are usually started on gavage feed- ings. Bottle feeding or breastfeeding is gradually in- troduced as an infant matures and begins to demonstrate feeding behaviors such as being awake, moving or fussing as if hungry (Fig. 26.8). To avoid tir- ing, preterm nipples that are softer than regular nip- ples are used.

Observe preterm infants closely after both oral and gavage feeding to be certain their filled stomach is not causing respiratory distress.

Offering a pacifier during gavage feeding can help strengthen the sucking re- flex, better prepare an infant for bottle feeding or breastfeeding, and provide oral satisfaction. In addi- tion, initiating and maintaining nonnutritive sucking can help a newborn remember how to suck.

Gavage feedings may be given intermittently every few hours or continuously via tubes passed into the

FIGURE 26.8 Feeding a preterm infant. Notice the small bottle used. (© Caroline Brown, RNC, MS, DEd.)

stomach or intestine through the mouth or nose. Infants may be fed by continuous drip feedings at about 1 mL/hr. This can be helpful for infants on ven- tilators or those who experience oxygen deprivation with handling. If feedings are given intermittently, stomach secretions are usually aspirated, measured, and replaced before each feeding. An infant who has a stomach content of more than 2 mL just before a feeding is receiving more formula than he or she can digest in the time allowed. Feedings should not be in- creased and possibly even cut back to ensure better digestion and to decrease the possibility of regurgita- tion and aspiration. Inability to digest this way is also a sign that necrotizing enterocolitis, a destructive in- testinal disorder that often occurs in preterm babies, may be developing (Raab, 2007) (see Chapter 45).

Formula. The caloric concentration of formulas used for preterm infants is usually 24 cal/oz, compared with 20 cal/oz for a term baby. Supplementing additional minerals such as iron, calcium, and phosphorus and electrolytes such as sodium, potassium, and chloride may be necessary, depending on the newborn's blood studies. As with a term neonate, vitamin K should be administered at birth. However, the amount administered is more often 0.5 mL instead of 1 mL be- cause of the infant's small size. Vitamin A is important in improving healing and possibly reducing the inci- dence of lung disease (Wiswell, Tin, & Ohler, 2007). Vitamin E seems to be important in preventing he- molytic anemia in preterm infants.

Breast Milk. There is increasing evidence that al- though preterm infants grow well on the increased caloric distribution of commercial formulas, the best milk for them, the same as with term infants, is breast milk (Sisk et al., 2007). The immunologic properties of breast milk apparently play a major role in preventing neonatal necrotizing enterocolitis, as well as increase immune defenses (Conti, 2007).

The mother who wants to breastfeed can manually express breast milk for her infant's gavage feedings. If she cannot bring this in daily, expressed breast milk can be frozen for safe transport and storage. The sodium content of breast milk in a mother whose infant has been born preterm is higher than that of milk in a mother whose infant has been born at term. Therefore, it is better for infants to receive their own mother's breast milk rather than banked milk. This high level of sodium is necessary for fluid retention in the preterm in- fant. Breast milk is 20 cal/oz, so parents may be ad- vised to add a human milk fortifier to supplemental bot- tles of breast milk to supply additional calories, protein, vitamins, and minerals (Conti, 2007). Mothers should continue to breastfeed their preterm infants after hospi- tal discharge (Greer, 2007).

Nursing Diagnosis: Ineffective thermoregulation related to immaturity

Outcome Evaluation: Infant's temperature is main- tained at 97.6° F (36.5° C) axillary.

Preterm newborns have a great deal of difficulty main- taining body temperature because they have a rela-

tively large surface area per kilogram of body weight. In addition, because they do not flex their body well but remain in an extended position, rapid cooling from evaporation is more likely to occur (Knobel & Holditch-Davis, 2007).

A preterm infant has little subcutaneous fat for in- sulation and poor muscular development and so can- not move as actively as an older infant to produce body heat. A preterm infant also has a limited amount of brown fat, the special tissue present in newborns to maintain body temperature. Preterm infants also cannot shiver, a useful mechanism to increase body temperature; at the same time, they cannot sweat and thereby reduce body temperature because of an im- mature central nervous system and hypothalamic control. This makes preterm infants dependent on the environmental temperature provided to keep warm. In a birthing room, typically kept at 62° to 68° F (16.6° to 20° C), preterm infants should be kept under radiant heat warmers or warmed by skin-to-skin contact. A 1500-g infant exposed to this low a temperature loses 1° C of body heat every 3 minutes if left unprotected. Be certain that a radiant heat warmer is warmed before the infant is born. Unless there are obvious ab- normalities noted when the child is born, physical as- sessment of a preterm infant, even weighing, can be delayed until the infant can be placed in the warmth of an incubator or under a radiant warmer with a servo-
control.

If an infant is going to be transported to a depart- ment within the hospital, such as the x-ray depart- ment, or to a regional center for specialized care, keeping the newborn warm during transport is crucial. Remember infants lose heat by radiation as well as conduction. If a warmed incubator is placed near a cold window or air conditioner or in a cold transport ambulance, the infant will lose heat to the distant source. An additional heat shield or plastic wrap may be placed over an infant on a radiant warmer to help conserve heat during transport.

Nursing Diagnosis: Risk for infection related to imma- ture immune defenses in preterm infant

Outcome Evaluation: Temperature is maintained at
97.6° F (36.5° C) axillary; further signs and symptoms of infection such as poor growth or a reduced tem- perature are absent.

The skin of a preterm baby is easily traumatized and therefore offers less resistance to infection than the skin and mucous membrane

of a mature baby. In ad- dition, preterm infants have a lowered resistance to in- fection. They have difficulty producing phagocytes to localize infection and have a deficiency of IgM anti- bodies because of insufficient production. To help prevent infection, linen and equipment used with preterm infants must not be shared with other infants. Staff members must be free of infection, and hand-washing and gowning regulations should be strictly enforced.

Nursing Diagnosis: Risk for impaired parenting related to interference with parent–infant attachment resulting from hospitalization of infant at birth

Outcome Evaluation: Parents visit frequently and hold infant; speak of him or her in positive terms.

In a preterm infant, the first and second periods of re- activity normally observed in newborns at 1 hour and 4 hours of life (see Chapter 18) may be delayed. In some infants, no period of increased activity or tachy- cardia may appear until 12 to 18 hours of age. If the purpose of a period of reactivity is to stimulate respi- ratory function, this places a preterm infant at an even greater threat of respiratory failure, because respira- tory efforts may not be stimulated. A second conse- quence of a delayed period of reactivity is the loss of an opportunity for interaction between parents and the newborn in the early postpartum period.

At one time, a preterm infant was handled as little as possible by hospital staff to conserve the infant's en- ergy. Parents were strictly isolated from the nursery to prevent the introduction of infection. When the child reached a "magic" weight of 4.5 or 5.5 lb, the parents were called and told their child was ready to be dis- charged. Some nursery personnel offered to allow the mother to feed her infant once under supervision before the day of discharge. In other nurseries, the mother was simply handed the smallest infant she had ever seen and told to take the child home and "mother" this stranger.

Although it is extremely important to conserve a preterm infant's strength by reducing sensory stimula- tion as much as possible and handling an infant gen- tly, it is now recognized that preterm infants need as much loving attention as term newborns. Rocking, singing, and talking to them and gentle holding are measures to help preterm infants develop a sense of trust in people, which will enable them to relate satis- factorily to people in the future. Encourage parents to begin interacting with their infant in as normal a man- ner as possible as soon as possible to strengthen bonding (Box 26.8). Holding an infant with skin-to-skin contact is an effective way to begin this (Moore, Anderson, & Bergman, 2009).

Before effective bonding can be established, par- ents may need time to come to terms with their feel- ings of disappointment that the infant is so small or guilt that they were not able to stop the preterm birth. A nurse can be instrumental in helping them air these feelings and develop a more positive attitude toward their preterm infant.

If an infant cannot be removed from an incubator or a radiant heat warmer, parents can still handle and stroke the infant in the incubator or warmer. Because parents may not be psychologically ready for birth when a preterm baby is born, it may be more difficult for them to believe they have a child than if the baby were born at term. Encourage a woman to express breast milk for her infant if the child is too young to nurse. If a woman decides not to breast- feed, encourage her to come to the hospital and hold the baby before and after gavage feedings or to give bottle feedings. By feeding her baby or expressing milk for the feedings, she is directly participating in the care and taking on responsibility for the infant's welfare.

BOX 26.8 ✻ Focus on Family Teaching

Guidelines for Parents of a Newborn in Intensive Care

Q. Mrs. Atkins tells you, "I'm always afraid I'll touch the wrong thing when I visit our son in the neonatal intensive care unit. What can I do to feel more comfortable there?"

A. Here are some guidelines that should be helpful:

- Learn the name of your child's primary nurse or care manager and physician. Make a point of talking to them when you visit, so the information you receive is consistent, and these people can get to know you.
- Discuss with your child's care manager or primary nurse the time you will usually visit, so she or he can schedule the times so there is time dur- ing your visits for you to hold your child and interact with him.
- Ask for explanations of any equipment or medications being used with your child, so you understand the plan of care. Insist on being included in care decisions.
- If you cannot visit on any day, call the nursery and ask to talk to your child's primary care nurse or physician. Such telephone calls are not viewed as a bother but are welcomed as the mark of a concerned parent.
- If you planned to breastfeed, ask if you can supply ex- pressed breast milk for your infant as soon as feedings are started. This contribution may help to give you a feeling of having a greater part in your baby's care.
- Supply a tape recording of your voice, so your baby can learn to recognize it, and a small toy for your nurse the baby's bed. These actions not only supply auditory and visual stimulation for your child but also help to baby's procedures and rest
- give you a more "normal" feeling toward infant care.
- Use your baby's name when you talk about him (not "the baby") to help you gain a firm feeling that this is
- your baby, not the nursery's.

If your child is hospitalized a distance from home, ask if transfer to a local hospital in a less technical envi- ronment will be possible at a later date.

If the baby is transferred to a regional center, make sure the parents have an opportunity to see the baby before the transfer. A photograph of the baby for them to keep is helpful in making the birth more real. Encourage them to visit the distant site as often as

possible. Notes to convey messages from the baby to them can be taped to the incubator or warmer.
On the days they cannot visit, parents can still stay in touch by telephone or nursery e-mail. By the time a baby is ready for discharge, the parents should be able to feel they are taking home "their" baby, one whom they know and have already begun to love.
Parents visiting a high-risk nursery often need a great deal of support from nursing personnel (Box 26.9). Remember that although radiant warmers, incubators, ventilators, and monitors become familiar equipment to nurses, they are unusual and frightening to parents. A parent may want very much to touch an infant but be so

BOX 26.9 ✻ Focus on Communication

Mrs. Atkins gave birth to a 2-lb boy at 34 weeks of pregnancy. The infant has been classified as a small-for-gestational-age preterm infant. Although you have told Mrs. Atkins twice that she is welcome to visit the neonatal intensive care unit (NICU), you notice that her chart indicates that she has not yet done so.

Less Effective Communication

Nurse: Mrs. Atkins, I've noticed you haven't been to the nursery to see your son yet.
Mrs. Atkins: I'm waiting for my husband to come in.
Nurse: Will that be today?
Mrs. Atkins: Tomorrow. He's out of town on business.
Nurse: Have you called the nursery to ask about your son?
Mrs. Atkins: No. I'm waiting for my husband. We'll do it together.
Nurse: Okay. Let me know if there is anything else you need.

More Effective Communication

Nurse: Mrs. Atkins, I've noticed you haven't been to the nursery to see your son yet.
Mrs. Atkins: I'm waiting for my husband to come in. nancy, 2 days ago.
Nurse: Will that be today?
Mrs. Atkins: Tomorrow. He's out of town on business.
Nurse: Have you called the nursery to ask about your son?
Mrs. Atkins: No. I'm waiting for my husband. We'll do it to- gether.
Nurse: Often it's intimidating to visit or telephone a high-risk nursery. I know it's important to you to go as a family, but I hate to see you miss these first few days with your son. What if I go with you?
Mrs. Atkins: Could you? I don't want to go alone.

Visiting an NICU is intimidating for parents, not only be- cause of the high-tech equipment that surrounds their baby but also because their baby often appears much smaller or sicker than they imagined. In the first scenario, the nurse assumed that waiting for the husband to come to the hos- pital was what was important to the mother. In the second scenario, the nurse asked enough questions to realize that having another person accompany her to the nursery was the mother's need, a need the nurse could meet.

FIGURE 26.9 Encourage families to visit with immature infants to establish bonding. (© Caroline Brown, RNC, MS, DEd.)

afraid touching might set off an alarm that he or she stands back with arms folded instead (Fig. 26.9).
Because preterm infants are hospitalized for long periods, parents can be baffled by receiving informa- tion from a parade of different health care profession- als or a different person every time they visit. Primary nursing or case management with one nurse as the consistent caregiver helps to reduce the number of people who contact the parents and who communi- cate the baby's nursing needs to the rest of the staff. Making the baby's siblings as welcome in a high- risk nursery as the baby's parents is yet another major role for a nurse of high-risk infants. Check to be cer- tain that siblings do not have an upper respiratory in- fection or fever. Their immunizations should be up to date and they should not have been recently exposed to a communicable disease, such as chickenpox.

Nursing Diagnosis: Deficient diversional activity (lack of stimulation) related to preterm infant's rest needs
Outcome Evaluation: Infant demonstrates interaction with caregivers by attuning to faces or voices.

Preterm infants need rest to conserve energy for growth and respiratory function, to combat hypo- glycemia and infection, to stabilize temperature, and to develop inner balance and attentiveness. To allow for this, procedures should be organized to maximize the amount of rest available to an infant. If this is not a coordinated effort, an infant may be awakened con- stantly for procedures.
Preterm infants may have more difficulty blocking out stimuli than term infants do be- cause their nervous systems are immature. They may react negatively by such behaviors as gagging, cry- ing, splaying fingers and toes, or going limp when ex- posed to bright lights, noise, or overly strenuous han- dling. Because these infants have little strength to move away from an unwanted stimulus, it is a care- giver's responsibility to be sensitive to these cues and move the object or noise away from the infant (Thomas & Uran, 2007). Until ready to take in stimuli, the infant may need to be shielded from noise and light as much as possible. Likewise, pain should be kept to a minimum.

At the same time as a preterm infant needs rest, he or she needs planned periods of pleasing sensory stimulation. Like all newborns, preterm infants re- spond best to stimulation that appeals to their senses—sight, sound, and touch. A passive face, pic- ture, or decal may be appealing for only short periods. The view from inside an incubator can be distorted by the acrylic dome. Most people view an infant in an in- cubator from the side. This means an infant's face is rarely in the same line of vision as the adult's (an en face position). It is important to look directly at an infant in the straightforward position so the infant is provided with the stimulation of a human face. As infants mature, they should have mobiles (perhaps black and white) or bright objects placed in view. As an infant's position is changed from side to stomach to opposite side, the ob- ject should be moved to be in line with the child's vision. Infants in closed incubators may be able to hear nothing but the sound of the incubator motor. They may see people looking or nodding at them and may see their mouths moving, but they cannot benefit from the sound of their voices because this is obscured by the continuous hum of the motor. Provide some "talk time"—words spoken softly but clearly to an infant's ear—during each nursing shift to offer normal contact. Even an infant who cannot be removed from an in- cubator should not suffer from lack of touch. Gently stroking an infant's back or smoothing the back of the head should not be tiring. Transcutaneous oxygen de- terminations allow you to recognize when an infant is comforted by handling (oxygen saturation remains steady or increases) and when the child is growing tired (oxygen saturation falls). There should be time during every nursing shift for this interaction, particu- larly if clinical interventions with an infant include un- comfortable procedures such as suctioning or blood drawing. As soon as infants can be out of incubators or removed from warmers, they need special time just to
be rocked and held.

Nursing Diagnosis: Risk for disorganized infant be- havior related to prematurity and environmental over- stimulation

Outcome Evaluation: Newborn's vital signs remain within normal limits; infant demonstrates increasing ability to adapt to stimuli; demonstrates decreasing levels of irritability, crying, respiratory pauses, tachyp- nea, and color changes.

The amount of rest and stimulation required by preterm infants for healthy development is best indi- vidualized. Developmental care (care designed to meet the specific needs of each infant) can lead to in- creased weight gain and decreased crying and apnea spells in preterm infants (Symington & Pinelli, 2009) (Box 26.10). Because preterm infants have im- mature central nervous systems, their reactions or ad- justments to stimuli may be different from those of term infants. The environment of an intensive care unit is also totally different from what infants would have experienced if they had remained in utero until term. Based on these two premises, nursing care must be geared toward making the environment of infants as

atraumatic as possible while helping them adjust to new experiences within their limited ability.
The usual sound level of nurseries has been docu- mented to be about 40 to 50 dB; a radio playing raises this to 60 to 65 dB. The closing of portholes or tapping on the sides of incubators raises the sound level inside them to 80 dB or more, or a sound level that can be painful. Other abnormal stimuli are bright lights for 24 hours a day, frequent handling, and painful procedures. When a preterm infant is stressed, behaviors such as respiratory pauses, tachypnea, color changes, tremors, sighing, flaccidity, finger splaying, and gaze averting occur. Such behaviors are alerts that the environment has become too stimulating and needs to be modified. Activities such as dimming the lights or covering an in- cubator, turning an infant to the side and containing his

body with rolled towels, offering nonnutritive sucking, and maintaining a "quiet hour" to reduce sound are all ways to reduce stimuli (Symington & Pinelli, 2009).
Nursing Diagnosis: Parental health-seeking behaviors related to preterm infant's needs for health maintenance
Outcome Evaluation: Parents describe schedule for basic immunizations and health assessments and state who will provide ongoing health care.
Discharge from an NICU is a major transition for par- ents as well as their infant. Before discharge, the par- ents of a preterm infant need to learn and practice any special methods of care necessary for their infant and interventions to help maximize their child's develop- ment. Some parents tend to overprotect preterm in- fants, such as not allowing visitors or not taking an in- fant outside. Let parents know their concern is normal, but overprotection is not necessary.
Ongoing health maintenance of a preterm infant follows the usual pattern of well-child care. Basic im- munizations are given according to the chronologic age of an infant. In many communities, NICUs main- tain their own well-child settings for infants who were hospitalized there. This allows for long-term follow- up studies on the effect of oxygen or drug therapy and continuity of care. Many parents prefer bringing their infant back to such a facility rather than estab- lishing a new network of health care because they have already established trust and confidence in that health care team. This often also increases their self-esteem because they hear the staff's delight in the progress made by their child. However, preterm infants can be followed by any health care provider for well-child care.
When plotting the height and weight of preterm in- fants at well-child visits, remember to account for early birth on the growth chart by double charting— that is, plotting the child's weight and height accord- ing to the chronologic age (a pattern that probably in the early months places the child below the 10th per- centile). Then, in another color, plot the height and weight according to an infant's "setback" or adjusted age, or the age an infant would be if he or she had been born at term. A preterm baby typically gains "catch-up" weight in the first 6 months of life, so by 1 year of age a baby plots over the 10th percentile on a growth chart without accounting for a setback age.
Evaluate growth and development of a preterm in- fant by the same manner. A preterm infant can be ex- pected to meet first-year milestones not at the chrono- logic age but at the setback age.
To evaluate the parents' transition to having so small an infant at home, ask at health promotion visits if the parents are:

- Beginning to feel more comfortable with their infant
- Able to allow the child to stay with a babysitter or another family member
- Beginning to incorporate their infant normally into their family life
- Making plans for the infant beyond the immediate newborn period

The Postterm Infant

A postterm infant is one born after the 42nd week of a pregnancy (Fortner, Althaus, & Gurewitsch, 2007). Most nurse-midwives and obstetricians recommend inducing labor at 2 weeks postterm to avoid postmature births. However, when gestational age has been miscalculated or if for some other reason labor is not induced until week 43 of pregnancy or after, the pregnancy may result in a

postterm infant.

An infant who stays in utero past week 42 of pregnancy is at special risk because a placenta appears to function effec- tively for only 40 weeks. After that time, it seems to lose its ability to carry nutrients effectively to the fetus. A fetus who remains in utero with a failing placenta may die or develop postterm syndrome. Infants with this syndrome have many of the characteristics of the SGA infant: dry, cracked, almost leather-like skin from lack of fluid, and absence of vernix. They may be lightweight from a recent weight loss that oc- curred because of the poor placental function. The amount of amniotic fluid may be less at birth than normal, and it may be meconium stained. Fingernails will have grown well beyond the end of the fingertips. Such infants may demon- strate an alertness much more like a 2-week-old baby than a newborn.

When a pregnancy becomes postterm, a sonogram is usu- ally obtained to measure the biparietal diameter of the fetus. A nonstress test or complete biophysical profile (see Chapter 9) may be done to establish whether the placenta is still func- tioning adequately. Cesarean birth may be indicated if a non- stress test reveals that compromised placental functioning may occur during labor.

At birth, the postterm baby is likely to have difficulty es- tablishing respirations, especially if meconium aspiration oc- curred. In the first hours of life, hypoglycemia may develop because the fetus had to use stores of glycogen for nourish- ment in the last weeks of intrauterine life. Subcutaneous fat levels may also be low, having been used in utero. This can make temperature regulation difficult, making it important to prevent a postterm infant from becoming chilled at birth or during transport. Polycythemia may have developed from decreased oxygenation in the final weeks. The hematocrit may be elevated because the polycythemia and dehydration have lowered the circulating plasma level.

Any woman is anxious when she does not have her baby on her due date. She is apt to become extremely anxious and perhaps angry when it is determined her baby is post- term or should have been born earlier. It may seem that if a baby stayed so long in utero, the baby should be extra healthy and strong. Why, then, she asks, is her baby being transferred for special care? A mother may also feel guilty for not providing well for her infant in the last few weeks of pregnancy.

Make sure a woman spends enough time with her new- born to assure herself that although birth did not occur at the predicted time, the baby should do well with appropriate in- terventions to control possible hypoglycemia or meconium aspiration. All postterm infants need follow-up care until at least school age to track their developmental abilities. The lack of nutrients and oxygen in utero may have left them with neurologic symptoms that will not become apparent until they attempt fine-motor tasks.

ILLNESS IN THE NEWBORN

A number of illnesses occur specifically in newborns. These automatically cause the infant to become high risk.

Respiratory Distress Syndrome

Respiratory distress syndrome (RDS) of the newborn, for- merly termed hyaline membrane disease, most often occurs in preterm infants, infants of diabetic mothers, infants born by cesarean birth, or those who for any reason have decreased blood perfusion of the lungs, such as occurs with meconium aspiration (Raab, 2007). The pathologic feature of RDS is a hyaline-like (fibrous) membrane formed from an exudate of an infant's blood that begins to line the terminal bronchioles, alveolar ducts, and alveoli. This membrane prevents ex- change of oxygen and carbon dioxide at the alveolar–capil- lary membrane. The cause of RDS is a low level or absence of surfactant, the phospholipid that normally lines the alve- oli and reduces surface tension to keep the alveoli from col- lapsing on expiration.

Because surfactant does not form until the 34th week of gestation, as many as 30% of low-birth-weight infants and as many as 50% of very-low-birth-weight infants are susceptible to this complication.

Pathophysiology

High pressure is required to fill the lungs with air for the first time and overcome the pressure of lung fluid. For example, it takes a pressure between 40 and 70 cm H_2O to inspire a first breath but only 15 to 20 cm H_2O to maintain quiet, continued breathing. If alveoli collapse with each expiration, as happens when surfactant is deficient, forceful inspirations requiring optimum pressure are still required to inflate them. Even very immature infants release a bolus of surfactant at birth into their lungs from the stress of birth. However, with deficient surfactant, areas of hypoinflation begin to occur and pulmonary resistance increases. Blood then shunts through the foramen ovale and the ductus arteriosus as it did during fetal life. The lungs are poorly perfused, affecting gas exchange. As a result, the production of surfactant decreases even further. The poor oxygen exchange that results leads to tissue hy- poxia, which causes the release of lactic acid. This, combined with the increasing carbon dioxide level resulting from the for- mation of the hyaline membrane on the alveolar surface, leads to severe acidosis. Acidosis causes vasoconstriction, and de- creased pulmonary perfusion from vasoconstriction further limits surfactant production. With decreased surfactant pro- duction, the ability to stop alveoli from collapsing with each expiration becomes impaired. This vicious cycle continues until the oxygen–carbon dioxide exchange in the alveoli is no longer adequate to sustain life without ventilator support.

Assessment

Most infants who develop RDS have difficulty initiating res- pirations at birth. After resuscitation, they appear to have a period of hours or a day when they are free of symptoms be- cause of an initial release of surfactant. During this time, however, subtle signs may appear:

- Low body temperature
- Nasal flaring

- Sternal and subcostal retractions
- Tachypnea (more than 60 respirations per minute)
- Cyanotic mucous membranes

Within several hours, expiratory grunting, caused by clo- sure of the glottis to create a prolonged expiratory time, can be heard. A partially closed glottis this way is helpful as it in- creases the pressure in the alveoli on expiration, helps to keep the alveoli from collapsing, and makes oxygen exchange more complete. Even with this attempt at better oxygen ex- change, however, as the disease progresses, infants become cyanotic and their PO2 and oxygen saturation levels fall in room air. On auscultation, there may be fine rales and di- minished breath sounds because of poor air entry. As distress increases, an infant may exhibit:

- Seesaw respirations (on inspiration, the anterior chest wall retracts and the abdomen protrudes; on expiration, the sternum rises)
- Heart failure, evidenced by decreased urine output and edema of the extremities
- Pale gray skin
- Periods of apnea
- Bradycardia
- Pneumothorax

The diagnosis of RDS is made on the clinical signs of grunting, central cyanosis in room air, tachypnea, nasal flaring, retractions, and shock. A chest radiograph will reveal a diffuse pattern of radiopaque areas that look like ground glass (haziness). Blood gas studies (taken from an umbilical vessel catheter) will reveal respiratory acidosis. A β-hemolytic, group B streptococcal infection may mimic RDS, as this infection is so severe in newborns that the insult to the lungs is enough to stop surfactant produc- tion. Cultures of blood, cerebrospinal fluid, and skin may be obtained to rule out this condition. An antibiotic (peni- cillin or ampicillin) and an aminoglycoside (gentamicin or kanamycin) may be started while culture reports are pending.

Therapeutic Management

RDS can be largely prevented by the administration of sur- factant through an endotracheal tube at birth for an infant at risk because of low gestational age.

Surfactant Replacement. As a preventive measure, syn- thetic surfactant is sprayed into the lungs by a syringe or catheter through an endotracheal tube at birth while an in- fant is first positioned with the head held upright and then tilted downward. It is important an infant's airway not be suctioned for as long a period as possible after administra- tion of surfactant to avoid suctioning the drug away. Although there are almost no unfavorable reactions to sur- factant administration, some, such as mucus plugging from the solution, do occur. An infant who is receiving surfac- tant and then is placed on a ventilator needs close observa- tion because lung expansion can improve rapidly. Anticipate the need to adjust ventilator settings to prevent excessive lung pressure.

Oxygen Administration. Administration of oxygen is neces- sary to maintain correct PO2 and pH levels. Continuous pos-

itive airway pressure (CPAP) or assisted ventilation with pos- itive end-expiratory pressure (PEEP) will exert pressure on the alveoli at the end of expiration and keep the alveoli from collapsing (Ho et al., 2009). This greatly improves oxygen exchange. A possible complication of oxygen therapy in the very immature or very ill infant is retinopathy of prematurity (see discussion later in chapter) or bronchopulmonary dys- plasia (see Chapter 40).

Ventilation. Normally, on a ventilator, inspiration is shorter than expiration, or there is an inspiratory/expiratory ratio (I/E ratio) of 1:2. It is difficult to deliver enough oxy- gen to stiff, noncompliant lungs in this usual ratio, how- ever, without forcing the air into the lungs at such a high pressure and rapid rate that a pneumothorax becomes a constant concern (Snow & Brandon, 2007). Infant ventila- tors are therefore available with a reversed I/E ratio (2:1). These are pressure-cycled to control the force with which air is delivered. High-frequency, oscillatory, and jet ventila- tion are other methods of introducing oxygen to infants with noncompliant lungs. These systems maintain airway pressure and then intermittently "jet" or oscillate at a rapid rate (400–600 times a minute) an additional amount of air to inflate alveoli.

Complications of any type of ventilation are possible, such as pneumothorax and impaired cardiac output because of decreased blood flow through the pulmonary artery from lung pressure. There is also a possible risk of increased in- tracranial and arterial pressure and hemorrhage from changing blood pressure. Being certain that infants are not overhydrated is important to help prevent increased blood pressure and increased pulmonary artery pressure.

Indomethacin or ibuprofen may be used to cause closure of a patent ductus arteriosus, making ventilation more effi- cient (Donze, Smith, & Bryowsky, 2007). Indomethacin has been associated with adverse effects such as decreased renal function, decreased platelet count, and gastric irritation. Carefully monitor urine output and observe for bleeding, es- pecially at puncture sites, if this is prescribed.

Additional Therapy. Yet another method of increasing pul- monary blood flow is by using muscle relaxants. Pancuronium (Pavulon) can be administered intravenously to the point of abolishing spontaneous respiratory action. Doing so allows mechanical ventilation to be accomplished at lower pressures because there is no normal muscle resis- tance to overcome. The possibility of pneumothorax is re- duced while PO2 is increased. Obviously infants who have no spontaneous respiratory function because of drug ad- ministration need critical observation and frequent ABG analysis because they totally depend on caregivers at this point (Playfor et al., 2007).

The effect of pancuronium decreases as the life of the drug expires; its effect can be interrupted by the adminis- tration of atropine or injectable neostigmine methylsulfate (Prostigmin Methylsulfate Injectable). For this reason, when pancuronium is being administered, both atropine and Prostigmin should be immediately available. An in- fant's plan of care should be specially marked to show that pancuronium therapy is being used so in the event of a power failure, manual ventilatory assistance can be begun immediately.

Some infants are maintained on extracorporeal mem- brane oxygenation (ECMO) to ensure adequate oxygena- tion (Maclaren & Butt, 2007). Other therapies include liquid ventilation or administration of perfluorocarbons and inhalation of nitric oxide (Stephens & Fawcett, 2007). Extracorporeal Membrane Oxygenation. ECMO was first developed as a means of oxygenating blood during car- diac surgery. Its current use has expanded to the manage- ment of chronic severe hypoxemia in newborns with ill- nesses such as meconium aspiration, RDS, pneumonia, and diaphragmatic hernia. It is used also for near-drowning vic- tims or infants with severe lung infection. With ECMO, blood is removed from the baby by gravity using a venous catheter advanced into the right atrium of the heart. The blood circulates from the catheter to the ECMO machine, where it is oxygenated and rewarmed. It is then returned to

is heavy compared with air, helps to distend the lungs. As the liquid moves into a lung, oxygen is carried along with it; as the liquid spreads over all lung surfaces, an exchange of oxy- gen occurs (Lindemann et al., 2007). The administration of liquid ventilation can also be used to deliver surfactant to a newborn's lungs.

Nitric Oxide. An additional measure that can help to oxy- genate a newborn's lungs is the administration of nitric oxide. This causes pulmonary vasodilation, which can be helpful to increase blood flow to the alveoli when persistent pulmonary hypertension is present (Kumar et al., 2007).

G2aS i),,, While you were caring for Baby Atkins, who is ventilator dependent and receiving pancuro- nium, a power failure occurred? What would be your first actions?

an infant's aortic arch by a catheter advanced through the

carotid artery. ECMO is typically used for 4 to 7 days. It has many potential complications, chief of which is in- tracranial hemorrhage, possibly from the anticoagulation therapy necessary to prevent thromboembolism. Constant nursing care is required for a child receiving ECMO to en- sure that the child's blood volume remains adequate, bleed- ing does not occur, and adequate oxygen is being supplied to body tissues.

Liquid Ventilation. Liquid ventilation involves the use of perfluorocarbons, substances used in industry to assess for leakage in pipes. When oxygen is bubbled through it, perflu- orocarbons pick up and carry the oxygen with them. When perfluorocarbons are introduced into lungs that inflate poorly because they are deficient in surfactant, or in lungs damaged by trauma or disease, the weight of the fluid, which

Supportive Care. An infant with RDS must be kept warm because cooling increases acidosis in all newborns, and for the newborn with RDS it may increase to lethal levels. Keeping an infant warm also reduces the metabolic oxygen demand. Provide hydration and nutrition with intravenous fluids, glucose, or gavage feeding because the respiratory ef- fort makes an infant too exhausted to suck (see Focus on Nursing Care Planning Box 26.11).

Prevention

RDS rarely occurs in mature infants. Dating a pregnancy by sonogram and by documenting that the level of lecithin in surfactant obtained from amniotic fluid exceeds that of sphingomyelin by 2:1 are important ways to be certain an in-

BOX 26.11 ✻ Focus on Nursing Care Planning

A Multidisciplinary Care Map for a Newborn With Respiratory Distress Syndrome

Mr. and Mrs. Atkins are the parents of a 34-week-old, 2-lb baby boy, born last night after a short, 4-hour labor.

Family Assessment ✻ Family consists of two parents. as a consulting engineer; Mrs. Atkins decorator. Mr. was not present not visited the inten- the birth certifi- cate because she could not decide on a name. She want to give him our favorite name be-

ratory therapist and then transported to the intensive care nursery. Temperature 97.2° F (36.2° C). Bradycardic and tachypneic with grunting respirations. Sternal and sub- costal retractions present. Skin pale and somewhat cyan- otic. Chest x-ray with ground-glass appearance. Arterial blood gases (ABGs) reveal respiratory acidosis. Endotracheal (ET) intubation, mechanical ventilation, sup- plemental oxygen, and intravenous fluid therapy initiated.

Mr. Atkins works before pregnancy as a home Atkins was out of town on business so for the infant's birth. Mrs. Atkins has sive care nursery. She refused to sign said, "I don't

cause he might die." Mr. Atkins telephoned early this morning and acted more upset the baby was born than receiving intensive care. He asked his wife, "What did you do to cause this?"

Client Assessment ✻ Newborn, 5 hours old, delivered vaginally. Difficulty establishing respirations at birth. Resuscitated by the neonatal nurse practitioner and respi-rations.

Nursing Diagnosis ✻ Impaired gas exchange related to immaturity of newborn's lungs and lack of surfactant

Outcome Criteria ✻ Vital signs within acceptable parameters. Temperature maintained at 97.7° F (36.5° C). Absence of cyanosis; diminished retractions; ABG values within acceptable parameters; no sound of grunting

Activities of Daily Living

Nurse/ neonatal nurse practitioner	Assess respiratory rate, depth, and rhythm; auscultate lung sounds; evaluate ABG results and skin color. Assess infant's axillary temperature every hour. Maintain respiratory program as pre- scribed, such as oxygen by ET tube or ventilator. Signs of increasing respiratory distress may denote lessen- ing air exchange. Infant maintains a sta- ble respiratory rate and depth with as- sistive respiratory aids in place.
Nurse	Maintain a neutral ther- mal environment so infant's temperature remains stable. Neutral thermal environ- ment minimizes the risk of cold stress, which increases metabolic demands for oxygen. Infant's temperature is maintained at 36.5° C (97.7° F) axillary.

Consultations

Nurse	Determine what developmental care resources will be available for infant care. Consult with develop- mental care coordi- nator regarding spe- cific developmental care measures for infant. Developmental care or trying to reduce infant stress can improve infant's outcome. Developmental care co- ordinator establishes an individualized program for infant care.

Procedures/Medications

Nurse/ neonatal nurse practitioner; physician	Assess infant's re- sponse to respira- tory support. Assess oxygen saturation levels via pulse oximetry. Maintain ET tube, me- chanical ventilation, and supplemental warm humidified oxygen. Anticipate the need for CPAP or PEEP. The ET tube protects a patent airway. Mechanical ventila- tion assists with de- livering necessary air to the lungs. Using warm, humidified oxygen prevents cold stress and dry- ing of mucous mem- branes. Oxygen sat- uration levels provide information about tissue oxygenation. CPAP and PEEP exert pressure on alveoli at end-expira- tion, preventing alve- olar collapse.
Physician/nurse	Surfactant restores the naturally occurring lung surfactant to improve lung com- pliance. Suctioning would remove the drug from its in- tended site.

Assess availability of surfactant for administration.

Administer surfactant via ET tube as per protocol. Refrain from suctioning for 1 hour if possible.

Respiratory support measures are in place, and infant's respiratory rate re- mains within desig-nated parameters.

Surfactant is administered.

Nutrition

Nurse/ enteral nutritionist/ physician	Assess infant's need for nourishment based on gestational age and exhaustion from rapid breathing.	Administer nutrition via enteral feedings: breast milk supplemented with high-calorie formula. Anticipate the need for total parenteral nutrition if weight gain is not sufficient.	Additional nutrients are necessary because stress of RDS requires increased caloric expenditure. Total parenteral nutrition may be necessary to meet these additional needs.	Infant tolerates feedings without difficulty. Mother supplies breast milk for feedings.

(continued)

BOX 26.11 ✻ Focus on Nursing Care Planning (continued)

Nutrition

Nurse — Assess blood glucose levels every 4 hours by heel stick. Report hypoglycemia (blood glucose level <45 mg/dL). Glucose is a source of energy. Monitoring glucose levels helps to determine if sufficient energy is available to meet the newborn's metabolic needs. Infant maintains a glucose level >45 mg/dL.

Patient/Family Education

Nurse — Assess what parents know about the cause of preterm labor. Teach parents that the cause of preterm birth often cannot be identified. Parents will need to work together to arrange for best care for preterm infant. Parents state they are adjusting to shock of preterm birth based on better knowledge of cause.

Psychosocial/Spiritual/Emotional Needs

Nurse — Assess what activities parents think their very small infant can accomplish. Invite parents to see, touch, and spend as much time as possible with newborn. Guide them in activities such as skin-to-skin contact and basic caregiving. Seeing, touching, and caring promote attachment. Guidance in activities helps to alleviate anxiety. Parents visit in nursery or telephone at least every other day; touch and talk to newborn.

Psychosocial/Spiritual/Emotional Needs

Nurse — Assess if parents have worked through shock of preterm birth. Suggest parents bring in a mobile or toy to keep near newborn. A mobile or toy provides visual stimulation and promotes feelings of participation in the newborn's care. Parents state they know preterm birth is no one's fault; express interest in parenting.

Discharge Planning

Nurse — Assess what community organizations will be available to family for continued support. Refer parents to Web sites helpful for preterm information; suggest they join local Parents of Preemies organization. Parents may need continued support after they return home with a small infant. Parents give examples of how they are making active plans for infant's discharge and care.

fant born by cesarean birth or has labor induced is mature enough that RDS is not likely to occur.

Using a tocolytic agent such as terbutaline can help to prevent preterm birth for a few days. Because steroids appear to quicken the formation of lecithin, it may be possible to prevent RDS in infants by administering two injections of a glucocorticosteroid, such as betamethasone, to the mother at 12 and 24 hours during this time. This is most effective when given between weeks 24 and 34 of pregnancy. Unfortunately, there is often no warning that preterm birth is imminent until hours before birth. Because the steroid does not take effect before 24 to 48 hours, some

labors and births will progress too rapidly for this preventive measure to be effective.

Baby Atkins has surfactant administered at birth. The purpose of surfactant is to:

a. Help raise lung secretions by relaxing the airway.
b. Prevent alveoli from collapsing on expiration.
c. Paralyze respiratory muscles to synchronize breathing.
d. Reduce gastric secretions by action on the pancreas.

Transient Tachypnea of the Newborn (TTN)

At birth, a newborn may have a rapid rate of respirations, up to 80 breaths per minute when crying, caused by retained lung fluid (Raab, 2007). Within 1 hour, however, this rapid rate slows to between 30 and 60 breaths per minute. In about 10 in 1000 live births, the respiratory rate remains at a high level, between 80 and 120 breaths per minute. The infant does not appear to be in a great deal of distress, aside from the tiring effort of breathing so rapidly. Mild retractions but not marked cyanosis, mild hypoxia, and hypercapnia may be present. Feeding is difficult because the child cannot suck and breathe this rapidly at the same time. A chest radiograph will reveal some fluid in the central lung, but aeration is, overall, adequate. An ultrasound may show like findings (Copetti & Cattarossi, 2007).

Transient tachypnea may reflect a slight decrease in pro- duction of phosphatidyl glycerol or mature surfactant but is a direct result of retained lung fluid. Retained lung fluid lim- its the amount of alveolar surface that is available for oxygen exchange. This limitation requires an infant to increase res- piratory rate and depth of respirations to better use the sur- face available. Transient tachypnea occurs more often in in- fants who are born by cesarean birth, in infants whose mothers received extensive fluid administration during labor, and in preterm infants. Infants born by cesarean birth are probably more prone to develop this form of respiratory dis- tress because the thoracic cavity is not compressed as it is in vaginal birth, so less lung fluid is expelled than normally.

Close observation of such a newborn is a priority. Watch carefully to be certain the increased effort is not tiring. Also watch for beginning signs of a more serious disorder, because a rapid respiratory rate is often the first sign of respiratory ob- struction. Oxygen administration may be necessary. Transient tachypnea of the newborn peaks in intensity at approximately 36 hours of life and then begins to fade. Typically, by 72 hours of life, it spontaneously fades as the lung fluid is absorbed and respiratory activity becomes effective.

Meconium Aspiration Syndrome

Meconium is present in the fetal bowel as early as 10 weeks' gestation. If hypoxia occurs, a vagal reflex is stimulated, re- sulting in relaxation of the rectal sphincter. This releases meconium into the amniotic fluid. Babies born breech may expel meconium into the amniotic fluid from pressure on the buttocks. In both instances, the appearance of the fluid at birth is green to greenish black from the staining. Meconium staining occurs in approximately 10% to 12% of all preg- nancies; in 2% to 9% of these pregnancies, infants will aspi- rate the meconium (Szymanski & Bienstock, 2007). Meconium aspiration does not tend to occur in extremely- low-birth-weight infants because the substance has not passed far enough in the bowel for it to be at the rectum in these infants.

An infant may aspirate meconium either in utero or with the first breath at birth. Meconium can cause severe respira- tory distress in three ways: it causes inflammation of bron- chioles because it is a foreign substance; it can block small bronchioles by mechanical plugging; and it can cause a de- crease in surfactant production through lung trauma. Hypoxemia, carbon dioxide retention, and intrapulmonary

and extrapulmonary shunting occur. A secondary infection of injured tissue may lead to pneumonia.

Assessment

Infants with meconium-stained amniotic fluid can have dif- ficulty establishing respirations at birth (those who were not born breech have had a hypoxic episode in utero to cause the meconium to be in the amniotic fluid). The Apgar score is apt to be low. Almost immediately, tachypnea, retractions, and cyanosis occur.

With meconium-stained amniotic fluid, an infant should be suctioned with a bulb syringe or catheter while at the per- ineum, before the birth of the shoulders, to avoid meconium aspiration. Although there is some dispute regarding whether all infants with meconium staining need intubation, those with severe staining are intubated and meconium is suc- tioned from their trachea and bronchi (Halliday & Sweet, 2009). Do not administer oxygen under pressure (bag and mask) until an infant has been intubated and suctioned, so that the pressure of the oxygen does not drive small plugs of meconium farther down into the lungs, worsening the irrita- tion and obstruction.

After the initiation of respirations, an infant's respiratory rate may remain elevated (tachypnea) and coarse bronchial sounds may be heard on auscultation. An infant may continue to have retractions because the inflammation of bronchi tends to trap air in the alveoli, limiting the entrance of oxygen. This air trapping may also cause enlargement of the anteroposterior diameter of the chest (barrel chest). Blood gases will reveal a poor gas exchange, evidenced by a decreased PO2 and an in- creased PCO2. A chest radiograph will show bilateral coarse in- filtrates in the lungs, with spaces of hyperaeration (a peculiar honeycomb effect). The diaphragm will be pushed downward by the overexpanded lungs.

Therapeutic Management

Amnioinfusion can be used to dilute the amount of meco- nium in amniotic fluid and reduce the risk of aspiration al- though this is usually reserved for instances where the fetus shows distress (Szymanski & Bienstock, 2007). Some infants are scheduled to be born

by cesarean birth after deeply meco- nium-stained amniotic fluid becomes evident during labor. After birth and tracheal suction, infants may need to be treated with oxygen administration and assisted ventilation. Antibiotic therapy may be used to forestall the development of pneumonia as a secondary problem. Surfactant may be ad- ministered to increase lung compliance (El Shahed et al., 2009). Lung tissue is fairly noncompliant after meconium as- piration, which may necessitate high inspiratory pressure. This can cause pneumothorax or pneumomediastinum. Infants must be observed closely for signs of trapping air in the alveoli, because the alveoli can expand only so far and then will rupture, sending air into the pleural space (pneu- mothorax).

Because of increased pulmonary resistance, the ductus arte-
riosus may remain open, causing blood to shunt from the pul- monary artery into the aorta, compromising cardiac efficiency and increasing hypoxia. Observe an infant closely for signs of heart failure such as increased heart rate or respiratory distress. Maintain a temperature-neutral environment to prevent

increasing metabolic oxygen demands. Chest physiotherapy with clapping and vibration may be helpful to encourage re- moval of remnants of meconium from the lungs (see Chapter 40). Some infants will be maintained on ECMO to ensure ad- equate oxygenation (Radhakrishnan et al., 2007).

Although meconium aspiration is a serious insult to a new- born, with therapeutic interventions, the symptoms of this will begin to fade by a week's time with no long-term results.

Apnea

Apnea is a pause in respirations longer than 20 seconds with accompanying bradycardia. Beginning cyanosis also may be present. Many preterm infants have periods of apnea as a re- sult of fatigue or the immaturity of their respiratory mecha- nisms. Babies with secondary stresses, such as infection, hy- perbilirubinemia, hypoglycemia, or hypothermia, tend to have a high incidence of apnea (Thilo & Rosenberg, 2008). Gently shaking an infant or flicking the sole of the foot often stimulates the baby to breathe again, almost as if the child needed to be reminded to maintain this function. If an infant does not respond to these simple measures, resuscita- tion is necessary.

Closely observe all newborns, but especially preterm ones, to detect these apneic episodes. Apnea monitors that record respiratory movements are invaluable tools to detect failing respiration and sound a warning an infant needs attention. Infants with frequent or difficult-to-correct episodes may be placed on ventilators to provide respiratory coordination until they are more mature.

To help prevent episodes of apnea, maintain a neutral thermal environment and use gentle handling to avoid exces- sive fatigue. Always suction gently to minimize nasopharyn- geal irritation, which can cause bradycardia because of vagal stimulation. Using indwelling nasogastric tubes rather than intermittent ones can also reduce the amount of vagal stim- ulation. After feeding, observe an infant carefully because a full stomach can put pressure on the diaphragm and poten- tially compromise respirations. Careful burping also helps to reduce this effect. Never take rectal temperatures in infants prone to apnea; the resulting vagal stimulation can reduce the heart rate (bradycardia), which can lead to apnea. Theophylline or caffeine sodium benzoate may be adminis- tered to stimulate respirations. The mechanism by which these drugs reduce the incidence of apneic episodes is un- clear, but they appear to increase an infant's sensitivity to car- bon dioxide, ensuring better respiratory function. Infants who have had an apneic episode severe enough to require re- suscitation are at a high risk for sudden infant death syn- drome (SIDS). Such infants may be discharged home with a monitoring device to be used for 2 to 6 months.

Sudden Infant Death Syndrome (SIDS)

SIDS is sudden unexplained death in infancy. It tends to occur at a higher-than-usual rate in infants of adolescent mothers, infants of closely spaced pregnancies, and under- weight and preterm infants. Also prone to SIDS are infants with bronchopulmonary dysplasia, twins, Native American infants, Alaskan Native infants, economically disadvantaged black infants, and infants of narcotic-dependent mothers. The peak age of incidence is 2 to 4 months of age (Barkin & James, 2007).

Although the cause of SIDS is unknown, in addition to prolonged but unexplained apnea, other possible contribut- ing factors include:

- Viral respiratory or botulism infection
- Pulmonary edema
- Brain stem abnormalities
- Neurotransmitter deficiencies
- Heart rate abnormalities
- Distorted familial breathing patterns
- Decreased arousal responses
- Possible lack of surfactant in alveoli
- Sleeping in a room without moving air currents (the in- fant rebreathes expired carbon dioxide)

Typically, affected infants are well nourished. Parents re- port that an infant may have had a slight head cold. After being put to bed at night or for a nap, the infant is found dead a few hours later. Infants who die this way do not ap- pear to make any sound as they die, which indicates they die with laryngospasm. Although many infants are found with blood-flecked sputum or vomitus in their mouths or on the bedclothes, this seems to occur as the result of death, not as its cause. An autopsy often reveals petechiae in the lungs and mild inflammation and congestion in the respiratory tract. However, these symptoms are not severe enough to cause sudden death. It

is clear these children do not suffocate from bedclothes or choke from overfeeding, underfeeding, or cry- ing. Since the American Academy of Pediatrics made its rec- ommendation to put newborns to sleep on their back and with a pacifier, the incidence of SIDS has declined almost 50% (Damato, 2007). With the recommendation that in- fants sleep with a fan in their room to keep air moving, the incidence is expected to decrease further (Coleman-Phox, Odouli, & Li, 2008).

Parents have a difficult time accepting the death of any child. This can be especially difficult when it happens so sud- denly. In discussing the child, they often use both the past and present tense as if they are not yet aware of the death. Many parents experience a period of somatic symptoms that occur with acute grief, such as nausea, stomach pain, or ver- tigo. Parents should be counseled by a nurse or someone else trained in counseling at the time of the infant's death; it helps if they can talk to this same person periodically for however long it takes to resolve their grief. The American Sudden Infant Death Institute, listed at the beginning of the chapter, offers suggestions for counseling.

Autopsy reports should be given to parents as soon as they are available (if toxicology tests are included in the autopsy, results will not be available for weeks). Reading that their child's death was unexplained can help to reassure parents the death was not their fault. They need this assurance if they are to plan for other children. If there are older children in the family, they also need assurance that SIDS is a disease of infants and that the strange phenomenon that invaded their home and killed a younger brother or sister will not also kill them. If they wished the infant dead, as all children wish sib- lings were dead on some days, they need reassurance that their wishes did not cause the baby's death.

When another child is born, parents can be expected to become extremely frightened at any sign of illness in their child. They need support to see them through the first few months of the second child's life, particularly past the point at which the first child died. Some parents may need support to view a second child as an individual child and not as a re- placement for the one who died.

Often a new baby born to a family in which a SIDS infant died is screened using a sleep assessment as a precaution within the first 2 weeks of life. Depending on the parents' level of anx- iety, the new baby may receive this screening before hospital discharge. The baby may then be placed on continuous apnea monitoring pending the results of the sleep assessment.

Apparent Life-Threatening Event

Some infants have been discovered cyanotic and limp in their beds but have survived after mouth-to-mouth resuscitation by parents. An episode of this kind is called an apparent life- threatening event (Shah & Sharieff, 2007). For these infants as well as for preterm infants with a tendency toward apnea or new babies born to a family whose child died from SIDS, apnea monitoring is available. With apnea monitoring in place, an alarm sounds when the neonate experiences a pe- riod of apnea of 20 seconds or longer or a decreased heart rate below 80 beats per minute (Fig. 26.10). If parents are going to use an apnea monitor at home, make certain they will be able to hear it in all parts of the house or apartment. Usually the alarm is not loud enough to be heard in the basement from an upstairs bedroom. Caution them about household noises such as a loud television, radio, vacuum cleaner, or hair dryer that may interfere with hearing the alarm. Be cer- tain they know how to apply and reposition the apnea leads and that they are comfortable enough with the monitor to see past it to the child. In addition, parents should be taught cardiopulmonary resuscitation before their infant is dis- charged from the hospital (Fig. 26.11).

Caring for a child at home on an apnea monitor may be extremely stressful for the parents and their relationship. They often have difficulty finding a competent babysitter.

FIGURE 26.10 An apnea monitor for home monitoring. (Photograph courtesy of Respironics/Healthdyne Technologies, Marietta, GA.)

FIGURE 26.11 Parents of infants with respiratory disorders need to learn cardiac resuscitation before their infant is discharged from the hospital. Here a nurse teaches the technique using a doll.

These parents can benefit from a community or home care referral so they have a second opinion regarding how well they are managing, as well as a listening ear to discuss the strain of having to be constantly alert for a sound that means their infant has stopped breathing. Having someone periodically review with them what steps to take should the alarm sound (jiggle the baby, begin mouth-to-mouth resus- citation, call the emergency response personnel) can be very comforting. Because SIDS is a baffling disease, these par- ents will live in fear of SIDS until their child reaches at least 1 year of age.

Periventricular Leukomalacia

Periventricular leukomalacia (PVL) is abnormal formation of the white matter of the brain (Tsukimori et al., 2007). It is caused by an

ischemic episode that interferes with circula- tion to a portion of the brain. Phagocytes and macrophages invade the area to clear away necrotic tissue. What is left is an abnormality in the white matter of the brain (revealed on a sonogram as a hollow space). PVL occurs most frequently in preterm infants who experience cerebral ischemia. Once the condition has occurred, there is no therapy. Infants may die of the original insult; they may be left with long-term effects such as learning disabilities. Any action to reduce environ- mental stimuli or sudden shifts in cerebral blood flow, such as avoiding rapid fluid infusions or sudden noises, is impor- tant in preventing PVL and limiting the long-term effects of prematurity (Brunssen & Harry, 2007).

Hemolytic Disease of the Newborn

The term "hemolytic" is derived from the Latin word for "destruction" (lysis) of red blood cells. Lysis of red blood cells in the newborn leads to hyperbilirubinemia (an ele- vated level of bilirubin in the blood). This can result from destruction of red blood cells by a normal physiologic process (see Chapter 18). When abnormal destruction of red blood cells occurs, it is termed hemolytic disease. In the past, hemolytic disease of the newborn was most often caused by an Rh blood type incompatibility. Because prevention of Rh

antibody formation has been available for almost 40 years, the disorder is now most often caused by an ABO incom- patibility. In both instances, the mother builds antibodies against an infant's red blood cells, leading to hemolysis (de- struction) of the cells. The destruction of red blood cells causes severe anemia and hyperbilirubinemia from the bilirubin released from red cells. Prevention of the condition begins in pregnancy, as discussed in Chapter 21.

Rh Incompatibility

Theoretically, no direct connection exists between the fetal and maternal circulation, so no fetal blood cells should enter the maternal circulation. In actuality, occasional pla- cental villi break and a drop or two of fetal blood does enter the maternal circulation. If the mother's blood type is Rh

(D) negative and the fetal blood type is Rh positive (con- tains the D antigen), the introduction of fetal blood causes sensitization to occur, and the woman begins to form anti- bodies against the D antigen. Few antibodies form this way, however. Most form in the woman's bloodstream in the first 72 hours after birth because there is an active ex- change of fetal–maternal blood as placental villi loosen and the placenta is delivered. After this sensitization, in a sec- ond pregnancy there will be a high level of antibody D cir- culating in the woman's bloodstream, which will then act to destroy the fetal red blood cells early in the pregnancy if the new fetus is Rh positive. By the end of pregnancy, a fetus can be severely compromised by the action of these antibodies crossing the placenta and destroying red blood cells. Some infants require intrauterine transfusions to combat red cell destruction. Preterm labor may be induced to remove the fetus from the destructive maternal environ- ment. Administering phenobarbital to women during their last weeks of pregnancy has been tried to reduce symptoms in newborns as it speeds liver maturity so that the infant liver better converts indirect to direct bilirubin. This, un- fortunately, also carries the risk of fetal sedation (Thomas, Muller, & Wilkinson, 2009).

ABO Incompatibility

In most instances of ABO incompatibility, the maternal blood type is O and the fetal blood type is A; it may also occur when the fetus has type B or AB blood. A reaction in an infant with type B blood is often the most serious.

Hemolysis can become a problem with a first pregnancy in which there is an ABO incompatibility as the antibodies to A and B cell types are naturally occurring antibodies or are present from birth in individuals whose red cells lack these antigens. Unlike the antibodies formed against the Rh D fac- tor, these antibodies are of the large (IgM) class and do not cross the placenta. An infant of an ABO incompatibility, therefore, is not born anemic, as is the Rh-sensitized child. Hemolysis of the blood begins with birth, when blood and antibodies are exchanged during the mixing of maternal and fetal blood as the placenta is loosened; destruction of red cells may continue for up to 2 weeks of age. Interestingly, preterm infants do not seem to be affected by ABO incompatibility. This may be because the receptor sites for anti-A or anti-B antibodies do not appear on red cells until late in fetal life. Even in the mature newborn, a direct Coombs' test may be only weakly positive because of the few anti-A or anti-B sites

present. The reticulocyte count (immature or newly formed red blood cells) is usually elevated as the infant attempts to replace destroyed cells.

Assessment

Rh incompatibility of the newborn can be predicted by find- ing a rising anti-Rh titer or a rising level of antibodies (indi- rect Coombs' test) in a woman during pregnancy. It can be confirmed by detecting antibodies on the fetal erythrocytes in cord blood (positive direct Coombs' test) by percutaneous umbilical blood sampling (see Chapter 9) or at birth. The mother in this situation will always have Rh-negative blood (dd), and the baby will be Rh positive (DD or Dd).

With Rh incompatibility, an infant may not appear pale at birth despite the red cell destruction that has occurred in utero. This is because the accelerated production of red cells during the last few months in utero compensates to some de- gree for the destruction. The liver and spleen may be en- larged from an attempt to destroy damaged blood cells. If the number of red cells has significantly decreased, the blood in the vascular circulation may be hypotonic to interstitial fluid; fluid will shift from the lower to higher isotonic pressure by the law of osmosis, causing extreme edema. Finally, the se- vere anemia can result in heart failure as the heart has to beat so fast to push the dilute blood forward. Hydrops fetalis is an old term for the appearance of a severely involved infant at birth.

Hydrops refers to the edema, and fetalis refers to the lethal state.

Most infants do not appear jaundiced at birth because the maternal circulation has evacuated the rising indirect biliru- bin level. With birth, progressive jaundice, usually occurring within the first 24 hours of life, will begin, indicating in both Rh and ABO incompatibility that a hemolytic process is at work. The jaundice occurs because as red blood cells are de- stroyed, indirect bilirubin is released. Indirect bilirubin is fat soluble and cannot be excreted from the body. Under normal circumstances, the liver enzyme glucuronyl transferase con- verts indirect bilirubin to direct bilirubin. Direct bilirubin is water soluble and combines with bile for excretion from the body with feces. In preterm infants or those with extreme he- molysis, the liver cannot convert indirect to direct bilirubin, so jaundice becomes extreme.

Pregnanediol, the breakdown product of progesterone, can interfere with the conjugation of indirect bilirubin. This is excreted in breast milk until the high levels of progesterone that were present during pregnancy are decreased, usually 24 to 48 hours after birth. Breastfed babies, therefore, may evi- dence more jaundice than bottle-fed babies.

Normally, cord blood has an indirect bilirubin level of 0 to 3 mg/100 mL. An increasing indirect bilirubin level is dangerous because if the level rises above 20 mg/dL in a term infant or 12 mg/dL in a preterm infant, brain damage from bilirubin-induced neurologic dysfunction (BIND) or a wide spectrum of disorders caused by increasingly severe hyperbilirubinemia that range from mild dysfunction to kernicterus (invasion of bilirubin into brain cells) can occur. An infant needs to use glucose stores to maintain metabolism in the presence of anemia. This can cause a progressive hypoglycemia, compounding the initial prob- lem. A decrease in hemoglobin during the first week of life to a level less than that of cord blood is a later indication of blood loss or hemolysis.

Therapeutic Management

Initiation of early feeding, use of phototherapy, and ex- change transfusion all may be immediate measures necessary to reduce indirect bilirubin levels in an infant affected by ABO or Rh incompatibility. In infants with severe hemolytic disease, the hemoglobin concentration may continue to drop during the first 6 months of life, or their bone marrow may fail to increase production of erythrocytes in response to con- tinuing hemolysis. If this occurs, an infant may need an ad- ditional blood transfusion to correct this late anemia. Therapy with erythropoietin to stimulate red blood cell pro- duction is also possible.

Initiation of Early Feeding. Bilirubin is removed from the body by being incorporated into feces. Therefore, the sooner bowel elimination begins, the sooner bilirubin removal be- gins. Early feeding (either breast milk or formula), therefore, stimulates bowel peristalsis and accomplishes this.

Phototherapy. An infant's liver processes little bilirubin in utero because the mother's circulation does this for an in- fant. With birth, exposure to light apparently triggers the liver to assume this function. Additional light supplied by phototherapy appears to speed the conversion potential of the liver. In phototherapy, an infant is continuously ex- posed to specialized light such as quartz halogen, cool white daylight, or special blue fluorescent light. The lights are placed 12 to 30 inches above the newborn's bassinet or in- cubator. Specialized fiberoptic light systems incorporated into a fiberoptic blanket also have been developed and are ideal for home care. The infant is undressed except for a di- aper so as much skin surface as possible is exposed to the light (Fig. 26.12).

Term newborns are generally scheduled for phototherapy when the total serum bilirubin level rises to 10 to 12 mg/dL at 24 hours of age; preterm infants may have treatment begun at levels lower than this (Symons & Mahoney, 2008). Continuous exposure to bright lights this way may be harmful to a newborn's retina, so the infant's eyes must al- ways be covered while under bilirubin lights. Eye dressings or cotton balls can be firmly secured in place by an infant mask.

FIGURE 26.12 A newborn receiving phototherapy is undressed except for a diaper so he receives maximum exposure to the lights. His eyes are covered snugly to protect them from the bright light.

Check the dressings frequently to be certain they have not slipped or are causing corneal irritation. A constant concern is that suffocation from eye patches could occur.

The stools of an infant under bilirubin lights are often bright green because of the excessive bilirubin that is ex- creted as the result of the therapy. They are also frequently loose and may be irritating to skin. Urine may be dark-col- ored from urobilinogen formation. Monitor axillary tem- perature to prevent an infant from overheating under the bright lights. Assess skin turgor and intake and output to ensure that dehydration is not occurring from the warm environment.

Infants receiving phototherapy should be removed from under the lights for feeding so that they continue to have in- teraction with their mother. In addition, supplemental feed- ings with additional formula may be recommended to pre- vent dehydration. Remove the eye patches while the infant is with the mother to give an infant a period of visual stimula- tion. To prevent a lengthy hospital stay, infants may be dis- charged and continue therapy at home.

Parents need an explanation of the rationale for pho- totherapy. Incubators are automatically associated with se- riously ill infants, but the use of lights does not seem scien- tific (almost a home remedy). Parents can easily be confused by the two interventions, one seemingly serious and the other seemingly not serious at all. Although the long-term effects have not yet been studied, there appears to be minimal risk to an infant from phototherapy, pro- vided the infant's eyes remain covered and dehydration from increased

insensitive water loss does not occur. It is too early to predict if all infants who receive phototherapy need follow-up in coming years to detect skin cancer that possibly could occur from the therapy (Newman & Maisels, 2007).

Home Phototherapy. Home phototherapy is primarily used for decreasing physiologic jaundice rather than that associ- ated with blood incompatibility. It has the advantage of al- lowing for uninterrupted contact between the parents and a newborn and therefore has the potential to aid bonding. Parents must understand the importance of the therapy; the lights must be a full 12 inches away from an infant to prevent burning; an infant must continuously wear eye patches and a diaper during phototherapy to protect the retinas and the ovaries or testes; and bilirubin levels should be assessed ap- proximately every 12 hours.

An infant should have the eye patches removed when away from the lights for feeding for a period of visual stimu- lation and interaction. The point at which infants are most apt to dislodge eye patches is when they cry as they wake for a feeding. Urge parents not to allow an infant under biliru- bin lights to cry for a sustained period to avoid having this happen.

An infant's progress can be measured daily by a transcuta- neous bilirubinometer, a hand-held fiberoptic light placed against an infant's skin. The intensity of the yellow color of the skin is measured by the meter, and a numeric level of bilirubin is calculated.

A newer innovation for hyperbilirubinemia management is the phototherapy blanket, a fiberoptic blanket that is wrapped around the baby. Light generated by the blanket has the same effect on bilirubin levels as banks of overhead lights. The advantages of a blanket are that an infant can be held for

long periods without interrupting the phototherapy, and eye patches are unnecessary (Box 26.12).

Exchange Transfusion. Intensive phototherapy in conjunc- tion with hydration and close monitoring of serum biliru- bin levels is the preferred method of treatment of neonatal jaundice. Despite these measures, if bilirubin levels con-

tinue to rise, exchange transfusion may be necessary. Before the procedure, the baby's stomach is aspirated to minimize the risk of aspiration from the manipulation involved. The umbilical vein is catheterized as the site for transfusion. The procedure involves alternatively withdrawing small amounts (2–10 mL) of the infant's blood and then replac- ing it with equal amounts of donor blood. The blood is ex- changed slowly this way to prevent alternating hypovolemia and hypervolemia. This can make an exchange transfusion a lengthy procedure of 1 to 3 hours. Automatic pumps are helpful to perform the exhausting repeated ritual. At the end of the procedure, using the last specimen of blood withdrawn, hematocrit, bilirubin, electrolytes (especially calcium), glucose determination, and blood culture are taken. Exchange transfusion may need to be repeated be- cause additional unconjugated bilirubin from tissue moves into the circulation after the exchange.

The therapy may be used for any condition that leads to hyperbilirubinemia or polycythemia. When used as therapy for blood incompatibility, it removes approximately 85% of sensitized red cells. It reduces the serum concentration of in- direct bilirubin and often prevents heart failure in infants. Because indirect bilirubin levels rise at relatively predictable levels, standards for performing exchange transfusion depend on the indirect bilirubin concentration, and transfusion is used when this level exceeds:

- 5 mg/100 mL at birth
- 10 mg/100 mL at age 8 hours
- 12 mg/100 mL at age 16 hours
- 15 mg/100 mL at 24 hours

It also may be used if the serum bilirubin level is rising more than 0.5 mg/hr in infants with Rh incompatibility or 1.0 mg/hr in infants with ABO incompatibility.

Keep a newborn warm during the procedure to prevent energy expenditure from having to maintain body tempera- ture. Maintain the blood being given at room temperature, or shock from the cold insult can result. Use only commer- cial blood warmers to warm blood, not hot towels or a radi- ant heat warmer, to avoid destroying red cells.

Albumin may be administered 1 to 2 hours before the procedure to increase the number of bilirubin binding sites and to increase the efficiency of the transfusion. Be careful to monitor the rate of flow of the albumin transfusion, because rapid flow of such a viscous fluid can quickly overburden an infant's heart. The type of blood used for transfusion is O Rh-negative blood, even though an infant's blood type is positive; if Rh-positive or type A or B blood were given, the maternal antibodies that entered the infant's circulation would destroy this blood also, and the transfusion would be ineffective. An amount equal to twice the blood volume (av- erage is 86 mL/kg) is used because this quantity will ensure an exchange of erythrocytes that is 85% to 90% effective. If the baby is transported to a regional center for the exchange transfusion, a sample of the mother's blood should accom- pany the infant, so cross-matching on the mother's serum can be done there.

During the transfusion, carefully monitor the newborn's heart rate, respirations, and blood pressure. Because blood stored for transfusion contains acid-citrate-dextrose (ACD), added to blood as an anticoagulant, which can lower blood calcium levels and cause acidosis, calcium gluconate is given

through the exchange catheter after each 100 mL of blood. If citrate-phosphate-dextrose was used as a preservative, hyper- glycemia may occur during the transfusion from the dextrose in the preservative. This may be followed by overproduction of insulin and hypoglycemia in the infant. If heparinized blood is used, the heparin content may interfere with clotting after the transfusion. In addition, because of its relatively low glucose concentration, heparinized blood may also lead to hypoglycemia. Administering protamine sulfate aids in the metabolism of heparin and restoration of clotting ability.

After the transfusion, closely observe the infant for umbil- ical vessel bleeding. Redness or inflammation of the cord sug- gests infection. Report any changes in vital signs. Take and record a blood glucose determination at 1 hour after the pro- cedure. Monitor bilirubin levels for 2 or 3 days after the transfusion to ensure the level of bilirubin is not rising again and that no further transfusion is necessary. Erythropoietin may be administered to increase new blood cell growth and prevent extended anemia.

Hemorrhagic Disease of the Newborn

Hemorrhagic disease of the newborn results from a defi- ciency of vitamin K (McNinch, Busfield, & Tripp, 2007). Vitamin K is essential for the formation of prothrombin by the liver. Lack of it causes decreased prothrombin function and impaired blood coagulation. Vitamin K is formed by the action of bacteria in the intestine. Because the intestinal tract of a newborn is sterile at birth, an infant forms minimal amounts of vitamin K until normal intestinal tract flora are established at about 24 hours of age. Babies born to women receiving anticonvulsive medication are at high risk for the condition because many of these medications interfere with vitamin K formation. Administering vitamin K intramuscu- larly to these women before birth can help to protect the newborn.

Newborns with vitamin K deficiency show petechiae from superficial bleeding into the skin. They may have conjuncti- val, mucous membrane, or retinal hemorrhage. They may vomit fresh blood or pass black, tarry stools because of bleed- ing into the gastrointestinal tract.

Distinguishing between tarry stools and normal meco- nium stools can be difficult in the first 1 or 2 days of life by simple observation. However, if an infant's stool does not change as it should from greenish-black (meconium) to the yellow color of a bottle-fed or breastfed baby, or if the stool color changes normally and then becomes black again, gas- trointestinal bleeding should be suspected. You can check for the presence of blood in the stool by a dipstick guaiac test.

Vitamin K deficiency bleeding usually occurs on day 2 to day 5 of life, when the available prothrombin is at its lowest level. The prothrombin time will be prolonged; the coagula- tion time may be normal or prolonged.

Hemorrhagic disease of the newborn can be prevented by the intramuscular administration of 1 mg of vitamin K to all newborns immediately after birth. Make certain infants who were born in unusual circumstances, such as those born out- side the hospital, are given vitamin K on their admission to the hospital nursery. Also double-check that infants whose birth involved an emergency, such as maternal hemorrhage or failure of the newborn to breathe spontaneously, have re- ceived it.

An infant who develops hemorrhagic disease of the new- born is treated with vitamin K, given intravenously or intra- muscularly. If bleeding is severe, an infant may need a trans- fusion of fresh, whole blood to increase the prothrombin level immediately.

Handle infants with this disease extremely gently to pre- vent further bleeding, because they bruise easily from heavy pressure. Subdural hemorrhage may occur, making hemor- rhagic disease a serious and potentially fatal disorder.

Twin-to-Twin Transfusion

Twin-to-twin transfusion is a phenomenon that can occur if twins are monozygotic (identical; share the same placenta) or if abnormal arteriovenous shunts occur that direct more blood to one twin than the other (Norton, 2007). The process occurs in as many as one third of all identical twin pregnancies. Enough blood is exchanged to be clinically im- portant in only about 15% of such pregnancies. The result of this shift of blood leads to anemia in the donor twin and polycythemia in the receiving twin. The anemic twin may also be SGA because of the lack of nutrients or oxygen for growth. This same SGA twin will be prone to hypoglycemia from lack of glucose stores. The hypovolemic twin will ap- pear pale next to the polycythemic twin; the polycythemic twin is prone to hyperbilirubinemia as the excessive red blood cell level is broken down.

Twin-to-twin transfusion can be identified in utero by a sonogram because one twin is noticeably larger than the other. All identical twins should have hemoglobin determi- nations done at birth and the results compared. A difference of more than 5.0 g per 100 mL is enough to suggest a trans- fusion has occurred. Each twin needs therapy as indicated by the extent of the blood distribution. The donor twin may need a transfusion to establish a functioning blood level; the recipient twin may need an exchange transfusion to reduce the polycythemia and viscosity of the blood.

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Baby Atkins develops hyperbilirubinemia. What is a method used to treat hyperbilirubinemia in a newborn?

a. Keeping infants in a warm and dark environment.
b. Early feeding to speed passage of meconium.
c. Gentle exercise to stop muscle breakdown.
d. Administration of a cardiovascular stimulant.

2MO

Necrotizing Enterocolitis

Necrotizing enterocolitis (NEC) develops in approximately 5% of all infants in intensive care nurseries (Carter, 2007). The bowel

develops necrotic patches, interfering with di- gestion and possibly leading to a paralytic ileus. Perforation and peritonitis may follow. NEC may occur as a complica- tion of exchange transfusion. The disorder is discussed in Chapter 45.

Retinopathy of Prematurity

Retinopathy of prematurity (ROP), an acquired ocular dis- ease that leads to partial or total blindness in children, is caused by vasoconstriction of immature retinal blood vessels. It was first recognized as an eye disorder in 1942, but only later was a high concentration of oxygen established as the causative agent (Askie & Henderson-Smart, 2009). Immature retinal blood vessels constrict when exposed to high oxygen concentrations. In addition, endothelial cells in the layer of nerve fibers in the periphery of the retina prolif- erate, leading to retinal detachment and blindness. Infants who are most immature and most ill (and consequently re- ceive the most oxygen) are at highest risk.

A preterm infant who is receiving oxygen must have blood PO_2 levels monitored by pulse oximeter, transcutaneous oxy- gen saturation, or blood gas monitoring. Keeping blood PO_2 levels within normal limits lowers the risk. When blood PO_2 levels rise to higher than 100 mm Hg, the risk of the disease increases greatly.

In the past, once ROP occurred, there was no reversing it. Today, cryosurgery or laser therapy may be effective in pre- serving sight. A person experienced in recognizing ROP should examine the eyes of all low-birth-weight newborns and those who have received oxygen therapy before discharge from a hospital nursery and again at age 4 to 6 weeks of age to detect any occurrence of the syndrome. Nurses can be in- strumental in limiting the occurrence of ROP by conscien- tious oxygen management (Coe, 2007).

THE NEWBORN AT RISK BECAUSE OF MATERNAL INFECTION OR ILLNESS

Maternal Infection

Newborns are susceptible to infection at birth because their ability to produce antibodies is immature. A number of in- fections in newborns, such as toxoplasmosis, rubella, syphilis, and cytomegalovirus infections, are spread to the fetus across the placenta in utero. The effect on the woman of these dis- orders is discussed in Chapter 12. Other infections are con- tracted from exposure to vaginal secretions at birth. Those infections are described next.

β-Hemolytic, Group B Streptococcal Infection

The major cause of infection in newborns is the β-hemolytic, group B streptococcal organism (GBS). This gram-positive bacterium is a natural inhabitant of the female genital tract. Between 50 and 300 infants in every 1000 live births display a positive culture for the organism (Heath & Schuchat, 2007). It may be spread from baby to baby if good hand- washing technique is not used in handling newborns. If a woman is found to be positive for GBS during late pregnancy (see Chapter 21), ampicillin administered intravenously at 28 weeks and again during labor helps to reduce the possi- bility of newborn exposure.

Assessment. Typically, a newborn at risk, such as one born after prolonged rupture of membranes or if the woman's vaginal culture is positive for GBS, will be screened for in- fection with a blood culture.

Colonization by GBS can result in an early-onset or a late- onset illness. With the early-onset form, signs of pneumonia become apparent within the first day of life, as well as tachyp- nea, apnea, and signs of shock such as decreased urine out- put, extreme paleness, or hypotonia. A chest radiograph is al- most indistinguishable from that of RDS (a ground-glass appearance). Pneumonia may develop so rapidly that as many as 20% of infants who contract the infection die within 24 hours of birth.

A late-onset type occurs at 2 to 4 weeks of age. With this, instead of pneumonia being the infection focus, meningitis tends to occur. Typical signs include lethargy, fever, loss of appetite, and bulging fontanelles from in- creased intracranial pressure as meningitis develops. Mortality from the late-onset type is not as high as that from the early-onset form (15% versus 20%), but neuro- logic consequences can occur in up to 50% of infants who survive.

Therapeutic Management. If a newborn displays signs or a blood screening test is positive, antibiotics are administered. Gentamicin, ampicillin, and penicillin are all effective against GBS infections.

Parents may have difficulty understanding how their in- fant could suddenly become this ill and may need a great deal of support in caring for their infant. This is even more important if the newborn survives the infection but is left neurologically challenged. In the future, immunization of all women of childbearing age against streptococcal B or- ganisms could decrease the incidence of newborns infected at birth.

Ophthalmia Neonatorum

Ophthalmia neonatorum is an eye infection that occurs at birth or during the first month (MacDonald, Mailman, & Desai, 2008). The most common causative organisms are Neisseria gonorrhoeae and Chlamydia trachomatis. An infant contracts the organism during birth, from vaginal secretions.

N. gonorrhoeae infection is an extremely serious form of con- junctivitis because, if left untreated, the infection progresses to corneal ulceration and destruction, resulting in opacity of the cornea and severe vision impairment.

Assessment. Ophthalmia neonatorum is generally bilat- eral. The conjunctivae become fiery red, with thick pus. The eyelids are edematous. Although this usually occurs on day 1 to day 4 of life, it should be considered as a possibil- ity when conjunctivitis occurs in any infant younger than 30 days.
Prevention. The prophylactic instillation of erythromycin ointment into the eyes of newborns prevents both gonococ- cal and chlamydial conjunctivitis. In the past, eye prophy- laxis was given immediately after birth so it was never for- gotten. Now it is customary to delay administration of the ointment until after the first reactivity period so the newborn can clearly see the parents during this important attachment period. This makes it easy for administration to be forgotten, so use some type of a checklist as a reminder of this impor- tant prophylaxis. Infants born outside the hospital also need prophylaxis to prevent ophthalmia neonatorum, the same as infants born in a birthing room.
Therapeutic Management. Therapy is individualized de- pending on the organism cultured from the exudate. If gono- cocci are identified, intravenous ceftriaxone (Rocephin) and penicillin are effective drugs. If chlamydia is identified, an ophthalmic solution of erythromycin is used.

Use standard and contact infection precautions when car- ing for this newborn. In addition to systemic antibiotic ther- apy, the eyes are irrigated with sterile saline solution to clear the copious discharge. When irrigating eyes, use a sterile medicine dropper or bulb syringe, and use barrier protection, including goggles to avoid splashing any solution into your own eye. The solution should be at room temperature. Direct the stream of the irrigation fluid laterally so it does not enter and contaminate the other eye.
The mother of the infected infant needs treatment for gonorrhea or chlamydia, before fallopian tube sterility or pelvic inflammatory disease results. Sexual contacts of the mother should be treated also, so the spread of the disease can be halted. With either infection, parents can be assured that with early diagnosis and treatment the prognosis for nor- mal eyesight in their child is good.

Hepatitis B Virus Infection

Hepatitis B virus (HBV) can be transmitted to the newborn through contact with infected vaginal blood at birth when the mother is positive for the virus (HBsAg+). Hepatitis B is a destructive illness: 70% to 90% of infected infants be- come chronic carriers of the virus. As many as 15% of these will develop liver cancer later in life (McKinlay & Matheny, 2007).
To reduce the possibility of HBsAg being spread to new- borns in the future, infants are now routinely vaccinated at birth (Lee et al., 2009). If the mother is identified as HBsAg+, an infant is also administered immune serum globulin (HBIG) within 12 hours of birth to decrease the possibility of infection. The infant should be bathed as soon as possible after birth to remove HBV-infected blood and secretions. Gentle suctioning is necessary to avoid trauma to the mucous membrane, which could allow HBV invasion. Although the virus is transmitted in breast milk, once immune globulin has been administered, women may breastfeed without risk to an infant.
Hepatitis B is further discussed in Chapter 45, because it also occurs in older chil- dren.

Generalized Herpesvirus Infection

A herpes simplex virus type 2 (HSV-2) infection, most prevalent among women with multiple sexual partners, can be contracted by a fetus across the placenta if the mother has a primary infection during pregnancy. More often, however, the virus is contracted from the vaginal secretions of a mother who has active herpetic vulvovaginitis at the time of birth. Between 15% and 30% of women of child-bearing age demonstrate antibodies to this virus or have the potential to have active lesions during labor (American College of Obstetricians and Gynecologists [ACOG], 2007).
Assessment. If the infection was acquired during pregnancy, an infant may be born with vesicles covering the skin. The long-term prognosis of the child is guarded, because severe neurologic damage may have occurred simultaneously. If in- fants acquire the infection at birth, at approximately day 4 to day 7 of life they show a loss of appetite, perhaps a low-grade fever, and lethargy. Stomatitis (ulcers of the mouth) or a few vesicles on the skin appear. Herpes vesicles are always clus- tered, pinpoint in size, and surrounded by a reddened base.

After the vesicles appear, infants become extremely ill. They develop dyspnea, jaundice, purpura, convulsions, and shock. Death may occur within hours or days. Between 25% and 70% of newborns who survive generalized herpesvirus infec- tions have permanent central nervous system sequelae.
To confirm the diagnosis, cultures are obtained from rep- resentative vesicles as well as the nose, throat, anus, and um- bilical cord. Blood serum is analyzed for IgM antibodies.
Therapeutic Management. An antiviral drug such as Acyclovir (Zovirax), a drug that inhibits viral deoxyribonu- cleic acid synthesis, is effective in combating this overwhelm- ing infection. Prevention, however, is the newborn's best protection. Women with active herpetic vulvar lesions are advised to have cesarean birth rather than vaginal birth to minimize the newborn's exposure. Antenatal antiviral pro- phylaxis reduces viral shedding and recurrences at birth and reduces the need for cesarean birth (Hollier & Wendel, 2009). Infants with an infection should be separated from other infants. Although transmission from this source is rare, women with herpes lesions on their face (herpes simplex or cold sores) should not feed or hold their newborns until le- sions are crusted and no longer contagious. Health care per- sonnel who have herpes simplex infections should not care for newborns until the lesions are crusted. Although facial herpes simplex lesions are probably caused by herpesvirus type 1, limiting contact does not seem excessive in light of the severity of HSV-2 disease. Urge a woman who is sepa- rated from her newborn at birth to view her infant from the nursery window and participate in planning care to aid bonding.

Human Immunodeficiency Virus Infection

HIV infection and acquired immunodeficiency syndrome (AIDS) can be caused by placental transfer or direct contact with maternal blood during birth. As older children are also exposed to this, the care of children with this infection is dis- cussed in Chapter 42.

An Infant of a Woman Who Has Diabetes Mellitus

An infant of a woman who has diabetes mellitus whose ill- ness was poorly controlled during pregnancy is typically longer and weighs more than other babies (macrosomia). The baby also has a greater chance of having a congenital anomaly such as a cardiac anomaly, as if hyperglycemia is teratogenic to a rapidly growing fetus. Caudal regression syndrome (hypoplasia of the lower extremities) is a syn- drome that occurs almost exclusively in such infants (Strehlow et al., 2007).

Most such babies have a cushingoid (fat and puffy) ap- pearance. They tend to be lethargic or limp in the first days of life as a result of hyperglycemia. The macrosomia results from overstimulation of pituitary growth hormone and extra fat deposits created by high levels of insulin during preg- nancy. The infant's large size is deceptive, however: such ba- bies are often immature. RDS occurs frequently in these in- fants because they may be born preterm or, even at term, lecithin pathways may not mature as rapidly in them. High fetal insulin secretion during pregnancy to counteract the hy- perglycemia may interfere with cortisol release. This could block the formation of lecithin and prevent lung maturity. A term frequently used for these infants is "fragile giant."

An infant of a diabetic woman loses a greater proportion of weight in the first few days of life than does the average newborn because of the loss of the extra fluid accumulated. Observe an infant closely to be certain that this large weight loss actually represents a loss of extra fluid and that dehydra- tion is not occurring.

Complications

A macrosomic infant has a greater chance of birth injury, es- pecially shoulder and neck injury. Cesarean birth may be necessary to avoid cephalopelvic disproportion. Immediately after birth, the infant tends to be hyperglycemic because the mother was at least slightly hyperglycemic during pregnancy and excess glucose transfused across the placenta. During pregnancy, the fetal pancreas responds to this high glucose level with islet cell hypertrophy, resulting in matching high insulin levels. After birth, as an infant's glucose level begins to fall because the mother's circulation is no longer supply- ing glucose, the overproduction of insulin will cause the de- velopment of severe hypoglycemia. Hyperbilirubinemia also may occur in these infants because, if immature, they cannot effectively clear bilirubin from their system. Hypocalcemia also frequently develops because parathyroid hormone levels are lower in these infants because of hypomagnesemia from excessive renal losses of magnesium.

Although infants of diabetic women are usually LGA, an infant born to a woman with extensive blood vessel involve- ment may be SGA because of poor placental perfusion. The problems of hypoglycemia, hypocalcemia, and hyperbiliru- binemia remain the same.

Therapeutic Management

In a newborn, hypoglycemia is defined as a serum glucose level of less than 45 mg/dL. To avoid a serum glucose level from falling this low, infants of diabetic women are fed early with formula or administered a continuous infusion of glu- cose. It is important the infant not be given only a bolus of glucose; otherwise, rebound hypoglycemia (accentuating the problem) may occur. Some infants of diabetic women have a smaller-than-usual left colon, apparently another effect of in- trauterine hyperglycemia, which limits the amount of oral feedings they can take in their first days of life. Signs of an in- adequate colon include vomiting or abdominal distention after the first few feedings. Careful monitoring for normal bowel movements is important.

An Infant of a Drug-Dependent Mother

Infants of drug-dependent women tend to be SGA. If the woman is dependent on a drug, an infant will show with- drawal symptoms (neonatal abstinence syndrome) shortly after birth (Box 26.13). These include such signs as:

- Irritability
- Disturbed sleep pattern
- Constant movement, possibly leading to abrasions on the elbows, knees, or nose
- Tremors
- Frequent sneezing
- Shrill, high-pitched cry
- Possible hyperreflexia and clonus (neuromuscular irri- tability)
- Convulsions
- Tachypnea (rapid respirations), possibly so severe that it leads to hyperventilation and alkalosis
- Vomiting and diarrhea, leading to large fluid losses and secondary dehydration

Specific neonatal abstinence scoring tools may be used to quantify and assess an infant's status. In newborns experienc- ing opiate withdrawal, signs usually begin 24 to 48 hours after birth, but in some infants they may not appear for up to 10 days. Generally signs

last approximately 2 weeks, but mild signs may appear for up to 6 months. In heroin-addicted neonates, the signs begin within the first 2 weeks of life, with an average onset of approximately 72 hours. The signs may last 8 to 16 weeks or longer. In methadone-addicted new- borns, withdrawal begins later and lasts longer than heroin withdrawal. The onset varies. A newborn may exhibit signs beginning at 24 to 28 hours, or these early signs may improve, then reappear at 2 to 4 weeks of age. Other newborns exhibit no signs until they are 2 to 3 weeks old.

There is no predictable withdrawal sequence noted for the cocaine-addicted neonate. Whether cocaine causes long-term effects varies with different studies, but factors such as mal- adaptive coping behaviors may be present in such newborns (Bernstein & Weinstein, 2007).

Narcotic metabolites or quinine (heroin is often mixed with quinine) may be obtained from an infant's urine or meconium in the first hour after birth. These products are quickly cleared from the body, however, so by the time

symptoms become severe, detection of narcotic substances may no longer be possible. Cocaine may be detected in in- fants' hair samples for an extended time.

Infants of drug-dependent women usually seem most com- fortable when firmly swaddled. Keep them in an environment free from excessive stimuli (a small isolation nursery, not a large, noisy one). Some quiet best if the room is darkened. Many infants of heroin-addicted women suck vigorously and continuously and seem to find comfort and quiet if given a pacifier. Infants of methadone- and cocaine-addicted women

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Why is it important for infants of diabetic women to be fed early?

a. Their stomachs are empty at birth.
b. To help prevent hypoglycemia.
c. Their mothers could not eat during labor.
d. To clear mucus from their intestinal tracts.

may have extremely poor sucking ability and may have diffi-

culty achieving sufficient fluid intake unless gavage fed.

Specific therapy for an infant is individualized according to the nature and severity of the signs. Maintenance of elec- trolyte and fluid balance is essential. If an infant has vomit- ing or diarrhea, intravenous administration of fluid may be indicated. The drugs used to counteract withdrawal symp- toms include paregoric, phenobarbital, methadone, chlor- promazine (Thorazine), and diazepam (Valium). These are typically used if the neonatal abstinence scoring system aver- age score is elevated on three successive occasions and nurs- ing interventions do not reduce the score. An infant should not be breastfed to avoid passing narcotics in breast milk to the child.

Once an infant has been identified as having been exposed to drugs in utero, the mother needs treatment for withdrawal symptoms and follow-up care as much as the infant. In addi- tion, evaluation is necessary to determine before discharge whether an environment that allowed for drug abuse will be safe for an infant at home (Sun, Freese, & Fitzgerald, 2007). Infants who are exposed to drugs in utero may have long- term neurologic problems (Pulsifer et al., 2008).

An Infant With Fetal Alcohol Exposure

Alcohol crosses the placenta in the same concentration as is present in the maternal bloodstream. This results in fetal al- cohol exposure and fetal alcohol syndrome (Elias, Tsai, & Manchester, 2008). The syndrome appears in about 2 per 1000 newborns and is often more difficult to document than recreational drug exposure. Alcohol has deteriorating effects on the placenta (Burd et al., 1007). Because it is unknown if there is a safe threshold of alcohol ingestion during preg- nancy, all pregnant women are advised to avoid alcohol in- take to prevent any teratogenic effects on their newborn (Welch & Mullins, 2007).

The newborn with fetal alcohol syndrome has several pos- sible problems at birth. Characteristics that mark the syn- drome include prenatal and postnatal growth restriction; central nervous system involvement such as cognitive chal- lenge, microcephaly, and cerebral palsy; and a distinctive fa- cial feature of a short palpebral fissure and thin upper lip. During the neonatal period, an infant may be tremulous, fid- gety, and irritable and may demonstrate a weak sucking re- flex. Sleep disturbances are common, with the baby tending to be either always awake or always asleep, depending on the mother's alcohol level close to birth.

The most serious long-term effect is cognitive challenge. Behavior problems such as hyperactivity may occur in school- age children. Growth deficiencies may remain throughout life. An infant needs follow-up so any future problems can be dis- covered. The mother needs follow-up to see if she can reduce her alcohol intake for better overall health.

Key Points for Review 2MO -

- Priorities for infants born with special needs, such as preterm or postterm infants, are the same as for term in- fants: initiation and maintenance of respirations, estab- lishment of extrauterine circulation, control of body tem- perature, intake of adequate nourishment, establishment of waste elimination, establishment of an infant–parent relationship,

prevention of infection, and provision of de- velopmental care for mental and social development.

- Many high-risk infants need resuscitation at birth. Prompt action with such measures as warmth, oxygen, in- tubation, and suctioning are needed.
- A small-for-gestational-age infant is one whose birth weight is below the 10th percentile on an intrauterine growth curve for that age infant. An infant could be preterm, term, or postterm.
- Small-for-gestational-age infants have difficulty maintain- ing body warmth because of low fat stores and may de- velop hypoglycemia from low glucose stores.
- A large-for-gestational-age infant is one whose birth weight is above the 90th percentile on an intrauterine growth chart for that gestational age. The infant could be born preterm, term, or postterm.
- Large-for-gestational-age infants tend to be infants of dia- betic women; they are particularly prone to hypoglycemia or birth trauma.
- A preterm infant is one born before 37 weeks of gestation. Preterm infants have particular problems with respiratory function, anemia, jaundice, persistent patent ductus arte- riosus, and intracranial hemorrhage. Infants who are born weighing 1500 to 2500 g are also termed low-birth- weight infants; those born weighing 1000 to 1500 g are very-low-birth-weight infants; those born weighing be- tween 500 and 1000 g are extremely very-low-birth- weight infants. All such infants need intensive care from the moment of birth to give them their best chance of sur- vival without neurologic aftereffects caused by their being so close to the age of viability.
- A postterm infant is one who has remained in utero past week 42 of pregnancy. Postterm infants have particular problems with establishing respirations, meconium aspi- ration, hypoglycemia, temperature regulation, and poly- cythemia.
- Respiratory distress syndrome commonly occurs in preterm infants from a deficiency or lack of surfactant in the alveoli. Without surfactant, the alveoli collapse on ex-

piration and require extreme force for reinflation. Primary therapy is synthetic surfactant replacement at birth by en- dotracheal tube insufflation, followed by oxygen and ven- tilatory support.

Both need careful assessment for respiratory distress and hypoglycemia.

- Transient tachypnea of the newborn is a temporary con-

dition caused by slow absorption of lung fluid at birth. Close observation of the infant is necessary until the fluid is absorbed and respirations slow to a normal rate.

- Meconium aspiration syndrome occurs when an infant as- pirates meconium-stained amniotic fluid before or during birth. Meconium is irritating to the airway and leads to both airway spasm and pneumonia. Infants need oxygen, ventila- tory support, and possibly an antibiotic until the effects of the insult to the airway subside. Infants should be suctioned before oxygen administration under pressure to prevent meconium from being forced further into their lungs.
- Apnea is a pause in respirations longer than 20 seconds, with accompanying bradycardia. It tends to occur in preterm infants who have secondary stresses such as infec- tion, hyperbilirubinemia, hypoglycemia, or hypothermia. Apnea monitors are used to detect this, and infants who are at high risk for apnea may be discharged home on a home monitoring program.
- Sudden infant death syndrome is the sudden, unexplained death of an infant. It is associated with infants sleeping on their stomachs (prone) and preterm birth. An important preventive measure is advising parents to position their in- fant on the back for sleeping.

CRITICAL THINKING EXERCISES

- Hyperbilirubinemia results from the destruction of red

blood cells, owing either to a normal physiologic response or an abnormal destruction of red blood cells. Hemolytic disease of the newborn is destruction of red blood cells from Rh or ABO incompatibility. The administration of RHIG (Rh antibodies) to Rh-negative mothers during pregnancy and after the birth of an Rh-positive infant to an Rh-negative mother has greatly reduced the incidence of the condition. Affected infants are jaundiced from re- lease of bilirubin from injured red blood cells. Phototherapy and exchange transfusion are used to prevent kernicterus (deposition of bilirubin in brain cells, causing destruction of the cells).

- Hemorrhagic disease of the newborn is a lack of clotting ability resulting from a deficiency of vitamin K at birth. This disorder is prevented by administering vitamin K to infants at birth.
- Retinopathy of prematurity is destruction of the retina caused by exposure of immature retinal

capillaries to high levels of oxygen. Monitoring oxygen saturation via arter- ial blood gases is an important preventive measure.

- Severe infections acquired at birth that may be seen in newborns include streptococcal group B pneumonia, he- patitis B infection, ophthalmia neonatorum (gonococcal and chlamydial conjunctivitis), and herpesvirus infection. Assessing newborns for symptoms of these infections is an important nursing responsibility.
- Infants of women with diabetes and those of drug-abusing women are at high risk at birth for further complications.

CRITICAL THINKING SCENARIO

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Nursing Care of the Child Born With a Physical or Developmental Challenge

- ankyloglossia
- atresia
- cleft lip
- cleft palate
- developmental hip dysplasia
- fistula
- frenulum
- hydrocephalus

- meconium plug
- omphalocele
- polydactyly
- spina bifida
- stenosis
- syndactyly
- transillumination
- volvulus

Bobby Jo Sparrow, age 16, is a new mother whose child has been admitted to the neonatal intensive care unit because of a neural tube disorder and congenital hip dysplasia. Ms. Sparrow is obviously upset over the diagnosis. She says, “I’m a good person. The

After mastering the contents of this chapter, you should be able to:

1. Describe common physical and developmental birth disorders.
2. Identify National Health Goals related to children born physically or developmentally challenged that nurses can help the nation achieve.
3. Use critical thinking to analyze the effect of a physically or developmentally challenged child on a family and propose ways to make care more family centered.
4. Assess a child who is born physically or developmentally challenged.
5. Formulate nursing diagnoses for children born with a physical or developmental challenge.
6. Establish expected outcomes to meet the needs of a child with a physical or developmental challenge.
7. Plan nursing care to meet the needs of a child born with a physical or developmental challenge such as encouraging mobility.
8. Implement nursing interventions for care of children born with physical or developmental challenges, such as preventing infection in a child with a neural tube disorder.

9. Evaluate expected outcomes to determine achievement and effectiveness of care.
10. Identify areas related to physically or developmentally challenged infants that could benefit by additional nursing research or application of evidence-based practice.
11. Integrate knowledge of congenital physical or developmental challenges with the nursing process to achieve quality maternal and child health nursing care.

only thing I did wrong during pregnancy was to take some cough medicine, so how could this have happened?"
Previous chapters described the importance of assessing all infants at birth. This chapter adds information about common congenital anomalies or structural disturbances that may occur in newborns. This information can serve as a basis for newborn assessment and for health teaching for parents.

How would you answer this mother? What type of advice would be most helpful to her?

Few things can change the usually joyous tone of a birthing room faster than the birth of a baby with a physical or devel- opmental challenge. Physicians or nurse-midwives, who are used to saying "perfect boy" or "beautiful girl" and holding up the infant for the parents' first glance, are suddenly without words. Words of congratulations hang unsaid in the air.
When a child is born with an apparent physical or de- velopmental challenge, nurses must play a major role in supporting and educating the parents to help them move for- ward from this point. Some congenital disorders require surgery but the prognosis is good, so this is only a temporary concern. Other disorders, however, represent serious, even life-threatening concerns for infants and financially draining long-term responsibilities for parents. This chapter covers the physical congenital disorders that are apparent at birth or soon after. Such disorders primarily involve the gastrointesti- nal, neurologic, and skeletal systems. Congenital disorders of the cardiovascular system, which also represent life-threaten- ing problems for an infant, are addressed in Chapter 41. National Health Goals related to children with congenital anomalies are shown in Box 27.1.

Nursing Process Overview For Care of a Physically or Developmentally Challenged Child

Assessment

Nursing assessment of a physically or developmentally challenged newborn focuses on determining an infant's im- mediate physiologic needs required to sustain life and the parents' immediate emotional needs to promote bonding between the child and parents. Assess how the anomaly af- fects the infant's eight primary needs:

- Establishment and maintenance of adequate respiration
- Establishment of extrauterine circulation
- Establishment of normal body temperature
- Ability to take in adequate nourishment
- Establishment of waste elimination
- Prevention of infection
- Development of an infant–parent bond
- Exposure to adequate stimulation

The parents' response to the diagnosis of a congenital challenge must also be assessed. Anomalies that affect a child's appearance may have the most immediate effect on the parents' ability to establish a positive feeling about their child. It is important, however, not to jump to con- clusions about parents' responses. Assessment of the fam- ily's verbal and nonverbal responses may reveal parents ready to meet this infant's special needs.

Nursing Diagnosis

Many nursing diagnoses established for children who are physically or developmentally challenged address the effect of the disorder on body function, including the child's pri- mary needs, and also on family interaction. Examples of possible diagnoses are:

- Imbalanced nutrition, less than body requirements, related to inability to take in adequate nutrition secondary to physical challenge

- Impaired physical mobility related to congenital anomaly
- Risk for impaired parenting related to birth of child with congenital anomaly
- Anticipatory grieving (parental) related to loss of "perfect" child

Outcome Identification and Planning

Nurses play an important role in providing care to high- risk infants at birth and guarding their health until a child care team arrives to transport the infant to a high-risk nursery. When establishing expected outcomes and plan- ning care, be certain to consider both the short- and long- term needs of the newborn and how these needs may affect the family. Also consider the family's resources, both emotional and financial, and devise a plan of care with these in mind. Parents with supportive family members nearby may be able to accept the limits of a child's chal- lenge and turn their attention to the planned treatment regimen or care priorities sooner than those without close friends or relatives to whom they can turn for comfort and support. For the latter, you may need to act not only as a source of information and support but also as a sounding board and advocate until the parents can begin to develop positive coping mechanisms that will help them come to

terms with this unexpected event. Referrals for support groups may be beneficial, allowing parents to learn they are not alone in this situation. The following organizations can be helpful sources of support for parents: National

IMMEDIATE CARE AT THE BIRTH OF AN INFANT BORN PHYSICALLY OR DEVELOPMENTALLY CHALLENGED

Easter Bifida March

Seal Society (http://www.easterseals.com), Spina Association of America (http://www.sbaa.org), of Dimes Birth Foundation (http://www

Most physicians and nurse-midwives believe that relating the news of congenital physical or developmental anomalies to parents is their responsibility. However, because the physi-

.marchofdimes.com), and American Cleft Palate Foundation (http://www.cleftline.org).

Implementation

Nursing interventions for a baby born physically chal- lenged include immediate life-sustaining measures such as providing for adequate intake of nutrients when a disor- der prevents the infant from sucking. Educating the par- ents about pretreatment and posttreatment procedures and encouraging them to hold, touch, and talk with their baby are especially important to the future emotional well-being of the child and family.

Parents may suffer a loss of self-esteem with the child's birth, feeling as if the baby is proof that something in the combination of their genes or the prenatal environment they provided was inadequate. They may need to hear positive comments about themselves and need to be given support until they can realize that by caring for the child they are accomplishing more, not less, than other couples. You can expect parents to move through the same stages of grief as those whose child has died at birth. Chapter 56 describes those stages and helpful nursing in- terventions in more detail.

Parents are acutely aware of what people think of their child. They watch closely how nurses and other health care providers handle their baby to see if they are giving as much attention to their baby as to other babies. To encourage parents to accept the child, be certain to treat the child in the same manner as any other—for ex- ample, rocking the baby after feeding or cooing and talk- ing to the baby as much as with other babies. Otherwise, parents may think that if a professional finds their child distasteful, how will they dare show the child to their family and friends? If you are able to look past the anom- aly to the whole child, however, they begin to do so, too. Through positive role modeling, you can set the stage for healthy parent–child interaction every time you han- dle an infant born with a physical or developmental challenge.

Outcome Evaluation

Evaluation should focus on expected outcomes estab-

cian or nurse-midwife must deliver the placenta and suture the perineum if an episiotomy was used for birth, if a neona- tal specialist is not immediately available, many minutes may pass before this person is ready to make a second inspection of the baby, assess the extent of the disorder from the physi- cal symptoms present, and tell the parents about the baby's condition and prognosis. This delay affects the parents in two ways: It leaves them believing they have just given birth to a perfect child among people who do not share their en- thusiasm, or they have just given birth to a child so deformed all the professionals in the room find it too horrible to even talk to them. Because parents are aware of the atmosphere in a birthing room, the second response is by far more likely. In terms of parent–child interaction, this response is unhealthy. Parents may begin anticipatory grieving for what they believe is a severely deformed child. Even when they are told later the disorder is not extensive and is easily correctable, and that as soon as the correction is made the child will be fine, the anticipatory grief reaction may be hard to stop. They may continue to cut themselves off emotionally from their child. For this reason, nurses need to be familiar with the most frequently encountered physical or developmental anomalies so that as the person who at that moment in the birth process is most available for patient education, they can explain the problem to parents. In other instances, nurses must be ready to serve as back-up informants to answer parents' questions after they have been told by a primary care provider their
child has been born less than perfect (Glenny et al., 2009).
The causes of most congenital anomalies are unknown, al- though they probably arise from a combination of envi- ronmental and genetic factors. Still, many people persist in believing that infants with congenital anomalies are born to people less deserving than others or to those who have sinned or have been looked on by someone with envy during preg- nancy. That eating raisins during pregnancy causes brown spots, and that strawberries cause hemangiomas, are com- mon beliefs that are still prevalent.
New parents need explanation of their child's disorder and a chance to talk about why they believe their child's dis- order occurred, to relieve their guilt that they were the cause and to allow them to regain sufficient self-esteem to be able to raise a child with a congenital disorder.
It is probably best to explain to parents what the disorder

lished

for a child's physical health and developmental

consists of and what the usual prognosis is before showing the

needs, as well as the family's ability to cope with whatever special care and growth needs the child may have in the future. Be sure parents have numbers to call for questions, follow-up care, and support.
Evidence suggesting achievement of expected outcomes may include:

- Parent describes positive features of child by 2 weeks.
- Parents state they understand talipes anomaly is a correctable condition by 1 month.
- Child is ambulatory with walker by 2 years of age. ❧

baby to them. Parents may find it hard to look at an infant with a cleft lip or palate or exposed abdominal contents, for ex- ample, and also listen. Their minds are so consumed with the sight, so unlike the child they had imagined, that they cannot hear. A typical explanation would be: "Your baby's upper lip isn't completely formed. That's called a cleft lip. Your doctor will call one of the plastic surgeons here to look at your baby. This is a problem that can be repaired so well surgically you'll barely be able to tell your baby had this problem. I'll bring the baby over so you can see her. Remember when you look at her this can be repaired. She seems perfect in every other way."

These statements define and limit the problem for the parents. They also give them direction about where and how they should proceed in beginning to seek help for their child. As most congenital abnormalities involve surgery, be certain to plan for adequate pain assessment and management post- operatively to make the experience of surgery this early in life not an unbearable procedure for a neonate (American Academy of Pediatrics [AAP], 2007).

PHYSICAL AND DEVELOPMENTAL DISORDERS OF THE GASTROINTESTINAL SYSTEM

Many of the most common congenital anomalies involve the gastrointestinal system because the gastrointestinal tract forms first as a solid tube, then undergoes canalization. If this canalization does not occur, a partial or complete blockage or obstruction can occur. Other disorders of the tract, such as cleft lip and cleft palate, are the result of midline closure fail- ure extremely early in intrauterine life. All of these disorders can interfere with an infant's ability to take in nourishment at birth. You may need to reinforce a mother's resolve to breastfeed as appropriate to aid in her success with this method of feeding.

Ankyloglossia (Tongue-Tie)

Ankyloglossia is an abnormal restriction of the tongue caused by an abnormally tight frenulum, the membrane at- tached to the lower anterior tip of the tongue (Kelley et al., 2008). Normally, in newborns, the frenulum appears short and is positioned near the tip of the tongue. As the anterior portion of the infant's tongue grows, the frenulum becomes located farther back. In most instances, therefore, an infant suspected of being tongue-tied has a normal tongue at birth; it just seems short to parents who are unaware of a newborn's appearance. This condition rarely causes speech difficulty or destructive pressure on gingival tissue. If it does, then surgi- cal release can be performed, but this is rare.

Showing parents other newborns or photographs of nor- mal tongues is helpful in convincing them a short frenulum is normal. Explore with them why they are concerned. Is there a child in the family with a speech disorder or a cleft lip and palate? Do the parents need assurance in any other way that their child is all right?

Thyroglossal Cyst

A thyroglossal cyst arises from an embryogenic fault that leaves a cyst formed at the base of the tongue, which then drains through a fistula (opening) to the anterior surface of the neck (Lin & Deschler, 2008). This condition may occur as a dominantly inherited trait. The cyst may involve the hyoid bone (the bone at the anterior surface of the neck at the root of the tongue) or may contain aberrant thyroid gland tissue. As the cyst fills with fluid, swelling and obstruc- tion can lead to respiratory difficulty from pressure on the trachea. If infected, the cyst appears swollen and reddened, with drainage of mucus or pus from the anterior neck.

The cyst is surgically removed to avoid future infection of the space or, if thyroid tissue is present, the possibility of

developing thyroid carcinoma later in life. Observe infants closely in the immediate postoperative period for respiratory distress, because the operative area will develop some edema from surgical trauma. Position infants on their sides so se- cretions drain freely from their mouths. Intravenous fluid therapy is given after surgery until the edema at the incision recedes somewhat and swallowing is safe once more (approx- imately 24 hours). If the mother is breastfeeding but the in- fant is NPO, encourage her to express her milk manually to preserve her milk supply. Observe infants closely the first time they take fluid orally to be certain they do not aspirate. Be certain parents feed their infant before the infant is dis- charged from the surgical unit so they can see that the infant is swallowing safely. This is important to help them develop confidence in themselves as parents and their ability to feed the infant at home in a relaxed and comfortable way.

Cleft Lip and Palate

The maxillary and median nasal processes normally fuse be- tween weeks 5 and 8 of intrauterine life. In infants with cleft lip, the fusion fails to occur in varying degrees, causing this disorder to range from a small notch in the upper lip to total separation of the lip and facial structure up into the floor of the nose, with even the upper teeth and gingiva absent. The deviation may be unilateral or bilateral. The nose is generally flattened because the incomplete fusion of the upper lip has allowed it to expand in a horizontal dimension (see Fig. 7.12). Cleft lip is more prevalent among boys than girls. It occurs at a rate of approximately 1 in every 750 live births. This incidence is significantly higher in the Asian popula- tion, 1 in 300, and significantly lower in the black popula- tion, 1 in 2000. About 46% of children have combined cleft lip and palate, 21% only a cleft lip, and 33% only a cleft palate. Almost 30% of children with cleft lip and palate de- formity have associated birth defects or the cleft palate occurs as only a portion of a larger syndrome (Hoffman, 2008).

Cleft lip occurs as a familial tendency or most likely
occurs from the transmission of multiple genes. Formation may be aided by teratogenic factors present during weeks 5 to 8 of intrauterine life, such as a viral infection or possibly a

FIGURE 27.1 Appearance of a cleft palate. Both the hard and soft palate are involved.

deficiency of folic acid (Novak, 2007). Parents of a child with a cleft lip should be referred for genetic counseling to ensure they understand that they have about a 4% chance of having another child with a cleft lip or palate or future children are at a greater risk than usual for this problem.

The palatal process closes at approximately weeks 9 to 12 of intrauterine life. A cleft palate, an opening of the palate, is usually on the midline and may involve the anterior hard palate, the posterior soft palate, or both (Fig. 27.1). It may be a separate anomaly, but as a rule it occurs in conjunction with a cleft lip. As a single entity, it tends to occur more fre- quently in girls than boys. Like cleft lip, it appears to be the result of polygenic inheritance or environmental influences. In connection with cleft lip, the incidence is approximately 1 in every 1000 births. As a single entity, it occurs in approxi- mately 1 in every 2000 births (Hoffman, 2008).

Assessment

Cleft lip may be detected by a sonogram while an infant is in utero. If not detected then, it is readily apparent on inspec- tion at birth. Cleft palate can be determined by depressing the newborn's tongue with a tongue blade. This reveals the total palate and the extent of any cleft present. Be sure to have good lighting to visualize the palate clearly. Because cleft palate is a component of many

syndromes, a child with a cleft palate must be assessed for other congenital anomalies.

Therapeutic Management

If a cleft lip is discovered while the infant is still in utero, fetal surgery can repair the condition, although this procedure is not usually attempted. If the disorder is not discovered until birth, a cleft lip is repaired surgically shortly thereafter, often at the time of the initial hospital stay or between 2 and 10 weeks of age. Some infants may have a nasal mold apparatus applied before surgery to shape a better nostril (Ezzat et al., 2007). Because the deviation of the lip interferes with nutrition, in- fants may be a better surgical risk at birth than they are after a month or more of poor nourishment. Early repair also helps infants experience the pleasure of sucking as soon as possible. It is equally important from a psychological standpoint that these disorders be repaired early. Parents can find it extremely difficult to bond with an infant whose face is deformed in this way. This is not a sign of a "bad" parent, but it is reality and a problem that requires intervention. Because facial contours change as a child grows, a revision of the original repair or a nasal rhinoplasty to straighten a deviated nasal septum may be necessary when the child reaches 4 to 6 years of age.

The optimal time for repair of cleft palate is controversial as

early repair increases speech development but may result in a necessary second-stage repair as the child's palate arch grows. A two-stage palate repair, with soft palate repair at 3 to 6 months of age and hard palate repair at 15 to 18 months of age, may be recommended (van Aalst, Kolappa, & Sadove, 2008).

Currently, the results of surgical repair of cleft lip and cleft palate are excellent (Fig. 27.2). It is helpful to show parents photographs of babies with good repairs to assure them that their child's outcome can also be this successful. Do not use the older term for this condition, harelip, when talking with parents about the problem. Before modern surgical techniques were available, children were left with large lip scars, gross speech impediments, and a poor appearance after surgery. The

FIGURE 27.2 Infant showing surgical repair of cleft lip. Parents can be encouraged that the results of cleft lip repair are generally excellent. (Photo Researchers, Inc.)

word "harelip" tends to be associated with these negative out- comes rather than with the current positive outlook.

Because palate repair narrows the upper dental arch, there may be less space in the upper jaw for the eruption of teeth, causing poor teeth alignment. All children born with a cleft palate need follow-up treatment by a pedodontist, or a den- tist skilled in children's dental problems, so that as the child grows, extractions or realignment of teeth can be done as in- dicated (Cheng, Moor, & Ho, 2007). They also need follow- up to detect if speech or hearing difficulty occurs.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to feeding problem caused by cleft lip or palate

Outcome Evaluation: Newborn ingests an adequate diet of 50 kcal/lb (110 kcal/kg) in 24 hours; weight is maintained within 10% of birth weight.

Preoperative Period. Before a cleft lip or palate is re- paired, feeding the infant is a problem because the in- fant has difficulty maintaining suction (Glenny et al., 2009). In addition, it is important that the child does not aspirate.

It may be possible for an infant with a cleft lip to breastfeed because the bulk of the mother's breast tends to form a seal against the incomplete upper lip. Although the baby needs the enjoyment of sucking, some surgeons do not want a baby to breastfeed or suck on a nipple before surgical correction of the

disorder to avoid any local bruising of tissue. Therefore, the best feeding method for the child with cleft lip may be to support the baby in an upright position and feed the infant gently using a commercial cleft lip nipple. A Breck feeder, an apparatus similar to a bulb syringe, or a Haberman feeder may also be used (Fig. 27.3). If the surgical repair will be done immediately, the mother will be able to breastfeed as early as 7 to 10 days after surgery. Teach her how to pump or manually express breast milk to maintain a milk supply for this time. If surgery will be delayed for 1 month, she will need to de- cide whether she wants to continue to express milk for this long a period; continuing support from the nursing staff could be important to encourage her to do this.

Be certain an infant with a cleft lip is bubbled well after feeding because of a tendency to swallow air caused by the inability to grasp a nipple or syringe edge securely with the mouth. If a cleft extends to the nares, an infant will breathe through the mouth, caus- ing the oral mucous membranes and lips to become dry. Offering small sips of fluid between feedings can help keep the mucous membranes moist and prevent cracks and fissures that could lead to infection.

Infants with cleft palate cannot suck effectively ei- ther, because pressing their tongue or a nipple against the roof of their mouth would force milk up into their pharynx, leading to aspiration. The most successful

FIGURE 27.3 (A) Specialty feeding devices used for infants with cleft lip and cleft palate. (B) An infant uses a Haberman Feeder™.

method for feeding this infant, like the child with cleft lip, therefore, is to use a commercial cleft palate nipple that has an extra flange of rubber to close the roof of the mouth. The nipple can be used with a plastic bot- tle that can be squeezed gently to increase the flow of the feeding to compensate for poor sucking. A Breck feeder may also be used.

If surgery is delayed beyond 6 months of age or the time solid food would be introduced, teach parents to be certain any food offered is soft. Particles of coarse food could invade the nasopharynx and cause aspi- ration. Infants whose surgery is delayed to this point can be fitted with a plastic palate guard to form a syn- thetic palate and help prevent this.

Postoperative Period. After surgery for cleft lip or palate, an infant is kept NPO for approximately 4 hours. The infant is then introduced to liquids (plain water). Begin the process with only a small amount to prevent vomiting.

It is important that no tension is placed on a lip su- ture line; avoiding tension helps keep the sutures from pulling apart and leaving a large scar. During this im- mediate postoperative period, the infant is usually fed using a specialized feeder because this causes less suture line tension than bottle feeding or breastfeeding. After palate surgery, liquids are generally continued for the first 3 or 4 days, and then a soft diet is followed until healing is complete. Ask parents what fluids the child prefers so they can be available after surgery.

After a cleft palate repair, when children begin eat- ing soft food, they should not use a spoon, because they will invariably push it against the roof of the mouth and possibly disrupt sutures. If being fed rather than being allowed to use a spoon himself evokes an intense reaction, it is better to leave a child on a liquid diet until the sutures are removed. Be certain milk is not included in the first fluids offered because milk curds tend to adhere to the suture line. After a feed- ing, offer the child clear water to rinse the suture line and keep it as clean as possible.

Nursing Diagnosis: Risk for ineffective airway clear- ance related to oral surgery

Outcome Evaluation: Child's respiratory rate remains between 20 to 30 respirations per minute without re- tractions or obvious distress.

Because of the local edema that occurs after cleft lip or palate surgery, observe children closely in the im- mediate postoperative period for respiratory distress. Before surgery, the infant with a cleft lip breathed through the mouth. After surgery, the infant now has to learn to breathe through the nose, possibly adding to respiratory difficulty. Generally, however, this is not a problem because newborns normally are strict nose-breathers.

Infants may need suction to remove mucus, blood, and unswallowed saliva. When performing suctioning, be gentle and do not touch the suture line with the catheter. After cleft lip surgery, place infants on their side to allow mouth secretions to drain. Support them well so they do not turn onto their abdomen, as this could put pressure on the suture line, possibly tearing it. Placing them in an infant bouncy chair is another possibility.

Nursing Diagnosis: Impaired tissue integrity at incision line related to cleft lip or cleft palate surgery

Outcome Evaluation: Incision line appears clean and intact and free of erythema or drainage during post- operative period.

After cleft lip surgery, the suture line is held in close approximation by a Logan bar (a wire bow taped to both cheeks; Fig. 27.4) or an adhesive bandage such as a Band-Aid simulating a bar that brings together the incision line but does not cover the incision. Assess the Logan bar or Band-Aid–simulated bar after each feeding or cleaning of the suture line to be certain it is secure and continues to protect the suture line from tension. Furnish adequate pain relief so, if possible, the infant does not cry, because crying in- creases tension on the sutures. To help avoid crying, try to anticipate the infant's needs. Have formula ready to feed on demand—do not wait until after the infant is awake and crying. Help the parents use what- ever measures, such as rocking, carrying, or holding, that are necessary to make the infant feel secure and comfortable. The baby also will need to be bubbled well after a feeding because there is a tendency to swallow more air than the average infant.

Nothing hard or sharp must come in contact with a recent cleft suture line. Observe infants after palate repair carefully to be certain they do not put toys with sharp edges into their mouths. They should not use a straw to drink, nor should they brush their own teeth—they will certainly brush the suture line accidentally. Keep elbow restraints in place as necessary when no one is with them so they do not put their fingers in their mouth and poke or pull at the sutures. Most children run their tongue over their sutures because of the odd feeling in the roof of their mouth, and most children this age do not respond to a caution not to do this. Because this often occurs when children have nothing to think about, help the parents provide diversional activities such as reading or singing to them.

If parents will be continuing to give an analgesic such as acetaminophen (Tylenol) after they return home, be certain they are aware of the correct dosage and time schedule for administration. Be sure they can demonstrate measures to protect the suture line at home until healing is complete.

FIGURE 27.4 A Logan bar is an apparatus that may be used to protect the surgical incision for a cleft lip repair.

Nursing Diagnosis: Risk for infection related to surgical incision

Outcome Evaluation: Infant's temperature is below
98.6° F (37° C) axillary; incision site is clean, dry, and intact without erythema or foul drainage.
Infection, and subsequent scarring, may result if crusts from serous drainage are allowed to form on a cleft lip suture line. Most surgeons prescribe cleaning the suture line with sterile water, sterile saline, or 50% hydrogen peroxide in sterile water used with sterile cotton-tipped applicators after every feeding or when- ever the normal serum that forms on suture lines accumulates. Use a smooth, gentle, rolling motion to apply the solution. Do not rub, because this can loosen sutures. If hydrogen peroxide is used, it will foam as it reacts with the protein particles at the su- ture line. Rinse the area with sterile water afterward. Gently dry the suture line with a dry sterile cotton- tipped applicator. Remember that an infant has sutures on the inside of the lip that need the same meticulous care as those visible on the outside.
Nursing Diagnosis: Risk for impaired parenting related to the birth of an infant who is physically challenged
Outcome Evaluation: Parents state a belief in a positive outcome for child; demonstrate positive coping behav- iors, evidenced by holding and helping with infant care.
To promote bonding, parents need to hold and inter- act with their infant during both the preoperative and postoperative periods. Caution them the incision line will appear swollen in the immediate postoperative pe- riod. Reassure them this appearance will improve over time. As soon as the child's sutures have been re- moved, the infant may be bottle fed (with an ordinary bottle) or breastfed. Caution both the breastfeeding mother (who has been maintaining her milk supply through expression) and the formula-feeding mother that because the infant has never sucked before, time will be needed to learn, just as does a newborn.
Notice whether the parents look at their baby's face while feeding the baby. Help them to understand that any negative feelings directed toward the child or themselves, such as sadness or anger their baby was born this way, are normal. This does not instantly make them feel better about what has happened, but the knowledge that what they are experiencing is nor- mal can help them begin to deal with such emotions. Many communities have support groups for parents of children born with a cleft lip or palate. Referral to these groups can be helpful (Box 27.2).
Nursing Diagnosis: Risk for situational low self-esteem related to facial surgery
Outcome Evaluation: Child participates in normal childhood activities that involve contact with other people; states activities he or she enjoys at health care visits; demonstrates age-appropriate develop- mental milestones.

If a scar remains after cleft lip surgery, children may need some help adjusting to it until a cosmetic repair can be completed later in life. Reinforce children's positive attributes, stressing that the scar is only one small aspect of who they are. As children reach adolescence, you may need to review a familial inheri- tance pattern of cleft lip so they are informed of the possible risk of transmission to their own children.

Nursing Diagnosis: Risk for infection (ear) related to al- tered slope of eustachian tube with cleft palate surgery

Outcome Evaluation: Parents state possible signs and symptoms of ear infection and state importance of early treatment; parents list signs of diminished hearing and appropriate agencies for support and guidance.

Changing the contour of the palate when it is repaired also changes the slope of the eustachian tube to the middle ear. This can lead to a high incidence of middle ear infection (otitis media) because organisms are more readily able to reach this area from the oral cavity. Review the signs of infection such as fever, pain, pulling on the ear, or discharge from the ear with parents. Also remind them of the importance of report- ing pharyngeal infection to their primary care provider promptly so it can be treated before the infection spreads to the middle ear. Because the eustachian tube may remain partially closed because of its changed position, serous otitis media (accumulation of fluid in the middle ear) also tends to occur more

frequently in these children than in others. If this hap- pens, myringotomy tubes may be inserted to drain mid- dle ear fluid and help protect hearing (see Chapter 50). Be certain that parents understand the need for routine screening for hearing loss during childhood, because this is a common early sign of serous otitis media.

Nursing Diagnosis: Risk for impaired verbal communi- cation related to cleft palate

Outcome Evaluation: Family members voice satisfac- tion with child's speech; developmental milestone of clearly articulated two-word sentences by age 2 years is met.

Infants with a cleft palate will begin to make speech sounds at the normal time (age 2 months), although their speech may be guttural and harsh. By 9 months, when other infants begin to say meaningful words ("bye-bye," "mama," "dada"), assuming the cleft palate is still unrepaired, speech sounds will be un- clear. Some parents try to discourage their baby from talking, thinking if the child does not talk until after the cleft palate repair is made, a speech impediment will not develop. Speech occurs at a specified develop- mental time, however, and despite the unfused palate it should be encouraged at these age-appropriate times. A child with a cleft palate can enunciate vowel sounds with the most clarity, so these are the sounds a parent should encourage the child to voice. Words such as "me," "they," "no," "mama," "home," "moon," "rain," "yell," and "row" are words consisting largely of vowel sounds and can be enunciated most clearly by the child before a cleft palate repair.

Almost all children who have had cleft palates con- tinue to have accompanying speech problems after the repair (Brunnegard & Lohmander, 2007). The soft palate must function for the child to pronounce "p" and "b" sounds. If cleft palate surgery is going to be delayed much past age 2 years (as might happen if the child has other congenital anomalies, such as heart disease), a plastic prosthesis to cover the in- complete palate may be prescribed. This allows the child to articulate more normally.

Children do not spontaneously outgrow faulty speech patterns, so training by a speech therapist may be necessary. Commonly used exercises chil- dren are asked to perform include blowing games, such as blowing a feather or a table tennis ball (a blowing motion is what is required to pronounce "p" and "b").

Pierre Robin Syndrome

The Pierre Robin syndrome (also called Pierre Robin se- quence) is a triad of micrognathia (small mandible), cleft palate, and glossoptosis (a tongue malpositioned downward). It is an example of cleft palate occurring as only one part of a syndrome (Hoffman, 2008). It is rare, occurring only once in every 8500 births (Lidsky, Lander, & Sidman, 2008). Children may have associated disorders of congenital glau- coma, cataracts, or cardiac disorders. They need thorough physical and genetic assessments to be certain that none of these associated disorders are present.

Observe all infants with Pierre Robin syndrome carefully to be certain they are not developing an airway obstruction. They may need frequent nasopharyngeal suctioning to re- move unswallowed saliva. Beginning at birth, children with this syndrome are apt to have episodes in which they have difficulty breathing because, as a result of their small jaws, their tongues are too large for their mouths. This discrepancy causes the tongue to drop backward and obstruct the airway. Obstruction is most likely to occur when the child is in a supine position. Unlike well infants, no infant with this syn- drome should be placed in a supine position to sleep; they are in grave danger of anoxia if left in this position. Use a side- lying position instead. Occasionally, infants have such exten- sive airway obstruction that attaching a suture to the anterior aspect of the tongue and pulling it forward is used to provide relief. The suture is attached to the mucous membrane of the lower lip, creating an artificial tongue-tied condition.

Parents need instructions to feed these infants with the same care and concern given all children with cleft palate. A gastrostomy tube or button may be inserted to relieve feed- ing difficulty (see Chapter 37). As the child grows older, the jaw will grow somewhat, although the mandible will always be small. Growth, coupled with a repair of the cleft palate, will decrease the respiratory problems.

Parents of the child with Pierre Robin syndrome take on a great deal of responsibility when they assume their infant's care. Be certain

they have the name and number of a health care provider they can call when they have questions. Many of these parents grow exhausted during the first few weeks of their child's life, afraid they may fall soundly asleep at night and miss their child having respiratory difficulty. Using a respira- tory monitor at night can be helpful to give assurance that the infant is breathing. As parents' confidence grows in their abil- ity to provide care, this problem lessens, but it may be months or even years before a high level of confidence is achieved.

Tracheoesophageal Atresia and Fistula

Between weeks 4 and 8 of intrauterine life, the laryngotra- cheal groove develops into the larynx, trachea, and beginning lung tissue. The esophageal lumen forms parallel to this. A number of anomalies may occur if the trachea and esophagus are affected by some teratogen that does not allow the two or- gans to separate but remain connected.

Esophageal atresia is obstruction of the esophagus. Often a fistula (opening) occurs between the closed esophagus and the trachea. The five usual types of esophageal atresia that occur are:

1. The esophagus ends in a blind pouch; there is a tracheoe- sophageal fistula between the distal part of the esophagus and the trachea (see Fig. 27.5A).
2. The esophagus ends in a blind pouch; there is no con- nection to the trachea (see Fig. 27.5B).
3. A fistula is present between an otherwise normal esopha- gus and trachea (see Fig. 27.5C).
4. The esophagus ends in a blind pouch. A fistula connects the blind pouch of the proximal esophagus to the trachea (see Fig. 27.5D).
5. There is a blind end portion of the esophagus. Fistulas are present between both widely spaced segments of the esophagus and the trachea (see Fig. 27.5E).

These are all serious disorders because during a feeding, milk can fill the blind esophagus and overflow into the tra- chea, or a fistula can allow milk to enter the trachea, result- ing in aspiration. The incidence of tracheoesophageal fistula is approximately 1 in 3000 live births (Fowler & Lee, 2008).

Assessment

Tracheoesophageal atresia must be ruled out in any infant born to a woman with hydramnios (excessive amniotic fluid). Hydramnios occurs because normally a fetus swallows amni- otic fluid during intrauterine life. A fetus with a tracheoe- sophageal atresia cannot swallow, so the amount of amniotic fluid can grow abnormally large. Many infants with tracheoe- sophageal fistula are born preterm because of the accompany- ing hydramnios, compounding their original problem with immaturity. The infant needs to be examined carefully for other congenital anomalies that could have occurred from the

FIGURE 27.5 Esophageal atresia and tracheoesophageal fistula. (A) In the most common type of esophageal atresia, the esophagus ends in a blind pouch. The trachea communicates by a fistula with the lower esophagus and stomach (approximately 90% of infants with the defect have this type). (B) Both upper and lower segments end in blind pouches (5%–8% of infants with the defect have this type). (C) Both upper and lower segments communicate with the trachea (2%–3% of infants with the defect have this type). (D) Very rarely, the upper segment ends in a blind pouch and communicates by a fistula to the trachea, or (E) a fistula connects to both upper and lower segments of the esophagus.

teratogenic effect at the same week in gestation, such as verte- bral, anal, cardiac, tracheoesophageal, renal, and limb anom- alies (a VACTERL syndrome) (Pelluard-Nehme et al., 2007). If not diagnosed in utero, diagnosing a child who has a tracheoesophageal fistula before the infant is first fed is im- portant. Otherwise, the infant will cough, become cyanotic, and have obvious difficulty breathing as fluid is aspirated. Newborns who have so much mucus in their mouths that they appear to be blowing bubbles should be suspected of having tracheoesophageal fistula. The condition can be diagnosed with certainty if a catheter cannot be passed through the infant's esophagus to the stomach or the stom- ach contents cannot be aspirated. If doing this, use a firm catheter because a soft one will curl in a blind-end esopha- gus and appear to have passed. If a radiopaque catheter is used, it can be demonstrated coiled in the blind end of the esophagus on radiography. A flat-plate radiograph of the ab- domen or ultrasound also may reveal a stomach distended with the air that is passing from the trachea into the esoph- agus and stomach. Either a barium swallow or a bronchial endoscopy examination can also reveal the blind-end esoph- agus and fistula.

Therapeutic Management

Emergency surgery for the infant with tracheoesophageal fis- tula is essential to prevent the development of pneumonia from leakage of stomach secretions into the lungs or dehy- dration or an electrolyte imbalance from lack of oral intake. Antibiotics may be prescribed to help prevent infection. A gastrostomy may be performed (under local anesthesia) and the tube allowed to drain by gravity to keep the stomach empty of secretions and prevent reflux into the lungs. Upper right lobe pneumonia from aspiration is one

of the major complications of this disorder.

Surgery consists of closing the fistula and anastomosing the esophageal segments. It may be necessary to complete the surgery in different stages and to use a portion of the colon to complete the anastomosis if the esophageal segments are far apart from each other. Observe infants closely at post- operative days 7 to 10, when sutures dissolve, because leaks occurring at anastomosis sites can occur at this time. If this occurs, fluid and air leak out into the chest cavity, and pneu- mothorax (collapse of the lung) can occur.

In some infants, some stenosis or stricture at the anasto- mosis site remains. If this occurs, esophageal dilatation at pe- riodic intervals to keep the repaired esophagus fully patent may be necessary. Gastroesophageal reflux may also occur after a repair if the esophagus is left shorter than usual (Fowler & Lee, 2008). This can lead to recurrent fistula for- mation from the presence of stomach acid in the esophagus. The ultimate prognosis for children with this disorder will depend on the extent of the repair necessary, the condition of the child at the time of surgery, and the presence or absence of other congenital anomalies. If the defect is a simple fistula, it can be repaired by endoscopic technique and application of fibrin glue to seal the fistula (Richter et al., 2008). Even with larger disorders, if surgery can be performed before pneumo- nia develops, the prognosis is good. However, the mortality rate for the condition remains high because of the presence of other congenital disorders and low birth weight that often accompanies the tracheal abnormality.

Outcomes established for the child with tracheoe- sophageal fistula must be realistic in terms of the ex- tent of the disorder, the timing of anticipated surgery, and the stage of grief or readiness for decision mak- ing and planning the parents have reached.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to inability to take in oral feedings

Outcome Evaluation: Child maintains weight within 10% of birth weight; maintains weight in same percen- tile on growth curve.

Before surgery, because oral fluid cannot be given until the esophagus is repaired, intravenous therapy or total parenteral nutrition can supply fluid and calories. This is continued for a time after surgery until the possibility of vomiting from the anesthetic is decreased. Then the infant may be fed orally, may be continued on total parenteral nutrition, or may be started on gastrostomy feedings, depending on whether the surgery could be completed in one stage or not. Early introduction of oral fluid may help to ensure patency of the esophagus be- cause it helps to decrease adhesion formation at the anastomosis site and also allows the infant the enjoy- ment and practice of sucking. If formula is given by gastrostomy feedings, introduce it into the tube slowly and allow it to run by gravity pressure only to prevent fluid from entering the esophagus and putting pressure on the suture line. After the feeding, the end of the tube should be elevated, covered by sterile gauze, and kept in the elevated position. Do not clamp it closed. In this way, any air introduced during the feeding will bubble from the tube and not enter the esophagus and pass the fresh suture line. This also helps to ensure that if the infant should vomit the feeding, the vomitus will be pro- jected into the gastrostomy tube and will not contami- nate the fresh sutures. Most newborns enjoy sucking a pacifier during gastrostomy feedings for sucking plea- sure. If a mother wishes to breastfeed, she can manu- ally express breast milk for the gastrostomy feedings.

If the child is to return home to await a second-stage operation, the gastrostomy tube will be left in place for a month or two. Therefore, parents must learn how to do gastrostomy feedings. Be certain they know to con- tinue usual infant care, such as holding or talking to the infant in the face of this different feeding method.

Nursing Diagnosis: Risk for infection related to aspira- tion or seepage of stomach secretions into lungs

Outcome Evaluation: Child's temperature remains below 98.6° F (37° C) axillary; absence of rales on auscultation.

Preoperative Care. Before surgery, position the infant upright in an infant chair or on the right side to prevent gastric fluid from entering the lungs from the fistula. Because the infant cannot swallow mucus, frequent oropharyngeal suctioning is necessary. A catheter may be passed into the blind-end esophagus and attached to low continuous or intermittent suction to keep this segment of the esophagus from filling with swallowed saliva and causing aspiration from overflow. Irrigation of the catheter may be necessary to keep it patent, be- cause mucus tends to dry and plug it.

If surgery will be delayed, the infant may have a cervical esophagostomy (the distal end of the blind esophagus is brought to the surface just over the ster- num so that mucus can drain). Apply a protective oint- ment liberally to protect skin. Use absorbent gauze around the opening to absorb moisture and prevent excoriation of the skin. A consult by a wound, ostomy, and continence therapy nurse may be needed to pre- vent further skin irritation.

Keeping the infant under a radiant heat warmer with a high-humidity oxygen source helps to maintain body heat and liquefy bronchial secretions while awaiting surgery. Try to keep the infant from crying; with crying, air enters the stomach from the trachea, distending the stomach and possibly causing vomit- ing with aspiration into the lungs. A pacifier may help relax a baby and also satisfy a sucking need.

Postoperative Care. After surgery, the infant will have one or two chest tubes in place because the chest cavity was entered for the repair. The posterior tube drains collecting fluid; the anterior tube allows air to leave the chest space, re-expanding the lungs. Care of the child with chest tubes is discussed in Chapter 41. In the first few days after surgery, observe the in- fant closely for respiratory distress. Continue to suc- tion saliva from the mouth as ordered because mucus tends to accumulate in the pharynx from surgical

trauma. Suctioning must be done only shallowly, how- ever, to prevent the suction catheter from touching the suture line in the esophagus. Turn the child frequently to discourage fluid from accumulating in the lungs. Humidified oxygen helps to keep respiratory secre- tions moist. Keep an infant laryngoscope and endo- tracheal tube readily available at the bedside in case extreme edema develops, increasing the infant's risk
for airway obstruction.

Nursing Diagnosis: Risk for impaired skin integrity re- lated to gastrostomy tube insertion site

Outcome Evaluation: Skin surrounding gastrostomy tube remains clean and dry, without erythema.

Gastric secretions, which are highly acidic, may leak onto the skin from the gastrostomy site, leading to skin irritation. Protect the skin by using a cream or commer- cial skin protection system. Consulting with a wound, ostomy, and continence therapy nurse can be helpful to reduce the possibility of skin irritation.

Omphalocele

An omphalocele is a protrusion of abdominal contents through the abdominal wall at the point of the junction of the umbilical cord and abdomen (Fig. 27.6). The herniated organs are usually the intestines, but they may include stom- ach and liver. They are usually covered and contained by a

FIGURE 27.6 Omphalocele. This large example seen at birth contains intestine and liver. (Ansary/Custom Medical Stock Photograph.)

thin transparent layer of amnion and chorion with the um- bilical cord protruding from the exposed sac. When the de- fect is less than 4 cm, it is termed a hernia of the umbilical cord; when greater than 10 cm, it is a true omphalocele. This condition occurs because at approximately weeks 6 to 8 of in- trauterine life, the fetal abdominal contents, growing faster than the fetal abdomen, are extruded from the abdomen into the base of the umbilical cord. At 7 to 10 weeks, when the abdomen has enlarged sufficiently, the intestine returns to the abdomen. Omphalocele occurs when the abdominal con- tents fail to return in the usual way. The occurrence is asso- ciated with chromosomal aberrations. A previous association between serotonin-reuptake ingestion during pregnancy has proven to be false (Louik et al., 2007).

Assessment

The incidence of omphalocele is about 1 in 5000 live births. Many omphaloceles are diagnosed by prenatal sonogram. It may also be revealed by an elevated maternal serum α-feto- protein (MSAFP) examination (see Chapter 11) during preg- nancy (Smith & Henderson, 2007). If not, the presence of omphalocele is obvious on inspection at birth. When an om- phalocele is identified in utero, cesarean birth may be per- formed to protect the exposed intestine. If this is the only disorder identified, however, vaginal birth can be allowed to proceed. Be sure to document the omphalocele's general ap- pearance and its size in centimeters at birth.

Therapeutic Management

Most infants will have surgery within 24 hours to replace the bowel before the thin membrane surrounding it ruptures or becomes infected. It is often difficult to replace the entire bowel with immediate surgery because the infant's abdomen, which did not need to grow to accommodate the abdominal contents, is smaller than usual. If the total bowel were re- placed into this small abdomen, respiratory distress could re- sult from the pressure of the visceral bulk on the diaphragm and lungs. Also, the bowel might not have room for effective peristalsis. If the omphalocele is small, a one-stage repair may be possible (van Eijck et al., 2008). If large, one surgical ap- proach is the use of a prosthetic patch repair that bridges the

unformed gap on the abdomen with a synthetic material with the skin drawn tight and closed over the patch. A second ap- proach is to replace only a portion of the bowel. The remain- der is contained by a Silastic pouch termed a "silo" suspended over the infant's bed. Over the next 5 to 7 days, bowel is gradually returned to the abdomen. During this time, the in- fant can be fed by total parenteral nutrition to supply nutri- ents and keep the bowel from filling with air or stool.

Outcomes established for the infant with omphalocele must be realistic in terms of the extent of the disorder, the timing of anticipated surgery, and the stage of grief or readiness for decision making and planning that the parents have reached. Omphalocele is a shock to parents; it is a condition that is obviously se- vere yet one that is generally unknown.

Nursing Diagnosis: Risk for infection related to expos- ed abdominal contents

Outcome Evaluation: Child's temperature remains below 98.6° F (37° C) axillary; skin surrounding om- phalocele remains clean, dry, and intact, without ery- thema or foul drainage.

Before surgery, it is important that the lining of peri- toneum covering the omphalocele not be ruptured or allowed to dry out and crack; if this happens, infection and malrotation of the uncontained intestine can occur, complicating the surgical repair. Exposure of intestine to air also causes a rapid loss of body heat. Therefore, immediately place the baby in a warmed incubator. Do not leave the

infant under a radiant heat source because this will quickly dry the exposed bowel. To keep the sac moist, cover it with either ster- ile saline-soaked gauze or a sterile plastic bowel bag until surgery. Because of the large amount of exposed intestinal surface, the saline used must be at body temperature to prevent lowering body temperature. If the omphalocele is large, infants may be prescribed a topical application of a solution such as silver sulfadi- azine to prevent infection of the sac.

The prognosis for a final successful surgical repair is good. Except for a large abdominal scar, the child who had an omphalocele will be the child originally envisioned by parents. If the size of the scar is a prob- lem for the child in later life, cosmetic surgery can re- duce its appearance.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to exposed abdomi- nal contents

Outcome Evaluation: Child's weight remains within 10% of birth weight; skin turgor is good; specific grav- ity of urine is 1.003 to 1.030.

A nasogastric tube is inserted at birth to prevent in- testinal distention, which would enlarge the bowel lumen, making it even more difficult to replace. Do not feed the infant orally or allow the infant to suck on a

pacifier until the bowel repair is complete, as doing so would distend the exposed bowel with food or air and also make its return to the abdomen more difficult. Some infants have an accompanying volvulus (a twisting of the bowel causing obstruction), which is another reason to omit oral feedings. After surgery, the infant is maintained on total parenteral nutrition. Once the final stage of bowel repair is completed, a normal infant diet can be introduced gradually. Ob- serve infants carefully for signs of obstruction such as abdominal distention, constipation, diarrhea, or vomit- ing when they begin oral feedings.

Infants with omphalocele can be hospitalized or re- ceive home care for a long time (a minimum of 1 or 2 months) waiting for a second-stage or even a third- stage operation, depending on the extent of bowel in- volved. If the infant is hospitalized, encourage parents to visit frequently. Be sure the infant has age-appro- priate toys available for stimulation.

Parents can become distressed that their child's operation is being done in such small stages. Offer support to help them accept that this treatment method is the best way to manage this type of intesti- nal disorder.

Gastroschisis

Gastroschisis is a condition similar to omphalocele, except that the abdominal wall disorder is a distance from the um- bilicus, usually to the right, and abdominal organs are not contained by a membrane but rather spill freely from the ab- domen (Thilo & Rosenberg, 2008). Also, a greater amount of intestinal content tends to herniate, increasing the poten- tial for volvulus and obstruction. The condition occurs be- cause of ischemia to blood vessels that supply the abdominal wall during the first trimester of pregnancy. For unknown reasons, it is increasing in incidence from about 2 in 10,000 births to 4.5 per 10,000 births, particularly in young moth- ers (Lund, Bauer, & Berrios, 2007). The care and surgical procedure are the same as those for omphalocele. Children with gastroschisis often have decreased bowel motility, and even after surgical correction may have difficulty with ab- sorption of nutrients and passage of stool. Long-term follow- up may be necessary to ensure that nutrition and elimination are adequate (Raab, 2007).

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Intestinal Obstruction

If canalization of the intestine does not occur in utero at some point in the bowel, an atresia (complete closure) or stenosis (narrowing) of the fetal bowel can develop. The most common site of this occurrence is in the duodenum.

Obstruction may occur because the mesentery of the bowel twisted as the bowel re-entered the abdomen (after being contained in the base of the umbilical cord early in in- trauterine life) or from looseness of the intestine in the ab- domen after it has returned (Ingoe & Lange, 2007). This twisting pattern is termed a volvulus and continues to be a problem for the first 6 months of life until the infant devel- ops firmer intestinal supports. Obstruction also can occur be- cause of thicker-than-usual meconium formation, blocking the lumen (meconium plug or meconium ileus).

Assessment

Intestinal obstruction may be anticipated if the mother had hydramnios during pregnancy (swallowed amniotic fluid could not be absorbed effectively by the fetus) or if more than 30 mL of stomach contents can be aspirated from the newborn stomach by catheter and syringe at birth (fluid is not passing freely through the tract). If the obstruction is not revealed by either of these findings, then symptoms of intestinal obstruc- tion in the neonate are the same as at any other time in life: the infant passes no meconium or may pass one stool (meconium that formed below the obstruction) and then not pass any more; the abdomen becomes distended and tender. As the ef- fect of the obstruction progresses, the infant will vomit. Remember that many neonates spit up feedings when burped. This rapid ejection of milk smells barely sour. True vomiting is usually sour-smelling (stomach acid has acted on it) and oc- curs spontaneously without coughing or back-patting. 2MO -

Obstructions are rare above the ampulla of Vater, the junc- tion of the bile duct with the duodenum, so vomitus will be bile stained (greenish). Because meconium is black, vomitus may also be dark. Bowel sounds increase with obstruction be- cause of the increase in peristaltic action that occurs as the in- testine attempts to push stool pass the point of obstruction. Waves of peristalsis may be

apparent across the abdomen. The infant may evidence pain by crying—hard, forceful, indig- nant crying—and by pulling the legs up against the abdomen. The child's respiratory rate will increase as the intestine fills and the diaphragm is pushed up against the lungs and lung capacity decreases. An abdominal flat-plate radiograph or sonogram will reveal no air below the level of obstruction in the intestines. A barium swallow or barium enema x-ray film may be used to reveal the position of the obstruction.

Therapeutic Management

When bowel obstruction is confirmed, an orogastric or a naso- gastric tube is inserted and then attached to low suction or left open to the air to prevent further gastrointestinal distention from swallowed air (see Chapter 37). Always use low intermit- tent suction with decompression tubes in neonates. Pressure greater than this can irritate and ulcerate their stomach lining. Intravenous therapy is necessary to restore fluid, and im- mediate surgery is scheduled because bowel obstruction is an emergency that must be treated before dehydration, elec- trolyte imbalance, or aspiration of vomitus occurs (Ingoe & Lange, 2007).

Repair of the obstruction (with the exception of meconium plug syndrome) is accomplished by laparoscopy or through an abdominal incision. The area of stenosis or atresia is removed, and the bowel is anastomosed. If the repair is anatomically dif- ficult or the infant has other anomalies that interfere with over-

all health, a temporary colostomy may be constructed and the infant discharged to home care, with surgery rescheduled at about 3 to 6 months of age. Care of the child with a colostomy is discussed in Chapter 37. A final surgical procedure will re- store the child to full health unless a large portion of the bowel had to be removed, which would have an impact on nutrient absorption (short bowel syndrome).

Nursing Diagnosis: Risk for deficient fluid volume re- lated to vomiting

Outcome Evaluation: Child's skin turgor is good; pulse rate is 100 to 120 beats per minute; no further vomit- ing occurs; urine output is at least 30 mL/hr.

Once an obstruction is suspected, keep an infant NPO to prevent the bowel from filling, and compounding the problem, and to prevent vomiting and aspiration. Vomiting in neonates is always serious, not only be- cause aspiration may occur but also because infants lose fluid rapidly, which results in dehydration. They also lose chloride (a component of the hydrochloric acid found in stomach contents), and this leads to metabolic alkalosis. The body attempts to compensate for the loss of chloride by excreting potassium, which can cause infants to become hypokalemic quickly. Keeping an infant NPO, restoring fluid by intravenous therapy, and monitoring laboratory values for electrolyte balance until surgery can be scheduled are crucial.

Meconium Plug Syndrome

A meconium plug is an extremely hard portion of meconium that has completely blocked the intestinal lumen, causing bowel obstruction. The cause is unknown but probably re- flects normal variations of meconium consistency. Meconium plugs usually form in the lower end of the bowel because this meconium formed early in intrauterine life and has the best chance to become dry and obstruct the bowel lumen. It may be associated with Hirschsprung's disease and is strongly as- sociated with cystic fibrosis (Balfour-Lynn, 2008).

Assessment

Because the obstruction is low in the intestinal tract, signs of obstruction such as abdominal distention and vomiting may not occur for at least 24 hours. Typically, the infant will be identified first as an infant who has had no meconium passage and is past 24 hours of age. A gentle rectal examination may reveal the presence of hardened stool, although the plug may be too high up in the bowel to be palpated. A radiograph or sonogram may reveal distended air-filled loops of bowel up to the point of obstruction. A slightly hypertonic water-soluble contrast agent enema not only may reveal the level of ob- struction but also may be therapeutic in loosening the plug.

Therapeutic Management

The administration of saline enemas (never use tap water in newborns because it can lead to water intoxication) may

cause enough peristalsis to expel the plug. Instillation of ace- tylcysteine (Mucomyst) with diatrizoate (Hypaque) rectally may also be prescribed to dissolve the plug. Gastrografin, a highly osmotic radiographic substance, can be administered as an enema. The substance pulls fluid into the bowel be-

G2aS i),,, On the second day of life you notice Baby Sparrow, who was born with meconium staining, is spitting up green mucus? Would it be safe to assume this is meconium-stained mucus? Is there a possibility the baby is vomiting bile-stained vomitus?

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cause of its low osmotic pressure, allowing the stool to soften and the plug to pass. Infants need to be well hydrated before

and after the procedure or they can become hypovolemic from the effect of the contrast medium.

Once the thickened portion of meconium has been passed, the infant should have no further difficulty and, over the next several hours, may pass a great amount of stool. Observe the infant for further passage of meconium (should occur at least once daily) over the next 3 days, however, to be certain that additional plugs do not exist farther up in the bowel. If an in- fant is going to be discharged before this time, instruct par- ents on the importance of observing for meconium and also about phoning their primary care provider should the infant have no further bowel movements while at home.

Occasionally, a neonate passes a small plug of hardened meconium—hard enough it would have caused an obstruc- tion except that it is so small—in the first 1 or 2 days of life. Be certain to record and report such a finding, because the infant will need close observation for continued defecation, the same as for the infant who actually had an obstruction, to be certain that there is not a larger and truly obstructing plug higher in the bowel.

Assess the family history of a newborn who has a meco- nium plug for cystic fibrosis, a recessively inherited disorder (see Chapter 40), or aganglionic megacolon (Hirschsprung's disease), a polygenic inherited disorder (see Chapter 45), as these disorders may be the cause of the hardened meconium. Hypothyroidism is yet another disorder that may present with constipation or hardened stool in newborns. Additional signs of hypothyroidism include a large protruding tongue, lethargy, and subnormal body temperature. Both hypothy- roid and cystic fibrosis screening is done along with phenyl- ketonuria screening. Be certain this blood test is obtained in any newborn with a meconium plug.

Meconium Ileus

Meconium ileus (obstruction of the intestinal lumen by hard- ened meconium) is a specific phenomenon that occurs almost exclusively in infants with cystic fibrosis (Kerby et al., 2008). It reflects extreme meconium plugging. A genetically recessive disease, with cystic fibrosis, the enzyme that moistens and makes all body fluids free-flowing is absent. All body fluids are therefore thick and tenacious. Cystic fibrosis (see Chapter 40) is most often thought of as a lung disorder, because the most severe manifestation of tenacious secretions is in the lung; tenacious lung fluid leads to stasis and infection and alveolar obstruction that reduces air exchange. Intestinal and pancre- atic secretions are affected also, however, and this may be sig- naled at birth by hardened obstructive meconium at the ileus level from lack of pancreatic trypsin secretion (meconium ileus). This will lead to the usual symptoms of bowel obstruc- tion: no meconium passage, abdominal distention, and vom- iting of bile-stained fluid. If the obstruction is too high for enemas to reduce it, the bowel must be incised and the hard- ened meconium removed by laparotomy. The infant must be further assessed for cystic fibrosis in the following months.

Diaphragmatic Hernia

A diaphragmatic hernia is a protrusion of an abdominal organ (usually the stomach or intestine) through a defect in the diaphragm into the chest cavity. This usually occurs on the left side, causing cardiac displacement to the right side of the chest and collapse of the left lung. It occurs in approxi- mately 1 in 2000 to 4000 live births. There is no difference between male and female incidence (Warner, 2007).

It occurs because early in intrauterine life, the chest and abdominal cavity are one; at approximately week 8 of growth, the diaphragm forms to divide them. If the diaphragm does not form completely, the intestines can herniate through the diaphragm opening into the chest cavity (Fig. 27.7).

Assessment

Diaphragmatic hernia is occasionally detected in utero by a sonogram. If extreme, surgery to remove the bowel from the chest can be attempted by fetoscopy while the fetus is still in utero. More often, however, the condition is diagnosed at birth. Newborns with a diaphragmatic hernia will have res- piratory difficulty from the moment of birth, because at least one of the lobes of their lungs cannot expand completely (and may not have fully formed). Their abdomen generally appears sunken because it is not as filled with intestine as in the normal newborn. Breath sounds will be absent on the affected side of the chest cavity. There may be cyanosis and intercostal or subcostal retractions. These infants have a po- tential for developing persistent pulmonary hypertension be- cause blood cannot perfuse readily through the unexpanded lung. This leads to right-to-left shunting through the fora- men ovale in the heart and also causes the ductus arteriosus to remain patent. One condition, then, has led to another,

FIGURE 27.7 Diaphragmatic hernia. The bowel loop in the chest compresses the heart and lung on that side.

and heart involvement complicates an already complicated lung picture. The mechanics of right-to-left heart shunts are further discussed in Chapter 41.

Therapeutic Management

Although surgical repair may be delayed until an infant is bet- ter stabilized, treatment is usually an emergency surgical re- pair of the diaphragm and replacement of the herniated intes- tine back into the abdomen (Moyer et al., 2009). A surgical repair can be accomplished by laparoscopy, a helpful tech- nique for newborns as it requires less anesthesia and cold ex- posure (Harres, 2007). Difficult repairs may require a thoracic incision and the placement of chest tubes. If the disorder of the diaphragm is large, an insoluble polymer (Teflon) patch may be used in reconstruction. The repair is complicated if there is not enough room in the abdomen for the intestine to be returned. In these infants, the abdominal incision may not be closed but left open to allow the intestine to protrude ab- dominally. It is covered by silicone elastomer (Silastic) and left to be closed at a later date after the abdomen has grown. Over the next week, the compressed lung (if it is normal) will gradually expand and begin to function. If it is hy- poplastic from the pressure of the intestine in utero, it will not expand; it will be removed at the time of surgery. Because of poor lung compliance, the infant's postoperative course is often complicated by severe pulmonary hypertension, per- haps requiring therapy with high-frequency oscillatory ven- tilation, inhaled nitric oxide, or extracorporeal membrane oxygenation (ECMO). The mortality rate of children with diaphragmatic hernia ranges from 25% to 40%, with death often because of associated anomalies of the heart, lung, and intestine (Thilo & Rosenberg, 2008).

Nursing Diagnosis: Risk for ineffective airway clear- ance related to displaced bowel

Outcome Evaluation: Child's respiration rate is 30 to 50 breaths per minute; PO_2 is 60 to 100 mm Hg; PCO_2 is 30 to 35 mm Hg; lungs are clear to auscultation.

The infant with a diaphragmatic hernia breathes bet- ter with the head elevated, as this allows the herniated intestine to fall back as far as possible into the ab- domen, providing a maximum amount of respiratory space in the chest. Positioning the infant so the com- pressed lung is down also allows the unaffected lung to expand most completely. A nasogastric tube or a gastrostomy tube is inserted immediately to prevent distention of the herniated intestine, which would cause further respiratory difficulty. Be certain only low intermittent suction is used to avoid injuring the lining of the stomach. Keep the infant NPO, again, to pre- vent the bowel from filling and becoming distended.

After surgery, continue to maintain the infant in a semi-Fowler's position in an infant chair to keep the pressure of the replaced intestine off the repaired diaphragm. Keep the infant in a warmed humidified environment to encourage lung fluid drainage from

the now uncompromised lungs. Suction the airway as necessary. Chest physiotherapy may be ordered to ensure that lung secretions do not pool and to prevent pneumonia. Positive-pressure ventilation may be ordered to increase lung expansion, although this pressure is kept to a minimum to prevent tearing the undeveloped or previously unopened lung tissue. Maintaining arterial oxygen (PO_2) at a high level of 100 mm Hg and the PCO_2 at a low level of 30 to 35 mm Hg may help to prevent arterial vasoconstriction of the hy- poplastic lung, thereby improving lung function.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to NPO status

Outcome Evaluation: Child's skin turgor remains good; weight is maintained within 10% of birth weight or be- tween a percentile curve on growth chart.

After surgery, to prevent pressure on the suture line in the diaphragm by a full stomach and bowel, nutrition will be supplied intravenously, such as with total par- enteral nutrition. When starting oral feedings, be cer- tain to bubble the infant well after feeding to reduce the amount of swallowed air and limit bowel pressure against the diaphragm.

Umbilical Hernia

An umbilical hernia is a protrusion of a portion of the intestine through the umbilical ring, muscle, and fascia surrounding the umbilical cord (Skandalakis et al., 2007). This creates a bulging protrusion under the skin at the umbilicus. It is rarely notice- able at birth while the cord is still present but becomes increas- ingly noticeable at health care visits during the first year.

Umbilical hernias occur most frequently in African American children and more often in girls than in boys. The structure is generally

1 to 2 cm (0.5 to 1 in) in diameter but may be as large as an orange when children cry or strain. The size of the protruding mass is not as important as the size of the fascial ring through which the intestine protrudes. If this fascial ring is less than 2 cm, closure will usually occur spon- taneously and no repair of the disorder will be necessary. If the disorder is more than 2 cm, surgery for repair will gener- ally be indicated to prevent herniation and intestinal ob- struction or bowel strangulation. This usually is done when the child is 1 to 2 years of age.

Some parents believe that holding an umbilical hernia in place by using "belly bands" or taping a silver dollar over the area will help to reduce the hernia. These actions can actually lead to bowel strangulation and should be avoided.

Surgery is generally accomplished on an ambulatory out- patient basis. The child returns from surgery with a pressure dressing, which remains in place until the sutures are well healed. Remind parents to sponge-bathe the child until they return for a postoperative visit and the dressing is removed. If the child is not yet toilet-trained, they need to keep diapers folded down below the dressing to prevent contaminating the suture line with stool.

Imperforate Anus

Imperforate anus (Fig. 27.8) is stricture of the anus (Vick et al., 2007). In week 7 of intrauterine life, the upper bowel elongates

FIGURE 27.8 Imperforate anus. The lower bowel ends in a blind pouch.

to pouch and combine with a pouch invaginating from the per- ineum. These two sections of bowel meet, the membranes be- tween them are absorbed, and the bowel is then patent to the outside. If this motion toward each other does not occur or if

was investigated. Currently, because newborns are discharged at 2 or 3 days or even a few hours after birth, possibly no one will notice that an infant has not passed a stool in that time. For an infant born in a birthing center or at home, follow-up, therefore, must include assessment of whether the infant is defecating. Collect a urine specimen on infants with imperfo- rate anus so it can be examined for the presence of meconium to help determine whether the child has a rectal–bladder fis- tula. Placing a urine collector bag over the vagina in girls may reveal a meconium-stained discharge or a rectovaginal fistula.

Therapeutic Management

The degree of difficulty in repairing an imperforate anus de- pends on the extent of the problem. If the rectum ends close to the perineum (below or at the level of the levator ani mus- cle) and the anal sphincter is formed, repair involves simple anastomosis of the separated bowel segments. The repair be- comes complicated if the end of the rectum is at a distance from the perineum (above the levator ani muscle) or the anal sphincter exists only in an underdeveloped form. All repairs are complicated if a fistula to the bladder or vagina is present. If the repair will be extensive, the surgeon may create a tem- porary colostomy, anticipating final repair when the infant is somewhat older (6 to 12 months). For a successful repair, it is unnecessary for an internal rectal sphincter to be present as long as the subrectal muscle is judged to be intact.

the membrane between the two surfaces does not dissolve, im- perforate anus occurs. The disorder can be relatively minor, re- quiring just surgical incision of the persistent membrane, or much more severe, involving sections of the bowel that are many inches apart with no anus. There may be an accompany-

ing fistula to the bladder in boys and to the vagina in girls, fur- ther complicating a surgical repair. The problem occurs in ap- proximately 1 in 5000 live births, more commonly in boys than in girls. Imperforate anus may occur as an additional complica- tion of spinal cord disorders, because both the external anal canal and the spinal cord arise from the same germ tissue layer.

Assessment

The condition may be detected by a prenatal sonogram. It is definitely discovered at birth when inspection of a newborn's anal region reveals that no anus is present, although this ob- servation may not be helpful, because the anus can appear nor- mal and the condition can still exist far inside, so that it is missed on simple inspection. Occasionally, the condition may be revealed because a membrane filled with black meconium can be seen protruding from the anus. A "wink" reflex (touch- ing the skin near the rectum should make it contract) will not be present if sensory nerve endings in the rectum are not intact. If these methods fail to detect the condition, it can be discovered in a newborn by the inability to insert a rubber catheter into the rectum. No stool will be passed, and abdom- inal distention will become evident. A radiograph or sonogram will reveal the disorder if the infant is held in a head-down po- sition to allow swallowed air to rise to the end of the blind pouch of the bowel. This method is also helpful to estimate the distance the intestine is separated from the perineum or the ex- tent of the correction that will be necessary.

Formerly, when all newborns stayed in the hospital 3 to 4 days after birth, imperforate anus was always discovered. When infants failed to pass stools after the first 24 hours, the reason

Nursing Diagnosis: Imbalanced nutrition, less than body requirements, related to bowel obstruction and inability for oral intake
Outcome Evaluation: Child's weight remains within 10% of birth weight or is maintained on a percentile curve on a growth chart; skin turgor is good.

Preoperative Care. Before surgery, keep the infant NPO to avoid further bowel distention. A nasogastric tube attached to low intermittent suction for decom- pression will be inserted to relieve vomiting and prevent pressure on other abdominal organs or the di- aphragm from the distended intestine. Intravenous therapy or total parenteral nutrition will be started to maintain fluid and electrolyte balance.

Postoperative Care. The newborn will return from surgery with a nasogastric tube still in place. When bowel sounds are present and the nasogastric tube is removed, small oral feedings of glucose water, for- mula, or breast milk can be begun.

Some infants, who are scheduled for repair in a second-stage operation and who have a temporary colostomy, are not permitted high-residue foods to lessen the bulk of stools. Although this is rarely a problem with infants because their diet naturally is a low-residue one, do not assume that parents know what low residue means. Examples include rice cereal and strained fruits and vegetables. They should avoid unrefined rice and grains, vegetables with fibers, or fruits with peels.

Nursing Diagnosis: Impaired tissue integrity at rectum related to surgical incision
Outcome Evaluation: Incision line remains free of ery- thema or drainage until it heals by about day 7 after surgery.

If a rectal repair was completed, remember there is a fresh suture line at the rectum. Take axillary or tym- panic temperatures rather than rectal temperatures to avoid loosening a suture. Infants should also have no enemas, suppositories, or any other intrusive rectal procedures. It might be helpful to hang a sign above the infant's crib cautioning against any intrusive rectal procedure. Infants may be given a stool softener daily to keep the stool from becoming hard and tearing the healing suture line. Clean the suture line well after bowel movements by irrigating it with normal saline. Placing a diaper under, not on, the infant may be help- ful so bowel movements can be cleansed away as soon as they occur. Do not place the infant on the ab- domen because, in this position, newborns tend to pull their knees under them, causing tension in the perineal area. A side-lying position is best.

An infant may need rectal dilatation done once or twice a day for a few months after surgery to ensure proper patency of the rectal sphincter. Review this technique (gently inserting a lubricated cot-covered finger into the rectum) with the parents and document that they are able to perform this procedure before the child is discharged. Be certain they also understand the importance of the procedure. The best surgical re- pair could end in failure if constriction occurs because the parents do not follow up with this procedure. If in- fants are to be discharged with a prescription for a daily stool softener, be certain parents understand why this is also important and have a plan for remem- bering the correct times and dosage.

Nursing Diagnosis: Risk for impaired parenting related to difficulty in bonding with infant ill from birth
Outcome Evaluation: Parents hold and comfort infant; describe positive characteristics of infant.

An imperforate anus may be a difficult anomaly for a parent to accept because it deals with a body area that they may not feel comfortable discussing. If it in- volves a temporary (or permanent) colostomy, learn- ing to care for their infant may be difficult. For these reasons, parents need a great deal of support fol- lowing the diagnosis. If a final surgical repair can be completed, they can be assured their child will have normal bowel function thereafter. If a final repair could not be surgically achieved, they have the even harder task of caring for a child with a permanent ostomy. They can be assured that children who always have ostomies accept these well as they grow older be- cause they have never known any other method of defecation (see Chapter 37 for a discussion of care priorities for the child with an ostomy).

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What is an important nursing measure for a newborn with a di- aphragmatic hernia?

PHYSICAL AND DEVELOPMENTAL DISORDERS OF THE NERVOUS SYSTEM

The most common developmental disorders of the nervous system at birth include abnormal accumulation of cere- brospinal fluid (CSF) (hydrocephalus), which has several causes, and abnormalities associated with neural tube closure (meningocele or spinal dysraphism). All these are the result of multifactoral inheritance as well as nutritional deficits (Donahue, 2008).

Hydrocephalus

CSF is formed in the first and second ventricles of the brain and then passes through the aqueduct of Sylvius and the fourth ventricle to empty into the subarachnoid space of the spinal cord, where it is absorbed. Hydrocephalus is an excess of CSF in the ventricles or the subarachnoid space (Moe, Benke, & Bernard, 2008). In the infant whose cranial sutures are not firmly knitted, this excess fluid causes enlargement of the skull. If fluid can reach the spinal cord, the disorder is called com- municating hydrocephalus or extraventricular hydrocephalus. If there is a block to such passage of fluid, the disorder is an ob- structive hydrocephalus or intraventricular hydrocephalus. Hydrocephalus is also classified regarding whether it occurs at birth (congenital) or from an incident later in life (acquired). The cause of congenital hydrocephalus is unknown, although maternal infection such as toxoplasmosis or infant meningitis may be factors (Smith & Henderson, 2007).

An excess of CSF in the newborn occurs for one of three main reasons:

- Overproduction of fluid by a choroid plexus in the first or second ventricle, as could occur from a growing tumor (rare).
- Obstruction of the passage of fluid in the narrow aque- duct of Sylvius (the most common cause). Other common sites of obstruction include the foramina of Magendie and Luschka, the openings that allow fluid to leave the fourth ventricle. Obstruction occurs because infections such as meningitis or encephalitis may leave adhesions behind that block fluid flow. Hemorrhage from trauma or a growing tumor also may obstruct the passage of CSF. An Arnold-Chiari disorder (elongation of the lower brain stem and displacement of the fourth ventricle into the upper cervical canal) is yet another cause.
- An interference with the absorption of CSF from the sub- arachnoid space if a portion of the subarachnoid membrane is removed, as occurs with surgery for meningocele, or after extensive subarachnoid hemorrhage, when portions of the membrane absorption surface become obscured.

Assessment

Hydrocephalus occurs in approximately 3 to 4 per 1000 live births (Moe, Benke, & Bernard, 2008). With an obstruction present, excessive fluid accumulates and dilates the system above the point of obstruction. If the atresia is in the aque- duct of Sylvius, the first, second, and third ventricles will di- late. If it is at the exit from the fourth ventricle, all ventricles will dilate. Symptoms may develop rapidly or slowly, de- pending on the extent of the atresia.

If hydrocephalus is present prenatally, it can sometimes be detected on a prenatal sonogram and can even be shunted in utero. The condition is generally not evident during preg- nancy or even at birth, however, because of the effect of in- trauterine pressure. It becomes evident in the first few weeks or months of life. The infant's fontanelles widen and appear tense, the suture lines on the skull separate, and the head di- ameter enlarges. As the fluid accumulation continues, the scalp becomes shiny and scalp veins become prominent. The brow bulges forward (bossing), and the eyes become "sunset eyes" (the sclera shows above the iris because of upper lid re- traction). Infants show symptoms of increased intracranial pressure, such as decreased pulse and respirations, increased temperature and blood pressure, hyperactive reflexes, strabis- mus, and optic atrophy. They may become either irritable or lethargic, and they fail to thrive. They may have a typical shrill, high-pitched cry (Box 27.3).

Treatment is most effective when the disorder is recognized early, because once intracranial pressure becomes so acute that brain tissue is damaged and motor or mental deterioration re- sults, even the best shunting procedure cannot replace and re- pair this damage to the brain cells. Assisting with detection of hydrocephalus is an important role for nurses in ambulatory child health settings. All children under age 2 years should have their head circumference recorded and plotted on an appropri- ate growth chart at health care visits, so a child whose head is growing abnormally can be detected (Zahl & Wester, 2008).

Measure the head circumference of all infants within an hour of birth and again before discharge from the health care facility to establish a baseline. Older children who have suf- fered head trauma severe enough to be seen in a medical fa- cility should have their head circumference noted at the time of the accident; then, if other symptoms of increased in- tracranial pressure appear, this head circumference measure- ment may be a meaningful part of the store of information available concerning the child's condition.

In addition to the general enlargement of the head, note any asymmetry that is occurring, because this may suggest the point of obstruction. A skull that is enlarging anteriorly with a shallow posterior fossa, for example, suggests the ob- struction is in the aqueduct or third ventricle.

The infant's motor function becomes impaired as the head enlarges, because of both neurologic impairment and atrophy caused by the inability to move such a heavy head. However, as long as a child has more than 1 cm of cerebral tissue present, motor function often is not impaired. Even with an extremely enlarged head, children's intelligence may remain normal, al- though fine motor development may be affected.

That hydrocephalus is present can be demonstrated by ul- trasound, computed tomography (CT), or magnetic resonance imaging (MRI). A skull x-ray film will reveal the separating su- tures and thinning of the skull. Transillumination (holding a bright light such as a flashlight or a specialized light [a Chun gun] against the skull with the child in a darkened room) will reveal the skull is filled with fluid rather than solid brain (Fig. 27.9). If the hydrocephalus is a noncommunicating type, dye inserted into a ventricle through the anterior fontanelle will not appear in CSF obtained from a lumbar puncture.

Therapeutic Management

The treatment of hydrocephalus depends on its cause and ex- tent. If it is caused by overproduction of fluid, acetazolamide (Diamox), a diuretic, may be prescribed to promote the ex- cretion of this excess fluid. Destruction of a portion of the choroid plexus may be attempted by ventricular endoscopy, or if a tumor in that area is responsible for the overproduc-

FIGURE 27.9 An infant with hydrocephalus. Transillumination reveals a fluid-filled skull. (Southern Illinois University/Photo

Researchers, Inc.)

Catheter
in enlarged ventricle

Subcutaneous catheter

Loop of catheter in peritoneum
to accommodate growth
FIGURE 27.10 A ventriculoperitoneal shunt removes excessive cerebrospinal fluid from the ventricles and shunts it to the peritoneum. A one-way valve is present in the tubing behind the ear.

tion of fluid, removal of the tumor should provide a solution. Hydrocephalus is usually caused by obstruction, however, so the treatment usually involves laser surgery to reopen the route of flow or bypassing the point of obstruction by shunting the fluid to another point of absorption.

As ventricular endoscopy is perfected and obstructions in the third or fourth ventricle can be relieved, the next generation of children with hydrocephalus may not need artificial shunting. Children today may still undergo a shunting procedure, however, and you may care for many older children or adults who have shunts in place (Komolafe, Adeolu, & Komolafe, 2008). A shunting procedure involves threading a thin polyethylene catheter under the skin from the ventricles to the peritoneum (Fig. 27.10). Fluid drains via this route into the peritoneum and is absorbed across the peritoneal membrane into the body circulation. This type of shunt usually has to be replaced as the child grows or it will become too short. As another complication, it could become enclosed in a fold of peritoneum and become obstructed or it could become infected (Box 27.4).

The ultimate prognosis for a child with hydrocephalus depends on whether brain damage occurred before shunting and, if a shunt is in place, whether the parents can recognize when it needs to be replaced to prevent increased intracranial pressure.

Nutrition and parent–child bonding are two major concerns for the infant with hydrocephalus. Box 27.5 on

nursing care planning illustrates these and other concerns.

Nursing Diagnosis: Risk for ineffective cerebral tissue perfusion related to increased intracranial pressure

Outcome Evaluation: Child shows no increased tem- perature or blood pressure, or decreased pulse rate, decreased respiratory rate, or decreased level of con- sciousness; PERLA (pupils equal and reactive to light

BOX 27.5 ✻ Focus on Nursing Care Planning

A Multidisciplinary Care Map for a Child With Hydrocephalus

At 3 months of age, Baby Sparrow develops hydro- He has a ventriculoperitoneal shunt inserted. cephalus after repair of his neural tube disorder.

Family Assessment ✻ Child lives with 16-year-old parents and four of mother's siblings. mechanic; visits in- attending school be- as yet. Mother surgery. "This'll fix everything, right? I want a healthy baby." Scalp veins prominent. Eyes appear sunset. Parents re- mother and her port two episodes of forceful vomiting yesterday. "His Child's father works as motorcycle cry is so high-pitched and shrill, and he doesn't want fant frequently. Mother no longer anything to drink." Mother is breastfeeding. Cerebral cause of child care. Has not named child perfusion pressure 55 mm Hg. Blood pressure 100/40; asking many questions about the pulse 100 bpm; respirations 16. Afebrile.

Nursing Diagnosis ✻ Risk for ineffective cerebral tissue perfusion related to increased intracranial pressure from hydrocephalus

Client Assessment ✻ A 3-month-old infant whose head circumference has continued to increase since myelo- meningocele surgery at birth. Head circumference at birth was 40th percentile, at 60th percentile at 6 weeks of age and now at 80th percentile. Mother noted infant had in- creasing irritability and lethargy over the last few weeks. Anterior fontanelle 4 cm × 4 cm; posterior fontanelle 3 cm × 1 cm. Sagittal suture line separated 1⁄4 inch.

Outcome Criteria ✻ Infant's vital signs are within age- appropriate parameters; head circumference is main- tained at current level; infant responds to auditory stimuli. Cerebral perfusion pressure remains above 50 mm Hg.

Team Member Responsible	Assessment	Intervention	Rationale	Expected Outcome
Activities of Daily Living				
Nurse	Assess if infant is able to turn because of increased head size.	Provide an environment for child that is stimulating yet not tiring (mobile, soft toys in crib). Urge parent to interact with child.	Lack of mobility can lead to pressure ulcers on head as well as insufficient 3-month development.	Child's parent plays with infant. Infant appears interested in age-appropriate toys. No irritated areas on head.
Consultations				
Nurse/ physician	Assess if neurosur- geon is available for consultation.	Arrange for consulta- tion for mother with neurosurgeon to discuss surgery and child's prognosis.	Viewing a child as to- tally disabled can cause a parent to not appreciate the child's capabilities.	Neurosurgeon meets with mother to dis- cuss that child's IQ appears normal; shunting will halt head growth.
Procedures/Medications				
Nurse	Assess infant's neurologic status postoperatively, in- cluding response to sound, pupillary response, flexion, increasing irritability or	Position the infant with the head of the bed elevated 15 degrees and prevent hyperextension, or rotation of the head. Record cerebral perfusion	Elevating head of bed aids shunt function- ing, helping reduce intracranial pres- sure. Cerebral perfu- sion pressure re- veals extent of intracranial	Child's cerebral perfusion pressure remains greater than established parameter. Responds to sound; no increasing irritability or

	lethargy.	pressure.	pressure.	lethargy.
Nurse	Measure and record head circumference every 4 hours. Assess anterior fontanelle for tenseness and bulging.	Document head circumference and appearance of anterior fontanelle.	Head circumference, if increasing, or a tense, bulging fontanelle indicates accumulating CSF.	Child's head circumference does not increase in size; fontanelles no longer feel tense.

Nutrition

Nurse/ nutritionist	Observe mother breastfeeding infant. assist mother with positioning the infant properly, supporting the head without flexion or hyperextension during feeding.	Encourage mother to breastfeed infant; Proper positioning is important to avoid neck vein compression, which could increase intracranial pressure.	Breast milk is the optimal nutrition for an infant.	Mother breastfeeds successfully following surgery.
Nurse	Monitor intake and output closely. corticosteroids as ordered.	Administer osmotic diuretic and necessary to ensure renal function. Osmotic diuretics decrease intracranial pressure. Corticosteroids reduce inflammation.	Adequate hydration is	Child's output remains over set parameter.

Patient/Family Education

Nurse/nurse practitioner Assess the parents' understanding of hydrocephalus and treatment measures. Review the structure and function of the brain and explain how hydrocephalus develops. Clarify any misconceptions. Reviewing and clarifying aid in learning and strengthen understanding. Mother states she understands purpose of shunt to relieve excess CSF.

Psychosocial/Spiritual/Emotional Needs

Nurse/nurse practitioner Assess mother's acceptance of child in light of many congenital disorders and no name for baby as yet. Observe mother's interaction with infant; remind her that congenital disorders occur in a proportion of all births. Young mother may have had little experience with life crises. Needs support from health care providers for this crisis. Mother states she understands child's condition is neither her nor the child's fault; states she can handle the present crisis.

Discharge Planning

Nurse	Assess if child's parents have questions about care he will need for future shunt care; if they understand postsurgery appointment is important.	Assist parents with caring for the child as much as possible; offer positive reinforcement frequently.	Caring for the child promotes active participation and parent–infant bonding. Positive reinforcement enhances self-esteem and aids in coping.	Mother and grandmother state they understand future care necessary for shunt; will contact neurosurgeon if any questions regarding child's progress. Mother keeps postsurgery appointment.
Nurse	Assess if home care follow-up will be necessary. Refer parents to support group of other parents of children with hydrocephalus.	Make referral for home care if needed. decrease feelings of isolation, provide opportunities for further learning. Follow-up home care provides continuing support, guidance, and education.	Support groups can to evaluate benefit for them. Agree to at least one home visit for follow-up care.	Mother and grandmother state they will attend a support group at least once

and accommodation); muscle strength equal and strong bilaterally; head circumference is maintained at age-appropriate level.
After a shunt is inserted, the infant's bed is usually left flat or raised only about 30 degrees so the child's head remains level with the body. This is because if the child's head is raised excessively, CSF may flow too rapidly and decompression can then occur too rapidly, leading to possible tearing of cerebral arteries.
A one-way valve is inserted in the shunt that opens when CSF has accumulated to the extent that pres- sure has increased. It closes when enough fluid has drained to reduce the pressure. The surgeon who per- forms the shunting procedure writes specific orders about how often the infant is to be turned and to what side after surgery. Often infants are not turned to lie on the side with the shunt to prevent putting pressure on the valve, which might cause it to open and rapidly decompress CSF.
Assess for signs of increased intracranial pressure after surgery such as tense fontanelles, increasing head circumference, irritability or lethargy, decreased level of consciousness, poor sucking ability, vomiting, an increase in blood pressure (difficult to measure ac- curately in infants unless arterial or umbilical lines are used with Doppler instrumentation), increasing tem- perature, and a decrease in pulse and respiratory rates (see Chapter 49 for tips on a complete neuro- logic assessment). Also assess for symptoms of in- fection such as increased temperature, increased pulse rate, general malaise, and signs of meningitis such as a stiff neck and marked irritability (Box 27.6). Be certain a child receives adequate pain manage- ment, because crying elevates CSF pressure.
Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to increased in- tracranial pressure
Outcome Evaluation: Child's weight remains within 5th to 95th percentile on height and weight chart; no vom- iting occurs.
Because an abdominal incision is involved to thread the catheter into the peritoneum, most children have a nasogastric tube placed during surgery. Keep them NPO until bowel sounds return and the tube can be removed. Introduce fluid gradually in small quantities after removal of the tube as vomiting that results from the introduction of fluid too soon after any surgery causes increased intracranial pressure.
Like other infants, infants with hydrocephalus should be held when being fed if possible. Be cer- tain to support their heads well when moving them to avoid strain on their neck from their heavier than usual head. Hold their head with the whole palm, not just the fingertips, because the skull can thin to such a degree that it can actually be punctured with a stiff, forceful touch. Urge parents to use a rocking chair with an armrest to provide support for their arm while feeding the infant. Otherwise, the infant's head can be so heavy that they cannot spend as much time holding the infant after a feeding as they might oth- erwise. No contraindications for breastfeeding exist.

Help breastfeeding mothers to find a comfortable position for feeding so that they can be successful with this.
Note how the child sucks. Increased intracranial pressure may be noted first because of poor or inef- fective sucking. Vomiting after feeding, without nausea (difficult to detect in a small infant), is also a common first sign of increased intracranial pressure.
Observe for constipation, because straining while passing stool causes increased intracranial pressure. This is not usually a problem with infants who are to- tally breastfed or formula fed. However, it can be a problem when children return for shunt replacement at an older age. Urge parents to offer adequate fluid and roughage in their child's diet as a preventive measure.
Nursing Diagnosis: Risk for impaired skin integrity re- lated to extra weight and immobility of head
Outcome Evaluation: Child's skin remains clean, dry, and intact, without signs of erythema or ulceration.

The head of an infant with hydrocephalus can be- come so heavy the infant cannot move it freely. As the skin of the head stretches thin, skin breakdown can occur at the pressure points. Wash the child's head daily and change the position of the head approxi- mately every 2 hours so that no portion of the head rests against the mattress for a long period. A syn- thetic sheepskin or silicon pad or an air, water, or al- ternating air mattress may help to relieve pressure points. If a Kling or stockinette bandage is used to hold a surgical head dressing in place, place a piece of gauze or cotton behind the child's ear before the bandage is applied to prevent skin surfaces from touching and becoming excoriated. Make sure the bandage does not become wet from backward- draining oral secretions or shunt leakage.
Nursing Diagnosis: Deficient knowledge related to home care needs of child with hydrocephalus
Outcome Evaluation: Parents state fears regarding ability to provide care but are able to manage this; state signs of increased intracranial pressure for which they should watch; demonstrate competence in shunt care.
Caring for a child with a shunt in place is an ongoing responsibility for parents. If parents do not seem to be asking many questions about the child's care after surgery, do not assume this is because they are tak- ing the child's care in stride. They may be too fright- ened or not understand neuroanatomy enough to know what questions to ask. An opening such as, "Most parents are a little nervous when they think about taking a child home with a shunt in place; do you feel that way?" gives them an opportunity to admit how they feel. Talking about how nervous they feel about the responsibility will not immediately make them more comfortable with the child's care. However, it can provide them with a starting point to bring their anxiety down to a manageable size. Assure them the health care providers caring for their child are interested in helping and supporting them.
If a valve has been inserted in the shunt, it can be palpated underneath the skin just behind the ear. Remind parents to stress to their child that this strange object is not to be felt continually. A child ner- vously fidgeting with a pressure pump can inadver- tently evacuate CSF from the ventricles at a danger- ously rapid rate.
Before an infant is discharged after surgery, be cer- tain the parents have ample opportunity to feed and provide care so they can be comfortable and feel they "know" their infant. Because irritability, lethargy, vom- iting, and a change in the baby's cry are signs of in- creased intracranial pressure, be certain parents know to report these immediately to their primary care provider. Before parents can report a change in the infant's disposition in this way, they must know the in- fant well, why it is important that they give care while their infant is hospitalized. A referral for home care fol- low-up may be appropriate to offer further support.
Nursing Diagnosis: Risk for delayed growth and devel- opment related to potential neurologic challenge

Outcome Evaluation: Child demonstrates regular ob- servable growth and achieves age-appropriate devel- opmental milestones.
Like all children, children with hydrocephalus need in- tellectual and emotional stimulation: they need to be talked to, smiled at, and played with. If the child's head is enlarged, turning it to look at things can be dif- ficult. It may be necessary to reposition mobiles or pictures so the child receives adequate visual stimu- lation. Role-model talking and singing to the child to help parents include these actions in their care.
At the time of hospital discharge, be certain parents have the telephone number of the person they should call if they have a question or concern about their child's condition or care, and a referral for home care follow-up, if appropriate. They also need an appoint- ment for the child's first checkup. Be sure they under- stand that infection of the shunt is a possibility and a severe complication because it can lead to meningi- tis. If this should occur, the infant will show signs of in- creased intracranial pressure as well as an increased temperature. In addition to being hospitalized, receiv- ing the usual treatment for meningitis (see Chapter 49), and receiving

intravenous antibiotics, the child may have an extraventricular shunt placed to promote drainage during this time. This allows antibiotics to be administered directly to the CSF and ensures that in- fected CSF is not draining to the peritoneal cavity, where it could cause peritonitis.
As the child reaches preschool and school age, parents need to confer with the school nurse to make the nurse aware that the child has a shunt in place and that the child may need special head protection for sports activities.
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Neural Tube Disorders
Because the neural tube forms in utero first as a flat plate and then molds to form the brain and spinal cord, it is susceptible to malformation. The term spina bifida (Latin for "divided spine") is most often used as a collective term for all spinal cord disorders, but there are well-defined degrees of spina bifida in- volvement, and not all neural tube disorders involve the spinal cord. All of these disorders, however, occur because of lack of fusion of the posterior surface of the embryo in early in- trauterine life. They can be compared with cleft palate or cleft lip—these are also midline closure disorders.
The incidence of neural tube disorders has fallen dramat- ically in recent years, from 3 to 0.6 per 1000. Such disorders may occur as a polygenic inheritance pattern, but poor nu- trition, especially a diet deficient in folic acid, appears to be a major contributing factor (Lumley et al., 2009). As a result,

pregnant women are advised to ingest 600 micrograms of folic acid daily to help prevent these disorders. The risk of bearing a second child with a neural tube disorder once one child is born with such a disorder increases to as much as 1 in 20. For this reason, women who have had one child with a spinal cord disorder are advised to have a maternal serum assay or amniocentesis for AFP levels to determine if such a disorder is present in a second pregnancy (levels will be ab- normally increased if there is an open spinal lesion). Serum assessment of MSAFP is done at week 15 of pregnancy, when AFP reaches its peak concentration. If the result is elevated, an amniocentesis is then done to assess the level of AFP in amniotic fluid. A prenatal sonogram is also helpful to deter- mine the presence of the disorder (see Chapter 11 for further discussion of these prenatal assessments).
Types of Disorders
Anencephaly. Anencephaly is absence of the cerebral hemi- spheres. It occurs when the upper end of the neural tube fails to close in early intrauterine life. It is revealed by an elevated level of AFP in the maternal serum or on amniocentesis and confirmed by a prenatal sonogram.
Infants with anencephaly may have difficulty in labor be- cause the underdeveloped head does not engage the cervix well. Many such infants present in a breech position. On vi- sual inspection at birth, the disorder is obvious (Fig. 27.11). Children cannot survive with this disorder because they have no cerebral function. Because the respiratory and cardiac centers are located in the intact medulla, however, they may survive for several days after birth.
When the condition is discovered prenatally, parents are offered the option of abortion. An ethical problem has arisen in several instances when parents, aware that the child cannot survive, elect to carry the infant to term so the organs can be

FIGURE 27.11 An infant with anencephaly. (Joseph R. Siebert, PhD/Custom Medical Stock Photograph.)

used for transplant. Nurses need to think through their feelings about caring for such infants, because it can be diffi- cult to give care to a child who will most likely die or who has been born only to help others live.
Microcephaly. Microcephaly is a disorder in which brain growth is so slow that it falls more than three standard devi- ations below normal on growth charts. The cause might be a disorder in brain development associated with an intrauter- ine infection such as rubella, cytomegalovirus, or toxoplas- mosis. Microcephaly may also result from severe malnutri- tion or anoxia in early infancy.
The prognosis for a normal life is guarded in children with microcephaly and depends on the extent of restriction of brain growth and on the cause. Generally the infant is cog- nitively challenged because of the lack of functioning brain tissue. True microcephaly must be differentiated from cran- iosynostosis (normal brain growth but premature fusion of the cranial sutures), which also causes decreased head circumfer- ence. Infants with craniosynostosis have abnormally closed fontanelles and often show bossing of the forehead and signs of increased intracranial pressure similar to infants with hy- drocephalus. With surgery, craniosynostosis can be relieved and brain growth will be normal.
Spina Bifida Occulta. Spina bifida occulta occurs when the posterior laminae of the vertebrae fail to fuse. This occurs most commonly at the fifth lumbar or first sacral level but may occur at any point along the spinal canal. The normal spinal cord is shown in Figure 27.12A. Spina bifida occulta may be noticeable as a dimpling at the point of poor fusion; abnormal tufts of hair or discolored skin may be present (Sponseller, 2007). Simple spina bifida occulta is a benign disorder; it occurs as frequently as in one of every four chil- dren (see Fig. 27.12B).
The term "spina bifida" is often used to denote all spinal cord anomalies. Because of this usage, parents, when told that their child has

a spina bifida occulta, may interpret this as meaning their child has an extremely serious disorder. Help clarify the degree of defect for them.

Meningocele. If the meninges covering the spinal cord her- niate through unformed vertebrae, a meningocele occurs. The anomaly appears as a protruding mass, usually approxi- mately the size of an orange, at the center of the back (see Fig. 27.12C). It generally occurs in the lumbar region, al- though it might be present anywhere along the spinal canal. The protrusion may be covered by a layer of skin or only the clear dura mater.

Myelomeningocele. In a myelomeningocele, the spinal cord and the meninges protrude through the vertebrae the same as with a meningocele. The difference is that the spinal cord ends at the point, so motor and sensory function is absent be- yond this point (see Fig. 27.12D). Because this results in lower motor neuron damage, the child will have flaccidity and lack of sensation of the lower extremities and loss of bowel and bladder control. Infants' legs are lax, and they do not move them; urine and stools continually dribble because of lack of sphincter control. Children often have accompanying talipes (clubfoot) disorders and developmental hip dysplasia. Hydrocephalus accompanies myelomeningocele in as many as 80% of infants because of the lack of an adequate subarach-

FIGURE 27.12 Degrees of spinal cord anomalies. (A) Normal spinal cord. (B) Spina bifida occulta. (C) Meningocele. (D) Myelomeningocele.

noid membrane for CSF absorption; the higher the myelomeningocele occurs on the cord, the more likely it is that hydrocephalus will accompany it. It is generally difficult to tell from visual appearance whether the disorder is myelomeningocele or the simpler meningocele (Fig. 27.13). A CT or ultrasound scan or MRI will reveal this.

Encephalocele. An encephalocele is a cranial meningocele or myelomeningocele. The disorder occurs most often in the oc- cipital area of the skull but may occur as a nasal or nasopha- ryngeal disorder. Encephaloceles generally are covered fully by skin, but they may be open or covered only by the dura. It is difficult to tell from the size of the encephalocele if only CSF is trapped in the protruding meninges or whether brain tissue could also be involved. Transillumination of the sac will reveal solid substance or fluid in the sac. CT, MRI, or ultrasound will reveal the size of the skull disorder.

Assessment

Neural tube disorders may be discovered during intrauterine life by prenatal ultrasound, fetoscopy, amniocentesis (discov- ery of increased AFP in amniotic fluid), or analysis of AFP in the maternal serum. If the condition is discovered in utero, it

FIGURE 27.13 A myelomeningocele. The infant also has hydrocephaly and a subluxated hip. (NMSB/Custom Medical Stock Photograph.)

may be possible to close the lesion by fetoscopic surgery. Infants may be born by cesarean birth to avoid pressure and injury to the spinal cord. Observe and record whether an in- fant born with a neural tube disorder has spontaneous move- ment of the lower extremities to assess if the child has lower motor function. Also assess the nature and pattern of voiding and defecation. A normal infant appears to be "always wet" from voiding but actually voids in amounts of approximately 30 mL and then is dry for 2 or 3 hours before voiding again. An infant without motor or sphincter control voids continu- ally. This pattern is the same for defecation. Observing these features aids in differentiating between meningocele and myelomeningocele. Differentiation will be further estab- lished by ultrasound or MRI.

Therapeutic Management

Children with spina bifida occulta need no immediate surgi- cal correction. The parents should be made aware of the de- fect, however, so they are not surprised if it is revealed on a spinal x-ray taken for some reason later in life. Some children may eventually need surgery to prevent vertebral deteriora- tion because of the unbalanced spinal column.

Treatment for a meningocele, myelomeningocele, or en- cephalocele involves immediate surgery to replace the con- tents that are replaceable and to close the skin disorder to prevent infection. In the past, surgery for neural tube disor- ders was done only after the infant had survived the newborn period. Currently, it is done as soon after birth as possible (usually within 24 to 48 hours) so infection through the ex- posed meninges does not occur.

Surgery for repair of a meningocele or myelomeningocele is not without risk, and brain disorders accompanying an en- cephalocele may limit the child's cognitive potential. The loss of meninges removed by surgery may limit the rate of ab- sorption of CSF. This may lead to a buildup of CSF, result- ing in hydrocephalus. Parents need a great deal of support to care for a child with a myelomeningocele because their child has multiple challenges. The child with myelomeningocele will continue to have paralysis of the lower extremities and loss of bowel and bladder function after surgery because the absent lower cord cannot be replaced. Table

27.1 provides a classification of motor function ability according to the loca- tion of spinal cord disruptions.

Although parents of an infant with a myelomeningo- cele were told before surgery that their child's spinal disorder is a type that means motor and sensory func- tion are absent in the child's lower extremities, the parents do not necessarily "hear" this information. Only after surgery do they begin to comprehend the extent of the condition. When the child is discharged from the hospital, be certain the parents understand what is the next step they need to follow for further care. This prevents them from feeling deserted when they most need support—the time when they first begin to appreciate what this problem will mean to them in the coming years, and what it will mean to their child throughout life.

Nursing Diagnosis: Risk for infection related to rupture or bacterial invasion of the neural tube sac

Outcome Evaluation: Neural tube sac remains intact; axillary temperature remains below 98.6° F (37° C).

If the exposed meningeal sac is allowed to dry, it can crack, allowing CSF to drain and microorganisms to enter. Pressure on the protruding mass is a prime rea- son why the sac ruptures, leading to quick decom- pression of the CSF (which can lead to herniation of the brainstem into the spinal cord and interference

with respiratory and cardiac centers) and possibly to infection (meningitis). Such pressure may also force CSF from the sac into the spinal column, increasing intracranial pressure. Therefore, it is crucial to prevent drying of and pressure on the exposed membrane.

Preoperative Positioning. Before surgery, use sterile gloves and sterile linens when caring for the infant. Position infants carefully to prevent pressure on the ex- posed meninges, either in a prone position or sup- ported on their side. When they are on their side, use a rolled blanket or diaper placed behind their upper back (above the disorder) and a separate one behind their lower back (below the disorder). This way, no pressure will be exerted on the lesion, and the infant will be pro- tected from rolling backward onto it. Placing infants on their abdomen has the added advantage of keeping the flow of feces and urine away from the spinal defect as well as keeping it free from pressure. A folded towel under the abdomen helps to flex the infant's hips, re- duce pressure on the sac, and ensure good leg posi- tion. If an infant is lying on a side, putting a folded diaper between the legs prevents skin surfaces from touching and rubbing (and also helps to keep the hips from internally rotating). Always notice the position of the infant's legs. If they are paralyzed because of lack of motor control, the infant cannot move and straighten them to a more comfortable position.

Placing a piece of plastic or sturdy plastic wrap below the meningocele on the child's back like an apron and taping it in place is another method of pre- venting feces from touching the open lesion. A sterile wet compress of saline, antiseptic, or antibiotic gauze over the lesion may be used to keep the sac moist. Rather than remove this to wet it again and risk rup- turing the sac, merely add additional fluid.

Although no pressure should be exerted on the open lesion by a top sheet, make certain that the child is adequately warm. The presence of the sac adds to the amount of body surface area exposed, thereby in- creasing heat loss. The infant may need to be kept in an incubator to maintain body heat if a large area of the back cannot be covered. Use caution when plac- ing the infant under a radiant heat source for warmth because radiant heat can dry the lesion and cause cracking. Any seepage of clear fluid from the defect should be reported promptly, because this is proba- bly escaping CSF. Checking any leakage for evi- dence of glucose will confirm the fluid is CSF (urine or mucus will not test positive for glucose).

Postoperative Care. After surgery, a child is again placed on the abdomen until the skin incision has healed (about 7 days). The same careful precautions against allowing urine or feces to touch the incision area are necessary.

Nursing Diagnosis: Risk for imbalanced nutrition, less than body requirements, related to difficulty assuming normal feeding position.

Outcome Evaluation: Child's skin turgor is good; weight is maintained within 10% of birth weight; spe- cific gravity of urine remains between 1.003 and 1.030.

To maintain nutrition, help parents hold the infant in as normal a feeding position as possible. Make cer- tain that a supporting arm does not press against the lesion. Remind the parents that when bubbling the in- fant, they should not pat the back over the defect. If the defect is large and the risk in picking up the infant is too great, the infant may be fed while lying on the side in bed or prone on a specialized bed frame. Raise the infant's head slightly by slipping a folded di- aper under it. Stroke the head, arms, or upper back while the infant sucks to give the child the same com- fort and assurance at feeding time as a baby receives while being held. Infants may enjoy a pacifier after feeding, because they do not experience the same enjoyment of sucking while feeding that would be ex- perienced if they could be held and cuddled. All new parents have some difficulty getting comfortable with

Nursing Diagnosis: Risk for impaired skin integrity re- lated to required prone positioning.
Outcome Evaluation: Infant's skin remains intact, with- out erythema or ulceration.
Preserving skin integrity is a major problem before surgery because the constant prone position puts pressure on the infant's knees and elbows. Laying the infant on a synthetic sheepskin helps reduce friction; after surgery, use paper tape or stockinette for dress- ing changes or place protective dressings such as Stomahesive on the skin under the area where the tape will touch. Change diapers frequently to prevent excessive contact of acid urine with skin. If hydro- cephalus has developed, the head will be heavy and pressure areas at the temples can occur if the head is not repositioned about every 2 hours.

feeding an infant. Parents who must feed their child in an unusual position or with an infant on a support frame will have even more difficulty. Role-model a warm, comforting parental role so parents can begin to form a positive parent–child interaction.

Children with increased intracranial pressure tend to suck poorly. If this complication develops after surgery, breastfeeding may be difficult. Parents need a realistic explanation of the treatment planned for the child so they can decide whether to continue breast- feeding. If it is necessary to forgo breastfeeding for this child, you can assure parents that the child will thrive on commercial formula.
Nursing Diagnosis: Risk for ineffective cerebral tissue perfusion related to increased intracranial pressure.
Outcome Evaluation: Child's head circumference re- mains within present percentile on growth chart; signs and symptoms of increased intracranial pressure are absent.
Preoperative Care. Increasing head size from poor absorption of CSF (hydrocephalus) is a common com- plication of neural tube disorders. To detect increased head size (development of hydrocephalus), measure head circumference once daily (or more frequently if ordered) in the preoperative period. Head circumfer- ence measurements are accurate only if the tape measure is placed on the same points of the child's head each time. Placing an indelible or ballpoint pen mark on the forehead just above the eyebrows and at the most prominent point of the occiput allows differ- ent people to measure the head during the day and yet be sure that they all measure at the same point.
Postoperative Care. Children may develop hydro- cephalus after surgery as well, probably because of interference with subarachnoid absorption of CSF. The shortening of the meninges can create an Arnold- Chiari disorder (see later) or can cause traction of the hindbrain into the spinal cord. Observe the child fre- quently for signs of increased intracranial pressure such as changes in vital signs, neurologic signs such as pupillary changes, or an increase in head circum- ference or bulging fontanelles, as well as behavioral changes such as irritability or lethargy to help detect if this is happening.

Nursing Diagnosis: Impaired physical mobility related to neural tube disorder
Outcome Evaluation: Child ambulates with the least amount of accessory equipment possible.
Help parents begin to plan stimulation activities their infant can accomplish with limited mobility. Encourage them to take the infant to the places chil- dren normally accompany parents—relatives' homes, shopping, the zoo, and so forth as encouraging chil- dren to be independent helps them lead as active a life as possible (Davis et al., 2007). (Fig. 27.14).

FIGURE 27.14 A child born with a neural tube disorder demonstrates her ability to walk using braces and a crutch. (Alexander Tsiara/Photo Researchers, Inc.)

Parents will need to perform passive exercises to prevent muscle atrophy and formation of contractures if a child has impaired lower extremity motor control. The child may need leg braces to help maintain good alignment and enable walking with crutches. Parents are generally anxious to do something for their child and follow routines of passive exercises well if they are given sufficient support for their accomplishments at health care visits. As the child grows older, tendon transplants or osteotomy may be necessary to prevent contractures and poor bone alignment. Because chil- dren with myelomeningocele have no sensation in their lower extremities, parents should make a routine of inspecting the child's lower extremities and but- tocks daily for any area of irritation or possible infec- tion. Teach children as they grow older to do this themselves. When children are using a wheelchair, be certain they press with their arms on the armrests to raise their buttocks off the wheelchair seat at least once every hour to help provide adequate circulation to lower extremities.
Nursing Diagnosis: Risk for impaired elimination re- lated to neural tube disorder
Outcome Evaluation: Child demonstrates ability to in- dependently manage bowel and bladder elimination by school age.
To ensure bladder emptying, an intermittent clean uri- nary catheterization technique may be taught to par- ents (inserting a clean catheter through the urethra into the bladder every 4 hours to drain urine from the bladder; Box 27.7). As children reach early school age, they can learn this technique for themselves. Prescription of a drug such as oxybutynin chloride (Ditropan) may improve bladder capacity and allow a child to need less frequent catheterization (Box 27.8) (Karch, 2009). It is possible to place artificial bladder sphincters in some children to help establish conti- nence. In some children, a continent urinary reservoir or ureterosigmoidostomy (see Chapter 46) is con- structed to bypass the nonfunctioning bladder. Children who are begun on intermittent clean catheterization from birth require fewer bladder aug- mentation procedures as they grow older.

Arnold-Chiari Disorder (Chiari II Malformation)

An Arnold-Chiari disorder is caused by overgrowth of the neural tube in weeks 16 to 20 of fetal life. The specific anomaly is a projection of the cerebellum, medulla oblon- gata, and fourth ventricle into the cervical canal. This causes the upper cervical spinal cord to jackknife backward, ob- structing CSF flow and causing hydrocephalus. A lum- bosacral myelomeningocele is also present in approximately 50% of children with this anomaly (Donahue, 2008).

The prognosis for the child with an Arnold-Chiari mal- formation depends on the extent of the disorder and the sur- gical procedure possible. Because of the upper motor neuron involvement, gagging and swallowing reflexes may be absent, increasing the risk for tracheal aspiration. Serious levels of sleep apnea may occur that also require surgical intervention (Tubbs et al., 2007).

BOX 27.7 ✻ Focus on Family Teaching

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Instructions for Clean Intermittent Catheterization

Q. Baby Sparrow's mother needs to learn clean inter- mittent catheterization for her son. She asks you, "How do I do this?"

A. Here are some helpful guidelines to follow:

1. Remember that the purpose of intermittent catheter- ization is to keep the bladder empty by using clean technique and frequent emptying so microorgan- isms do not have time to grow in urine in the blad- der. Always use clean equipment and catheterize at least every 4 hours.
2. Always carry catheterization equipment with you when away from home (a plastic bag containing a clean catheter and water-soluble lubricant). This en- ables you to stay longer away from home if you wish. If you will be using a public lavatory, you might want to include a presoaped washcloth rather than have to use rough paper towels.
3. To begin catheterization, wash your hands in warm, soapy water. This reduces the chance you will intro- duce germs from your hands into your child's bladder.
4. Next wash around your child's urinary meatus with a clean washcloth or paper towel and warm, soapy water. Rinse the washcloth and wash again with clear water. This reduces the chance that germs on the child's skin will be pushed into the bladder.
5. Coat the tip of a clean catheter with water-soluble lu- bricant. This reduces friction and makes the catheter slide into the bladder easily.
6. Quickly but gently insert the catheter into the urinary meatus approximately 3 inches. Urine should begin to flow immediately through the catheter. Let this drain into a collecting basin.
7. When urine stops flowing, gently remove the catheter. To reuse the catheter, clean it with soap and water, rinse with clear water, and replace in the plastic bag with the lubricant or replace with a new cathether.
8. Be certain that on special days such as family cele- brations or vacation you do not forget the impor- tance of catheterization.
9. As your child reaches school age, you can teach him how to do this himself. He will need to insert the catheter about 6 inches. Be certain he will be able to have access to a school bathroom every 4 hours during the day.
10. Phone your health care provider if urine is blood- tinged, smells foul, or is cloudy rather than clear or if your child appears to have pain in his abdomen or lower back or has an elevated temperature. These may be symptoms of a urinary tract infection.

PHYSICAL AND DEVELOPMENTAL DISORDERS OF THE SKELETAL SYSTEM

Either genetic or environmental factors can compromise fetal physical growth to such an extent they result in skeletal dis- orders in the newborn.

FIGURE 27.15 A young child learns to use a hand prosthesis during play. (M. Grecco/Stock Boston.)

Absent or Malformed Extremities

Congenital skeletal disorders may result from reasons such as maternal drug ingestion, virus invasion during pregnancy, or amniotic band formation in utero. In most instances, how- ever, the cause of the anomaly cannot be established. Children born without an extremity or with a malformed extremity can be fitted with a prosthesis early in life. In most instances, chil- dren will have better function if the malformed portion of an extremity is amputated before a prosthesis is fitted. This is a difficult decision for parents to make, however, because it is one that they cannot undo later. They need assurance that hands with malformed fingers, for example, will not later grow to become normal. A well-fitted prosthesis that a child learns to use at an early age will provide more function and

allow a more normal childhood and adult life than if the original dis- order is left unchanged (Fig. 27.15). Lower extremity pros- theses are fitted as early as age 6 months (so an infant will learn to stand at the normal time). Upper extremity prostheses are fitted this early also, so an infant can handle and explore objects readily.

Introducing a prosthesis early also prevents a child from adjusting to a missing extremity, such as writing with the feet or sliding across a floor rather than walking. Children can be- come so proficient at these adjustments that later in life they do not see the advantage of a prosthesis and refuse to use one. Although these self-adjustments may be cute in infants, in the long run they greatly limit a child's potential.

Learning to use a hand prosthesis takes weeks to months. Help parents think of interesting activities when introducing the prosthesis so the child can see immediately how useful it will be to use. Gait training for use of lower extremity prostheses begins with the use of parallel bars and proceeds to independent walking and mastery of steps.

Children who are born with an absent extremity may need help in mastering not only the use of a prosthesis but also a positive body image of themselves as whole. If possible, in the newborn period, introduce parents to the rehabilitation team who will be following their child. Further steps then will be outlined for them to help them move past the helplessness they may feel to more positive action. Visiting with a child who uses a prosthesis well can be a great help in convincing parents that their child can lead a normal life. Children with a congenital extremity loss do not grieve over the lost extrem- ity as do adults or older children, which means they are often better prepared to move on quickly to rehabilitation.

Finger and Toe Conditions

Finger or hand deformities occur in about 3% of all births. Polydactyly is the presence of one or more additional fingers or toes. When an entire extra finger or toe forms, the super- numerary digit is usually amputated in infancy or early child- hood. These extra fingers are often just cartilage or skin tags, and removal is simple and cosmetically sound. In syndactyly (two fingers or toes are fused), the fusion is usually caused by a simple webbing (Fig. 27.16); separation of the digits into two sound and cosmetically appealing ones is usually successful. In other instances, the bones of the fingers or toes are also fused, and cosmetic appearance and function cannot be fully reconstructed.

These hand anomalies are always upsetting to parents (one of the first things that new parents do is count the fin- gers and toes of newborns). They may need time to air their feelings and concerns. They may need reassurance at health maintenance visits throughout their child's development that the child is normal in other ways so they can accept and help

FIGURE 27.16 Syndactyly. (JPD/Custom Medical Stock Photograph.)

not just games. Otherwise, the exercises seem so simple par- ents may not take them seriously. In the few instances in which simple exercises are not effective and the condition still exists at 1 year of age, surgical correction followed by a neck immobilizer will be necessary. If extreme injury to the muscle occurred, torticollis can lead to the continued eleva- tion of one shoulder. Although a rare complication, this has the potential to lead to scoliosis later in life.

Parents may ask about the use of botulism (Botox) injec- tions, because adults who develop spastic torticollis may re- ceive this type of treatment (Benecke & Dressler, 2007). It is not recommended or necessary for most infants.

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the child develop self-esteem. Children need this same type of assurance so they can think of themselves as well people.

Chest Deviations

Pectus excavatum is an indentation of the lower portion of the sternum (Mavanur & Hight, 2008). Children usually are born with this condition, but they may also develop it after chronic obstructive lung disease or rickets. As a result, lung volume decreases and the heart is displaced to the left. This condition can be repaired, either for cosmetic reasons or to expand lung volume. With pectus carinatum, the sternum is displaced anteriorly, increasing the anterior-posterior diame- ter of the chest. This condition also can be repaired for phys- iologic or cosmetic reasons.

Torticollis (Wry Neck)

Torticollis is a term derived from tortus (twisted) and collum (neck). Torticollis (wry neck) occurs as a congenital anomaly when the sternocleidomastoid muscle is injured and bleeds during birth (Waldman & Manista, 2007). This tends to occur in newborns with wide shoulders when pressure is ex- erted on the head to deliver the shoulder. The infant holds the head tilted to the side of the muscle involved; the chin ro- tates to the opposite side. The injury may not be noticeable in the newborn and may become evident only as the original hemorrhage recedes and fibrous contraction occurs at 1 to 2 months of age. A thick mass over the muscle can usually be palpated at this time.

To relieve torticollis, parents need to begin a program of passive stretching exercises, lying the infant on a flat surface and rotating the

head through a full range of motion. In ad- dition, parents should always encourage the infant to look in the direction of the affected muscle. They can encourage this by holding the child to feed in such a position that the child must look in the desired direction. Placing a mobile on the child's crib to encourage the child to look toward the affected side also is helpful. Speaking to and handing the child objects from the affected side to make the child look that way are also helpful exercises.

If manual stretching is begun early and consistently by the parents, further treatment usually is not necessary. Help par- ents understand that these actions are important therapy and

Craniosynostosis

Craniosynostosis is premature closure of the sutures of the skull. This may occur in utero or early in infancy because of rickets or irregularities of calcium or phosphate metabolism; it also occurs as a dominantly inherited trait (Elias, Tsai, & Manchester, 2008). It occurs more often in boys than in girls. This condition needs to be detected early because prema- ture closure of the suture line will seal the skull closed and compromise brain growth. When the sagittal suture line closes prematurely, the child's head tends to grow anteriorly and posteriorly. If the coronal suture line fuses early, the orbits of the eyes become misshapen, and the increased intracranial pressure may lead to exophthalmos, nystagmus, papilledema, strabismus, and atrophy of the optic nerve with consequent loss of vision. Premature closure of the coronal suture line is associated with syndactyly. Therefore, closely observe all in- fants with syndactyly for head circumference. Conversely, as- sess all infants with craniosynostosis for syndactyly. Cardiac anomalies, choanal atresias, or disorders of elbows and knee

joints are also associated with craniosynostosis.

Measure head circumference on all children age 2 years or younger at health maintenance visits and compare these mea- surements with normal head circumference charts. The pos- terior fontanelle normally closes at 2 months of age, the an- terior fontanelle at 12 to 18 months. Children whose fontanelles close before these typical times need continued assessment to ensure that craniosynostosis is not developing. Craniosynostosis is diagnosed by radiography or ultra- sound, which reveals the fused suture line. If the suture line is the sagittal one, treatment may involve only careful obser- vation; if the coronal suture line is involved, it will need to be surgically opened to prevent brain compression and an ab-

normally shaped head (Elias, Tsai, & Manchester, 2008).

Achondroplasia

Achondroplasia (chondrodystrophia) is a failure of bone growth inherited as a dominant trait. It causes a disorder in cartilage production in utero. The epiphyseal plate of long

bones cannot produce adequate cartilage for longitudinal bone growth, which results in both arms and legs becoming stunted. Because the bones of the cranium are of membranous ori- gin, they continue to grow normally. Children's heads will therefore appear unusually large in contrast to their extremi- ties. The forehead is prominent and the bridge of the nose is flattened. Because this is a cartilage, not a brain, problem, in- telligence proceeds normally. Children's trunks are of near- normal size, but a thoracic kyphosis (outward curve) and

lumbar lordosis (inward curve) of the spine may develop.

Achondroplasia can be diagnosed in utero or at birth by comparing the length of extremities to the normal length (in the average child, the arms can be extended to the distance of the midthigh) or by radiography, which will reveal charac- teristic abnormally flaring epiphyseal lines. People with achondroplasia rarely reach a height of more than 4 feet 6 inches (140 cm). Women with this condition will have diffi- culty with childbearing because of a small pelvis, generally necessitating a cesarean birth.

Children with achondroplasia become aware of their ap- pearance as early as the preschool years. They are apt to be- come acutely aware of their appearance during school age, when they realize they look different from other children. Children may be prescribed growth hormone to increase their ultimate height or, although controversial, leg length- ening may be possible (Horton, Hall, & Hecht, 2007). Ideally, such children have parents who have adjusted well to their own short stature and therefore have developed good self-esteem and can implant these qualities in their child.

Children should be informed that, as with all dominantly inherited disorders, there is a high probability that their chil- dren will inherit the disorder. Adolescence may be a particu- larly difficult time for these children as they realize that occupational and reproductive options may be limited for them. Continued guidance or counseling can help them to emerge from this period with feelings of high self-esteem in themselves as adults.

Talipes Disorders

Talipes is a word formed from the Latin words talus ("ankle") and pes ("foot"). The talipes deformities are ankle–foot disor- ders, popularly called clubfoot (Forster & Fraser, 2007). The term "clubfoot" implies permanent crippling to many people, so avoid using this term when discussing talipes disorders with parents. With the orthopedic correction techniques currently available, correction should leave the child with normal foot position. However, shoe size may vary as much as two shoe sizes, and the child may have

asymmetry of leg length.

Approximately 1 in every 1000 children is born with a tal- ipes disorder, occurring more often in boys than in girls. It probably is inherited as a polygenic pattern. It usually occurs as a unilateral problem (Eilert, 2008).

Some newborns have a pseudo-talipes disorder that has de- veloped because of their intrauterine position. In these in- fants, the foot looks to be turned in but can be brought into a straight position by manipulation. In a true disorder, the foot cannot be properly aligned without further intervention. Be certain to demonstrate to parents that if a pseudo-disorder is present, the foot can easily be brought into line or is not de- formed. Otherwise, the first time parents fit booties or shoes on the infant, they will notice this and worry that the foot is misshapen.

A true talipes disorder can be one of four separate types: plantarflexion (an equinus or "horsefoot" position, with the forefoot lower than the heel); dorsiflexion (the heel is held lower than the forefoot or the anterior foot is flexed toward the anterior leg); varus deviation (the foot turns in); or valgus deviation (the foot turns out). Most children with talipes de- formities have a combination of these conditions or have an equinovarus (Fig. 27.17A) or a calcaneovalgus disorder (a child walks on the heel with the foot everted).

Assessment

The earlier a true disorder is recognized, the better will be the

correction. Make a habit of straightening all newborn feet to

G2aS i),,, Baby Sparrow's mother tells you she wants to let her newborn die rather than undergo palliative surgery to close the neural tube disorder? Whose rights should be honored, the parent's or the child's, and how should these rights be determined? What would be your role?

the midline as part of initial assessment to detect this disorder.

Therapeutic Management

Correction is achieved best if it is begun in the newborn period. A cast is applied while the foot is placed in an

A B

FIGURE 27.17 (A) Talipes equinovarus. (SPL/Photo Researchers, Inc.) (B) Casts for bilateral equinovarus.

overcorrected position. Although the disorder involves the ankle, the cast extends above the knee to ensure firm correc- tion (see Fig. 27.17B). (Care of the child in a cast is discussed in Chapter 51.) Because talipes casts are high on the leg, change diapers frequently to prevent a wet diaper from touch- ing the cast and causing it to become soaked with urine or meconium. Review with parents how to check the infant's toes for coldness or blueness and how to blanch a toenail bed and watch it turn pink to assess for good circulation. Because a newborn cannot report pain except by generalized crying, cry- ing episodes in the infant must be evaluated carefully. Such crying may be because of colic, hunger, or wet diapers; it might also be because of the tingling feeling of circulatory compres- sion (as when a foot is "asleep") from too tight a cast.

Infants grow so rapidly in the neonatal period that casts for talipes deformities must be changed almost every 1 or 2 weeks. If a mother has a complication of childbirth or is ex- hausted from childbirth (depression because of the child hav- ing been born congenitally challenged may manifest itself as exhaustion), be certain she knows to make arrangements for another family member to bring the infant to the hospital for cast changes.

After approximately 6 weeks (the time varies depending on the extent of the problem), the final cast is removed. After this, parents may need to perform passive foot exercises such as putting the infant's foot and ankle through a full range of motion several times a day for several months. These seem like simple maneuvers, so be sure to stress their importance to the parents; otherwise, they are easy exercises to omit when people's lives are busy. The infant may have to sleep in Denis Browne splints (shoes attached to a metal bar to maintain

position; see Chapter 51) or high-top shoes at night for a few more months.

Although a successful correction cannot be guaranteed, the prognosis for a full correction is good. For children who do not achieve correction by casting, surgery is yet another option to achieve a final correction.

Developmental Hip Dysplasia

Developmental hip dysplasia (often referred to as congeni- tal hip dysplasia) is improper formation and function of the hip socket (Eilert, 2008). The disorder occurs in 1 in 1000 births. It may be evident as subluxation or dislocation of the head of the femur (Fig. 27.18).

With this disorder, the acetabulum of the pelvis is flat- tened or shallow. This prevents the head of the femur from remaining in the

acetabulum and rotating adequately. In a subluxated hip, the femur "rides up" because of the flat ac- etabulum; in a dislocated hip, the femur rides so far up that it actually leaves the acetabulum. Why the disorder occurs is unknown, but it may be from a polygenic inheritance pat- tern. It may also occur from a uterine position that causes less-than-usual pressure of the femur head on the acetabulum.

Developmental hip dysplasia occurs most often in chil- dren of Mediterranean ancestry. It is found six times more frequently in girls than in boys, possibly because the hips are normally more flaring in females and possibly because the maternal hormone relaxin causes the pelvic ligaments to be more relaxed. Therefore, the femur does not press as effec- tively into the acetabulum during intrauterine life, deepening

FIGURE 27.18 Hip dysplasia. (A) A normal femur head and acetabulum. (B) A subluxated hip. The femur head is "rid- ing high" in the shallow acetabulum. (C) A dislocated hip. The femur head is not engaged in the shallow acetabulum.

the space. Involvement usually is unilateral. Sociocultural methods of childrearing, such as the way infants are carried, may promote or decrease the extent of the involvement.

Assessment

Detecting developmental hip dysplasia in the newborn is im- portant because the longer the condition goes undetected, the more difficult it is to correct. Sometimes the affected leg may appear slightly shorter than the other one because the femur head rides so high in the socket. This is most notice- able when the child is lying supine and the thighs are flexed to a 90-degree angle toward the abdomen. One knee will ap- pear to be lower than the other (a Galeazzi sign (Fig. 27.19A). An unequal number of skin folds may be present on the posterior thighs (see Fig. 27.19B). This finding is unreli- able, however, because some infants with normal hips have an uneven number of posterior thigh skin folds. Subluxated or dislocated hips are best assessed by noting whether the hips abduct (Box 27.9).

In some infants, the hip abducts properly at a newborn assessment, but at the time of a health maintenance visit at 4 to 6 weeks, a secondary shortening of the adductor mus- cles will have occurred, and the disorder will be evident. Hip dysplasia is difficult to detect at birth in an infant who was born from a footling or frank breech presentation be- cause the knees are stiff and do not flex readily. Always as- sess hip function in these infants at each health mainte- nance visit. Tight adductor muscles occur in children with cerebral palsy, so this disorder must be ruled out. Radiography, ultrasound, or MRI will reveal the shallow acetabulum and a more lateral placement of the femur head than is ordinarily seen.

Therapeutic Management

Correction of subluxated and dislocated hips involves posi- tioning the hip into a flexed, abducted (externally rotated) position to press the femur head against the acetabulum and cause it to deepen its contour by the pressure. Splints, halters,

FIGURE 27.19 Signs of developmental hip dysplasia. (A) With child in a supine position, the right knee on the side of the subluxation appears lower than the left because of malposition of the femur head. (B) Asymmetry of skin folds and promi- nence of the trochanter on the right side.

or casts may be used. The small number of children who do not achieve correction by these methods will have surgery and a pin inserted to stabilize the hip.

Nursing Diagnosis: Deficient parental knowledge related to splint, halter, or cast correction for hip dysplasia

Outcome Evaluation: Parents verbalize correct tech- nique for and correctly demonstrate application and removal of splint or halter device and care of device or cast.

Multiple Diapers or Splints. Often splint correction (to hold the legs in a frog-leg, or abducted, externally ro- tated position) is begun during the newborn's initial hospital stay by placing two or three diapers on the in- fant. The extra bulk of cloth between the child's legs effectively separates and spreads them. Many brands of disposable diapers are cut narrow between the legs so they do not offer this much bulk and will not work as well as cloth diapers.

The way that parents carry infants may contribute to the formation of hip dysplasia. Infants who are carried straddled on their parents' hips, the way Latin American mothers carry their infants, may have less hip dysplasia than those carried with their legs consis- tently

brought together, such as Native American in- fants carried on swaddling boards. Swaddling babies is comforting. Be certain, however, these parents un- derstand that bringing this child's legs together with a tight swaddling blanket will not be good for this infant.

Pavlik Harness. A Pavlik harness is an adjustable chest halter that abducts the legs. It is the method of choice for long-term therapy because it reduces the time in- terval for therapy to 3 to 4 weeks and simplifies care (see Fig. 27.20B). Soft plastic stirrups (booties) with quick-fastening closures such as Velcro attach to leg extension straps and hold the hips flexed, abducted, and externally rotated. Instruct parents to lay the infant supine, grasp the infant's thighs and abduct them to place the femoral head into the acetabulum, and then apply the harness. The harness is then worn continually except for bathing. Advise parents to assess the skin under the straps daily for irritation or redness.

A Pavlik harness does not show under a shirt and long trousers and promotes gentle reduction of the hip. However, if a hip is completely dislocated, a Pavlik harness may not be firm enough to hold the hips in the proper position. In addition, the harness will be ineffective if parents remove it too frequently.

Spica Cast. If a hip is fully dislocated or the subluxation is severe, an infant may be placed immediately in a frog-leg, A-line cast or a spica cast to maintain an ex- ternally rotated hip position (see Fig. 27.20C). These casts are heavy and are so wide that dressing infants or sitting them in an infant car seat or bassinet can be

Box 27.9 Nursing Procedure ✻ Assessing Ortolani's and Barlow's Signs

Procedure

1. Lay the infant supine and flex the knees to 90° at the hips.
2. Place your middle fingers over the greater trochanter of the femur and your thumb on the internal side of the thigh over the lesser trochanter.
3. Abduct the hips while applying upward pressure over the greater trochanter, and listen for a clicking sound.
4. Next, with your fingers in the same position, and holding the hips and knees at 90° flexion, apply a backward pressure (down and laterally) and adduct the hips. Note any feeling of the femoral head slipping.

Principle

1. Proper positioning ensures accurate results.
2. Placing your fingers in this way allows for abduction of the hips.

3. Normally, no sound is heard. A clicking or clunking sound is a positive Ortolani's sign and occurs when the femoral head re-enters the acetabulum.
4. Normally, the hip joint is stable. A feeling of the femur head slipping out of the socket posterolaterally is a positive Barlow's sign indicative of hip instability associated with developmental hip dysplasia.

B

C

FIGURE 27.20 (A) Hip abduction splint (Frejka splint) holds the hips in an abduction position, forcing the femur head into the acetabulum. (B) A Pavlik harness. (C) A hip abduction cast for correction of subluxation of the hip.

difficult. Be certain parents have a car seat that can be modified to accommodate a large cast. Newborns are unable to report that a cast is causing circulatory con- striction, so they need to be assessed hourly for circu- lation to the extremities for the first 24 hours the cast is in place and daily thereafter. Teach parents how to do this type of neurovascular assessment (check temper- ature and circulation in toes) before they take an infant home from the hospital so they can prevent circulatory compression from a rapidly growing leg outgrowing a cast. Casts will be changed periodically but main- tained for 6 to 9 months. If a reduction maneuver for congenital dislocated hip was forceful, causing tension in the soft tissues around the hip, the resulting com- pression of the joint may cause transient blockage of the blood supply to the femoral head or avascular necrosis. In its severest form, this can lead to femoral head death and loss of future growth at the proximal growth plate causing unequal leg lengths (Eilert, 2008).

General Care Guidelines. No matter what type of ther- apy is used—double-diapering, harness, or cast— surgery may still be necessary for a final correction. Making parents aware of this from the start prevents

them from thinking their child's condition is so serious that the usual methods of treatment failed. It helps them from becoming discouraged or dissatisfied with health care. It also helps them to accept from the be- ginning that this condition will be a long-term care concern. Some children will be 2 years old before the final cast or harness is removed.

The child and parents will be visiting their orthope- dist frequently during these early years. Assess that parents also schedule general health maintenance visits for routine immunizations and overall growth and development assessment. Spend time during health maintenance visits talking with them about infant stim- ulation. Because the child is not fully mobile, special adaptations are necessary. Teach parents to hold their child for feeding and to rock and cuddle the in- fant, even though a large cast or a brace may be bulky and awkward. They need to bring experiences to the infant because the child cannot crawl and walk toward interesting objects in the environment. A child's wagon can supply convenient and fun trans- portation. The child may also be able to lie prone and move about on a large skateboard. Many parents worry that the child who is still in a large cast at the

normal age for walking (12 months) will never learn to walk. They can be assured that this is not a problem; when the cast is removed, the child will quickly catch up with this developmental step.

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- Learning about the way a child will be physically chal- lenged immediately after birth helps parents adjust most easily. Advocate for parents by helping them obtain as much information as they need about their child's condition.
- Parent–infant bonding can be difficult to establish when a child is hospitalized at birth. Assess family relationships at health maintenance visits to see that bonding is occurring.
- Cleft lip and palate result from the failure of the maxillary process to fuse in intrauterine life. Surgical repair is possi- ble early in life, with a good prognosis for both these conditions.
- Tracheoesophageal atresia and fistula occur from failure of the trachea and esophagus to divide appropriately in intrauterine life. Surgical intervention often needs to be performed in several stages.
- Omphalocele is the protrusion of abdominal contents through the abdominal wall at birth, protected only by a peritoneal membrane. When the membrane is not present, this is called gastroschisis. Although several stages of repair are often necessary, surgical correction has a good outcome.
- Intestinal obstruction can result from atresia (complete closure) or stenosis (narrowing) of a part of the bowel. Correction is surgical removal of the narrowed bowel portion.
- A meconium plug occurs when an extremely hard portion of meconium blocks the lumen of the intestine. Infants with meconium plug syndrome need to be observed for continuing bowel function and need to be assessed for cystic fibrosis, because a meconium plug is often a symp- tom of this.
- Diaphragmatic hernia occurs when the abdominal organs protrude through a defect in the diaphragm into the chest cavity. This prevents the lungs from fully expanding at birth. These infants are critically ill at birth and need ex- tensive surgical correction.

- Imperforate anus is stricture of the anus, resulting in in- ability to pass stool. The infant may have a temporary colostomy created before a final surgical correction can be completed.
- Physical developmental disorders of the nervous system include hydrocephalus (excess cerebrospinal fluid in the ventricles) and spina bifida (incomplete closure of the spinal cord). Infants with hydrocephalus need surgery to relieve a ventricular obstruction or have a shunt implanted from their ventricles to the peritoneal cavity to remove ex- cess cerebrospinal fluid. Children with myelomeningo- cele, the most severe form of neural cord disorder, face permanent loss of lower neuron function and require con- tinued rehabilitation.

- Absent or malformed extremities may range from absence of a finger to absence of an entire limb. Children may need physical therapy and teaching on how to use a pros- thesis to gain full mobility and function.
- Developmental hip dysplasia is the improper formation and function of the hip socket; talipes deformities are foot and ankle deformities. Children may need extensive brac- ing and casting to correct these disorders.

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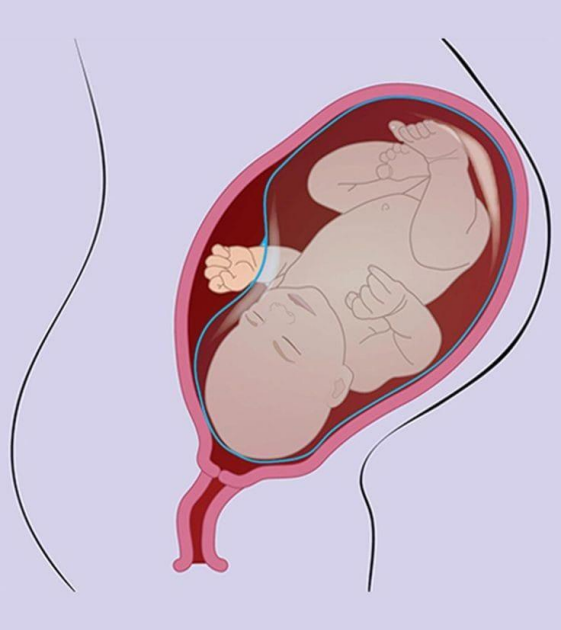
Nursing Assessment and Management of High-Risk Neonate

Nursing Assessment and Management of High-Risk Neonate objectives:

1. Nursing Assessment and management of High-risk Neonate
2. 2.Regulation of Birth and death Certificate for Newborn and its importance .

Nursing care of a family with a high-risk Newborn



Characteristic Causes of High-Risk Pregnancies

- Can relate to the pregnancy itself
- Can occur because the woman has a medical condition or injury that complicates the pregnancy
- Can result from environmental hazards that affect the mother or her fetus
- Can arise from maternal behaviors or lifestyles that have a negative effect on the mother or fetus

Resuscitation

https://youtu.be/h-QnKT-moeY

1 - Stimulate the neonate by drying

Tactile stimulation can trigger spontaneous breathing. It is done bydrying the neonate.
If the neonate starts to breathe or cry within 5 seconds, proceed toroutine care If not, stop stimulation and proceed to step 2.

2 - Clear the airway

Lay the neonate on the back with the head in a neutral position. avoidflexion or hyperextension of the neck, as this can obstruct the airway.

3 - Stimulate the neonate

Rub the back and the soles of the feet vigorously but not roughly (donot shake, slap or hang the infant by the feet, etc.). If the neonate is having difficulty breathing or still not breathing after 5 seconds: stop active stimulation, and proceed to steps 4 and 5.

- **4 - Clamp and cut the cord**

  If not already done, clamp and cut the cord.

- **5 - Perform bag-mask ventilation** (room air)

  Fit the mask over the nose and mouth. Press firmly to prevent air leaks. Hold it with one hand, with the thumb on one side and the index and middle fingers on the other

- **6 - Oxygenation**

  If oxygen is available: connect the ambu bag to an oxygen reservoir after 2 minutes of ventilation

Birth injury

- A birth injury describes any type of injury that a baby suffers before, during, or directly after childbirth.
- Many babies suffer from minor injuries during delivery that do not need to be treated and often heal on their own in days or weeks. Some birth injuries can lead to more severe complications

Birth injuries

Generally happen when the child is being born. Common injuries that occur during childbirth include physical head trauma and brain bleeds.

Birth defects

Abnormalities that typically form while a child is still in the womb birthdefects typically develop within the first three months of pregnancy.
Factors such as drug use, family medical history, and untreatedinfections may increase the risk of birth defects.

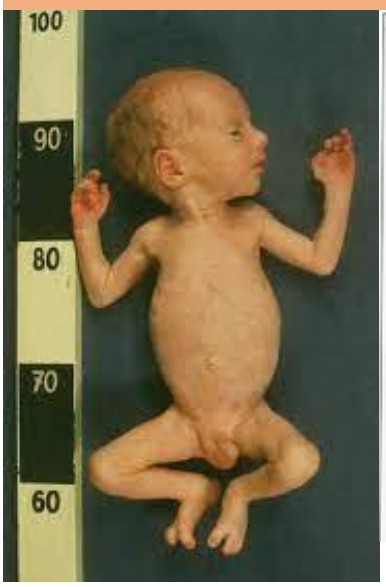
Incubator

https://youtu.be/eIFZZHYYJ28

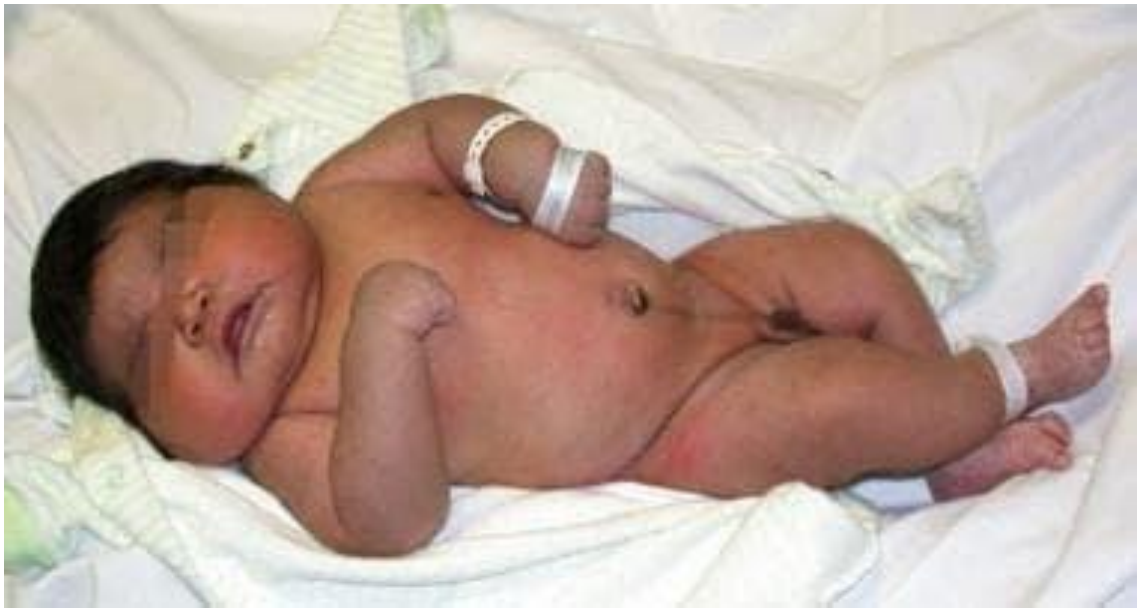
Phototherapy

https://youtu.be/hGEVOtdObCE

Small for gestational age



Large for gestational age



Preterm infant

Contractions and cervical change before 37 weeks

Symptoms

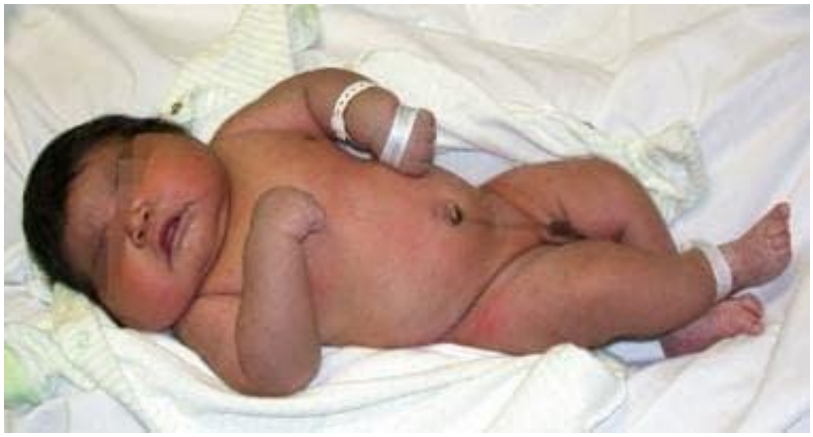
- **Uterine Contractions**
- **Menstrual-like Cramps**
- **Lower Backache**
- **Pelvic Pressure**
- **Intestinal Cramps**
- **Increase or Change in Vaginal Discharge**
- **A General Feeling That Something is Not Right**

Major Risks of Preterm Delivery

- Death
- Respiratory distress syndrome
- Hypothermia
- Hypoglycemia
- Jaundice
- Infection

Postterm infant

is a pregnancy that persist beyond 42 weeks of gestation



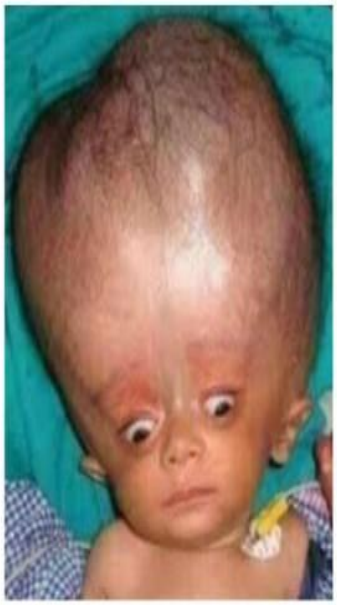
Nursing care of the child born with a physical or developmental challenge

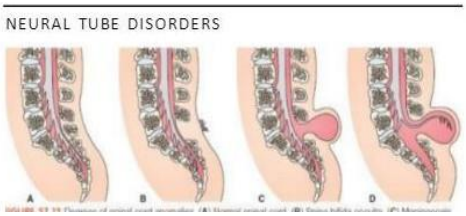
Cleft Palate

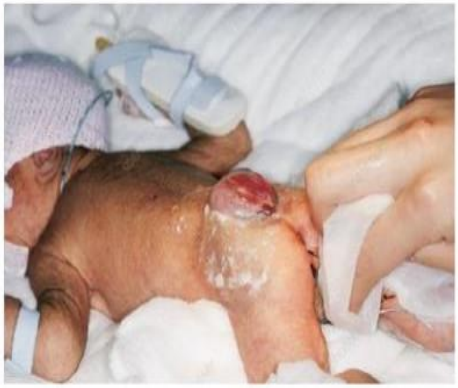
It is a palate opening that usually on the midline & involves anterior hard palate, posterior soft palate, or both. The palate process closes at 9th-12th WOIL. It usually occurs in conjunction with cleft lip. In assessing, direct visualization of palate by using tongue depressor. Child with cleft palate must be assess for other congenital anomalies.

Management

- Early repair -> second repair
- Soft palate: 3-6mos old repair
- Hard palate: 15-18mos old old







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Nursing care of the child born with a physical or developmental challenge

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Lecture 10

Gynecological Disorder

Gynecological Disorder

A gynecological disorder is a condition which affects the female reproduction organs, namely the breasts and organs in the abdominal and pelvic area including uterus, prolapse of the genital tract, benign or malignant genital tract, menstrual disorder, infertility.

Genital prolapse: The condition is most common in postmenopausal women who have had children, but can also occur in younger women and women who have not had children.

occurs when pelvic organs (uterus, bladder, rectum) slip down from their normal anatomical position and either protrude into the vagina or press against the wall of the vagina. The pelvic organs are usually supported by ligaments and the muscles, connective tissue and fascia which are collectively known as the pelvic floor. Weakening of or damage to these support structures allows the pelvic organs to slip down.

Prolapses are graded according to their severity; first, second or third degree prolapse.

Uterine prolapse: A uterine prolapse involves the descent of the uterus and cervix down the vaginal canal due to weak or damaged pelvic support structures.

Symptoms of a prolapsed uterus include:

- A feeling of fullness or pressure in your pelvis (it may feel like sitting on a small ball)
- Low back pain
- Feeling that something is coming out of your vagina
- Uterine tissue that bulges out of your vagina
- Painful sexual intercourse
- Difficulty with urination or moving your bowels
- Discomfort walking

Prolapsed Uterus Causes and Risk Factors

It can happen as a result of:

- Pregnancy/childbirths with normal or complicated delivery through the vagina
- Weakness in the pelvic muscles with advancing age
- Weakening and loss of tissue tone after menopause and loss of natural estrogen
- Conditions leading to increased pressure in the abdomen such aschronic cough (with bronchitis and asthma), straining (with constipation), pelvictumors (rare), or an accumulation of fluid in the abdomen
- Being overweight or obese with its additional strain on pelvic muscles
- Major surgery in the pelvic area leading to loss of external support

- Excess weight lifting
- Being white
- Family history

Diagnosis

health care provider can diagnose uterine prolapse with a medical history and physical examination of the pelvis.

- The doctor need to examine in standing position and while are lying down and ask to cough or strain to increase the pressure in abdomen.
- Specific conditions, such as ureteral obstruction due to complete prolapse, may need an intravenous pyelogram (IVP) or renal sonography. Dye is injected into your vein, and a series of X-rays are taken to view its progress through bladder.
- Ultrasound may be used to rule out other pelvic problems. In this test, a wand is passed over abdomen or inserted into vagina to create images with sound waves.
- Pelvic magnetic resonance imaging (MRI) is sometimes done if have more than one prolapsed organ or to help plan surgery.

Prolapsed Uterus Treatment

Treatment depends on how weak the supporting structures around your uterus have become.

Self-care at home

can strengthen pelvic muscles by performing Kegel exercises. do these by tightening pelvic muscles, as if trying to stop the flow of urine. This exercise strengthens the pelvic diaphragm and provides some support.

Medications

Estrogen (a hormone) cream or suppository ovules or rings inserted into the vagina help in restoring the strength and vitality of tissues in the vagina. But estrogen is only for use in select postmenopausal women.

surgery

Depending on age and whether wish to become pregnant, surgery can repair the uterus or remove it. When indicated, and in severe cases, uterus can be removed witha hysterectomy. During the surgery, the surgeon can also correct the sagging of the vaginal walls, urethra, bladder, or rectum. The surgery may be performed by an open abdominal procedure, through the vagina, or through small incisions in the abdomen or vagina with specialized instruments.

If do not want surgery or are a poor candidate for surgery, may decide to wear a supportive device, called a pessary, in vaginal canal to support the falling uterus. It can use this temporarily or permanently. They come in various shapes and sizes and must be fitted to you. If prolapse is severe, a pessary may not work. Also, pessaries can be irritating inside vagina and may cause a foul-smelling discharge.

Follow-up

Follow-up depends on how condition was treated.

- If had surgery, need to follow up according to surgeon's advice.
- If have a pessary inserted in vagina, it needs to be cleaned and checked by your health care provider for the correct position and fit at regular intervals unless you are instructed on how to remove it and clean it yourself at home.
- If have been told to do Kegel exercises, should have a regular follow-up visit so that your health care provider can check the progress of muscle strength.

Cystocele: A cystocele occurs when the tissues supporting the wall between the bladder and vagina weaken, allowing a portion of the bladder to descend and press into the wall of the vagina.

signs and symptoms of prolapsed bladder include:

- Pressure in the vaginal region
- Tissue protruding out of the vagina
- Pain in the vagina, lower back, abdomen or pelvic region
- Frequent urination or the urge to urinate
- Urinary incontinence or losing more urine than desired
- Difficultly using tampons
- Regular urinary tract infections
- No feeling of relief immediately after urination
- Pelvic pressure that worsens with standing, lifting or coughing
- Sexual intercourse might be painful

The primary **cause** of prolapsed bladder is childbirth.

- Obesity
- Heavy lifting
- Previous pelvic surgery
- Constipation
- Aging
- Menopause
- chronic coughing (or other lung problems)
- Excessive straining during bowel movements

Risk Factors

Other common risk factors for prolapsed bladder are:

- Aging
- Family history
- Previous pelvic surgery

Diagnosis

- physical and pelvic exam.
- review symptoms, and family and medical history

- Cystourethrogram: This test is also referred to as a voiding cystogram. A Cystourethrogram is an X-ray of the bladder taken while a patient is urinating. The patient's bladder is usually filled with contrast dye to show the form of the bladder and reveal any obstructions.
- Magnetic Resonance Imaging (MRI): An MRI can help determine the scope of the condition.
- Cystoscopy: This is a test that allows doctor to inspect the lining of bladder and the urethra, the tubular conduit that releases urine out of body.
- Urodynamics: This test demonstrates how well bladder is working and if there are any leaks or obstructions.
- Ultrasound: An ultrasound scan uses sound waves to capture images of bladder.

Treatment

Treatment for cystocele depends on the severity or grade of the prolapsed bladder. doctor will customize bladder prolapse treatment to particular medical history, family history, age, risk factors and condition.

Cystocele treatment may include:

- Lifestyle changes: doctor may recommend that avoid or eliminate certain activities that could make your condition worse. Activities might want to avoid are lifting heavy objects or excessive straining during bowel movements.
- Kegel exercises: These are daily pelvic muscle exercises.
- Pessary: This is a medical device positioned in the vagina to stabilize the bladder.
- Bladder Prolapse Surgery: Surgery can reposition the bladder. doctor may insert a sling to hold bladder in place.
- Hormone replacement therapy: to strengthen the muscles throughout the vagina and bladder.

Common cystocele complications are:

- Regular urinary tract infections
- Discomfort or pain during sexual intercourse
- You may experience incontinence
- Urine may leak from your vagina
- Cystocele may reoccur over time
- A cystocele sling may wear away with time and need to be removed
- Injury to bladder

Urethrocele: A urethrocele occurs when the urethra (tube leading from the bladder to the outside of the body) descends and presses into the wall of the vagina. A urethrocele rarely occurs alone, instead usually accompanying a cystocele. The term cystourethrocele is used to refer to the prolapse of both part of the bladder and the urethra**.**

Cause:

The urethrocele is held in place by a thick layer of muscle fibers and soft tissue, called the pelvic floor. However, certain situations may cause the pelvic floor muscles and tissues to lose their natural strength, causing them to stretch and become unable to hold the urethra (other structures of the female organ) in their original place. Once this occurs, the urethra, which is shaped like a tube, will widen and form a curve, until it starts to press into the vaginal wall.

risk factors:

- Age - Age also plays a role in this process, as the muscles also naturally weaken as a woman ages.
- Congenital defects - There are some rare cases in which young women who have never had any children suffer from this weakening of the pelvic muscles, as well as some cases wherein a urethral prolapse may already be present even at birth. Both cases are caused by congenital defects in the pelvic floor.
- Obesity
- Repetitive activities causing pressure to the pelvic floor, such as lifting heavy objects frequently
- Health conditions that cause repetitive strain on the pelvic muscles, such as chronic cough or chronic constipation
- Hysterectomy (surgery to remove the uterus)

treatment involves:

- **Kegel exercises** – Doing Kegel exercises is an effective way to strengthen the pelvic floor muscles, and this can help improve the patient's condition and reduce symptoms. To do Kegel exercises, simply contract and release the pelvic muscles repeatedly. These are the same muscles that control the flow of urine.
- **Surgery** – In some severe cases, urethrocele may be treated with surgery, in which the supporting structure surrounding the urethra is repaired.

Rectocele: A rectocele occurs when the tissues supporting the wall between the vagina and rectum weaken allowing the rectum to descend and press into the wall of the vagina.

Symptoms

mild cases of rectocele, the individual may notice Trusted Source pressure within the vagina, or they may feel that their bowels are not completely empty after using the bathroom.

In moderate cases, an attempt to evacuate can push the stool into the rectocele rather than out through the anus.

There may be pain and discomfort during evacuation. There is a higher chance of having constipation, and there may be pain during sexual intercourse. Some say it feels as if "something is falling out" or down within the pelvis. In severe cases, there may befecal incontinence, and sometimes the bulge may prolapse through the mouth (opening) ofthe vagina, or through the anus

Causes

weakening of the pelvic support structures and of the rectovaginal septum, the layer of tissue that separates the vagina from the rectum.

The following are risk factors:

- a drop in estrogen levels at menopause, making pelvic tissues less elastic
- a hysterectomy or other pelvic surgery
- chronic constipation
- long-term coughing, such as in chronic bronchitis
- sexual abuse during childhood
- being obese or overweight
- regularly lifting heavy objects

Diagnosis:

a diagnosis after examining the vagina and rectum. An imaging study can then determine the size of the rectocele.
The individual's account of how the rectocele impacts their life may help to assess the degree of prolapse.
If a doctor finds something unusual during a physical examination, they may recommend an imaging test, such as MRI or X-ray, to check for possible causes of the problem.
X-ray study that helps the doctor determine the size of the rectocele and how well the patient is evacuating.

Treatment

Depending on how severe the rectocele is, a doctor may suggest home remedies, medication, or, in some cases, surgery.

Enterocyte: An enterocyte is similar to a rectocele, but instead involves the Pouch of Douglas (area between the uterus and the rectum) descending and pressing into the wall of the vagina.

Vaginal vault prolapses: A vaginal vault prolapse occurs when the top of the vagina descends in women who have had a hysterectomy.

causes vaginal prolapse

Several common causes of a vaginal prolapse can include:

- Childbirth: Vaginal delivery raises the risk of prolapse more than a cesarean section (when the baby is delivered through a surgical opening in the wall of the abdomen). It's also thought that the more children a woman delivers, as well as the delivery of a large baby (more than 9 pounds), will raise the risk of prolapse.
- Surgery: A procedure like a hysterectomy, or radiation treatment in the pelvic area, could cause a prolapse.
- Menopause: During menopause, ovaries stop producing hormones that regulate monthly menstrual cycle (period). The hormone estrogen is particularly important because it helps keep your pelvic muscles strong. When body doesn't make as much estrogen as before, those pelvic muscles can become weak and a prolapse can develop.
- Aging: As grow older, you are at a higher risk of forming a prolapse.
- Extreme physical activity or lifting of heavy objects: Strain from activity can also weaken your pelvic muscles and allow your organs to sag out of position.
- Genetic or hereditary factors: pelvic support system could naturally be weaker than typical. This can be passed down throughout your family.

symptoms of vaginal prolapse

- A feeling of fullness, heaviness or pain in the pelvic area.
- Lower back pain.
- Bulging in the vagina.
- Organs slipping out of the vagina.
- Leakage of urine (urinary incontinence).
- Bladder infections.
- Difficulty having a bowel movement.
- Problems with sexual intercourse.
- Problems inserting tampons. Uterine prolapse is a common condition that can happen as a woman ages. and with multiple vaginal deliveries during childbirth,

causes uterine prolapse.

Several factors can contribute to the weakening of the pelvic muscles, including:

1. Loss of muscle tone as the result of aging.
2. Injury during childbirth, especially if had many babies or large babies (more than 9 pounds).
3. Obesity.
4. Chronic coughing or straining.
5. Chronic constipation.

uterine prolapse: is normally held in place inside your pelvis with various muscles, tissue, and ligaments. Because of pregnancy, childbirth or difficult labor and delivery, in some women these muscles weaken. Also, as a woman ages and with a natural loss of the hormone estrogen, their uterus can drop into the vaginal canal, causing the condition known as a prolapsed uterus

the symptoms:

1. A feeling of heaviness or pressure in the pelvis.
2. Pain in the pelvis, abdomen or lower back.
3. Pain during sex (intercourse).
4. Uterine tissue that falls through the opening of the vagina.
5. Frequent bladder infections.
6. Unusual or excessive discharge from the vagina.
7. Constipation.
8. Urination problems, including involuntary loss of urine (incontinence), the need to urinate frequently (urinary frequency) or the sudden urge to urinate (urinary urgency).

uterine prolapse diagnosed

1. pelvic examination to determine if the uterus has lowered from its normal position.During a pelvic exam, inserts a speculum (an instrument that lets the provider see inside the vagina) and examines the vagina and uterus. The nurse feels for any bulges caused by the uterus dropping down into the vaginal canal.

uterine prolapse treated

- non-surgical
- surgical

Non-surgical options

1. Exercise:

Kegel exercises, it help strengthen the pelvic floor and tighten the pelvic muscles muscles in mild cases of uterine prolapse .

2. Vaginal pessary: A pessary is a rubber or plastic doughnut-shaped device that fits around or under the lower part of the uterus (cervix). This device helps prop up the uterus and hold it in place. The nurse will fit and insert the pessary, which must be cleaned frequently and removed before sex.

Surgical options

1. Hysterectomy and prolapse repair: removing the uterus in a surgical procedure called a hysterectomy. This done through a cut (incision) made in the vagina (vaginal hysterectomy) or through the abdomen (abdominal hysterectomy). Hysterectomy is major surgery, and removing the uterus means pregnancy is no longer possible.
2. Prolapse repair without hysterectomy: This procedure involves putting the uterus back into its normal position. Uterine suspension by reattaching the pelvic ligaments to the lower part of the uterus to hold it in place. The surgery can be done through the vagina or through the abdomen depending on the technique that is used.

uterine prolapse be prevented / nursing education.
A few lifestyle tips that can reduce the risk of prolapse include:

1. Maintaining a healthy body weight.
2. Exercising regularly. In addition, do Kegel exercises to strengthen the pelvic floor muscles.
3. Eating a healthy diet.
4. Stop smoking. This reduces the risk of developing a chronic cough, which can put extra strain on the pelvic muscles.
5. Using proper lifting techniques.

Symptoms of pelvic organ prolapse

1. a feeling of heaviness around the lower tummy and genitals
2. a dragging discomfort inside the vagina
3. feeling like there's something coming down into the vagina – it may feel like sitting on a small ball
4. feeling or seeing a bulge or lump in or coming out of the vagina
5. discomfort or numbness during sex
6. problems peeing – such as feeling like the bladder is not emptying fully, needing to go to the toilet more often, or leaking a small amount of pee when cough, sneeze or exercise (stress incontinence).

Cystocele: Surgery for a prolapsed bladder can be done through the vagina or through the abdomen using minimally invasive robotic surgery. The procedure also typically addresses any prolapse of the top of the vagina or the urethra — the tube that carries urine out from the bladder.

Rectocele: Surgery for prolapsed rectum is typically done through the vagina. The surgeon also corrects any widening (“looseness”) of the vagina, which commonly occurs with this condition and thereby potentially improves sexual functioning and sexual pleasure for the patient and her partner.

Uterine or Vaginal Vault Prolapse: Historically, a hysterectomy has been performed for uterine prolapse. However, A prolapsed uterus can, in some cases, be moved back into place through the vagina or through the abdomen via minimally invasive robotic or open surgery.

Enterocele: Surgery for prolapsed bowel can be done through the vagina or through the abdomen using minimally invasive robotic surgery or open surgery.

Benign & Malignant disorders

Breast cancer: is the most common invasive cancer in females. is a disease in which cells in the breast grow out of control. There are different kinds of breast cancer. The kind of breast cancer depends on which cells in the breast turn into cancer. Breast cancer can begin in different parts of the breast. A breast is made up of three main parts: lobules, ducts, and connective tissue.

Symptoms

- armpit or breast pain does not change with the monthly cycle
- pitting, like the surface of an orange, or color changes such as redness in the skin of the breast
- a rash around or on one nipple
- discharge from a nipple, which may contain blood
- a sunken or inverted nipple
- a change in the size or shape of the breast
- peeling, flaking, or scaling of the skin of the breast or nipple

Causes

After puberty, a female's breasts are made up of fat, connective tissue, and thousands of lobules. These are tiny glands that can produce milk. Tiny tubes, or ducts, carry the milk toward the nipple.

Breast cancer develops as a result of genetic mutations or damage to DNA. These can be associated with Trusted Source exposure to estrogen, inherited genetic defects, or inherited genes that can cause cancer, such as the *BRCA1* and *BRCA2* genes.

When a person is healthy, their immune system attacks any abnormal DNA or growths. When a person has cancer, this does not happen.

As a result, cells within breast tissue begin to multiply uncontrollably, and they do not die as usual. This excessive cell growth forms a tumor that deprives surrounding cells of nutrients and energy.

Breast cancer usually starts in the inner lining of the milk ducts or the lobules that supply them with milk. From there, it can spread to other parts of the body.

Stages are:

- **Stage 0:** This is also called ductal carcinoma in situ. The cancerous cells are only within the ducts and have not spread to surrounding tissues.
- **Stage 1:** At this stage, the tumor measures up to 2 centimeters (cm) across. It has not affected any lymph nodes, or there are small groups of cancer cells in lymph nodes.
- **Stage 2:** The tumor is 2 cm across and has started to spread to nearby nodes, or it is 2–5 cm across and has not spread to the lymph nodes.
- **Stage 3:** The tumor is up to 5 cm across and has spread to several lymph nodes, or the tumor is larger than 5 cm and has spread to a few lymph nodes.
- **Stage 4:** The cancer has spread to distant organs, most often the bones, liver, brain, or lungs.

Imaging tests

Mammogram: This is a type of X-ray that doctors commonly use Trusted Source during initial breast cancer screening. It produces images that can show lumps or abnormalities. If there is any sign of a potential problem, the doctor usually conducts further testing.

Ultrasound: This scan uses sound waves to help a doctor differentiate between a solid mass and a fluid-filled cyst.

MRI: This combines different images of the breast to help a doctor identify cancer or other abnormalities. A doctor may recommendTrusted Source an MRI as a follow-up to a mammogram or ultrasound. Doctors may also use MRIs to screen people with a higher risk of breast cancer.

Biopsy

This involves Trusted Source extracting a sample of tissue and sending it to a laboratory for analysis.

The results show whether the cells are cancerous, and if they are, which type of cancer has developed. The results can even show whether the cancer is hormone-sensitive.

The doctor then stages the cancer to establish:

- the size of a tumor
- how far it has spread
- whether it is invasive

Treatment

The most effective approach depends on several factors, including:

- the type and stage of the cancer
- the sensitivity to hormones
- the person's age, overall health, and preferences

The main treatment options include Trusted Source:

- radiation therapy
- surgery
- biological therapy, or targeted drug therapy
- hormone therapy
- chemotherapy

Surgery

If surgery is necessary, the type depends on the diagnosis and the person's preferences. Types of surgery Source:

Lumpectomy: This involves removing the tumor and a small amount of healthy tissue around it.

A lumpectomy can help prevent the spread of cancer. This may be an option if the tumor is small and easy to separate from surrounding tissue.

Mastectomy: A simple mastectomy involves removing the breast's lobules, ducts, fatty tissue, nipple, areola, and some skin. In some types, a surgeon also removes the lymph nodes and muscle in the chest wall.

Sentinel node biopsy: If breast cancer reaches the sentinel lymph nodes, the first nodes to which it can spread, it can travel to other parts of the body through the lymphatic system. If the doctor does not find cancer in the sentinel nodes, it is usually not necessary to remove other nodes.

Axillary lymph node dissection: If a doctor finds cancer cells in the sentinel nodes, they may recommend removing several lymph nodes in the armpit. This can prevent cancer from spreading.

Reconstruction: Following a mastectomy, a surgeon can reconstruct the breast so that it looks more natural. This can help a person cope with the psychological effects of breast removal.

The surgeon can reconstruct the breast during the mastectomy or at a later date. They may use a breast implant or tissue from another part of the body.

Radiation therapy

A person may undergo radiation therapy around 1 month Trusted Source after surgery. It involves targeting the tumor with controlled doses of radiation that kill any remaining cancer cells.

Chemotherapy

A doctor may prescribe cytotoxic chemotherapy drugs to kill cancer cells if there is a high risk Trusted Source of recurrence or spread. When a person has chemotherapy after surgery, doctors call it adjuvant chemotherapy.

Sometimes, a doctor may recommend chemotherapy before surgery to shrink the tumor and make it easier to remove. This is called neoadjuvant chemotherapy.

Breast cancer screening

Expert guidelines about how often to have breast cancer screenings differ.
The American College of Physicians recommends that women aged 40–49 years with an average risk of breast cancer discuss the benefits and risks of regular screenings with a doctor.
Women aged 50–74 who have an average risk, the guidelines say, should have screeningsevery 2 years.
Women aged 75 or older should continue with screenings if their life expectancy is 10 or more years.
The ACS suggests that women with an average risk should be able to choose whether to have yearly scans from the age of 40Trusted Source onward. Regular annual screening should start at the age of 45, and at the age of 55, a woman should be able to decide whetherto start screening every other year, these guidelines state.
The American College of Radiologists recommend screenings every year, startingfrom 40 years of age.

Despite the variations, most experts recommend at least speaking with a doctor aboutbreast cancer screening from the age of 40 onward.

Cervical cancer is a type of cancer that occurs in the cells of the cervix — the lower partof the uterus that connects to the vagina. Various strains of the human papillomavirus (HPV), a sexually transmitted infection, play a role in causing most cervical cancer.

When exposed to HPV, the body's immune system typically prevents the virus from doing harm. In a small percentage of people, the virus survives for years, contributing tothe process that causes some cervical cells to become cancer cells.

Signs and symptoms of cervical cancer include:

1. Vaginal bleeding after intercourse, between periods or after menopause
2. Watery, bloody vaginal discharge
3. Pelvic pain
4. pain during intercourse

Risk factors for cervical cancer include:

1. Many sexual partners.
2. Early sexual activity.
3. Other sexually transmitted infections (STIs).
4. A weakened immune system.
5. Smoking.
6. Exposure to miscarriage prevention drug.

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Prevention

To reduce risks of cervical cancer:

- **Pap tests.** Pap tests can detect precancerous conditions of the cervix, so they can bemonitored or treated in order to prevent cervical cancer.
- **Practice safe sex.** Reduce risk of cervical cancer by taking measures to preventsexually transmitted infections, such as using a condom every time have sex .
- **Don't smoke.**

Management: the abnormal cells or lesions detected during screening tests, treatment isneeded to excise them. It includes cryotherapy (destroying abnormal tissue on the cervix by freezing it) or Loop electrosurgical excision procedure (LEEP) when the patient is noteligible for cryotherapy. **The treatment of cervical cancer varies with the stage of thedisease.**

- For early invasive cancer, surgery is advised.
- In more advanced cases, radiation combined with chemotherapy and in patients with disseminated disease, chemotherapy or radiation provides palliative management of symptoms.
- Palliative care is given to help people with advanced disease to have dignity and peace during difficult and final phases of life.

Uterine fibroids

Uterine fibroids are noncancerous growths of the uterus that often appear during childbearing years. Also called leiomyomas or myomas, uterine fibroids aren't associated with an increased risk of uterine cancer and almost never develop intocancer.

the most common signs and symptoms of uterine fibroids include:

1. Heavy menstrual bleeding
2. Menstrual periods lasting more than a week
3. Pelvic pressure or pain
4. Frequent urination
5. Difficulty emptying the bladder
6. Constipation
7. Backache or leg pains

Nursing Diagnosis

• Acute pain related to postoperative wound as manifested by facial expression andpain scale score
• Imbalanced nutrition less than body requirements related to pain as manifested bydecreased food intake.
• Impaired bowel elimination, constipation related to decreased activity, pain onstraining
• Disturbed sleep pattern related to pain and hospitalization
• Risk for infection related to the surgery
• Low Self-Esteem related to changes in femininity as evidenced by Withdrawal,depression

Ovarian dermoid cysts: Ovarian cysts are fluid-filled sacs or pockets in an ovary oron its surface. ovarian cysts — especially those that have ruptured — can cause serious symptoms. To protect health, get pelvic exams and know the symptoms that can signal a potentially serious problem.

Symptoms

1. Pelvic pain — a dull or sharp ache in the lower abdomen on the side of the cyst
2. Fullness or heaviness in your abdomen
3. Bloating

Risk factors

1. Hormonal problems.
2. Endometriosis.
3. A severe pelvic infection.
4. A previous ovarian cyst.

Menstrual disorder: With each menstrual cycle, the endometrium (uterine lining)prepares itself to nourish a fetus. If fertilization doesn't occur, the body sheds the endometrium during the monthly cycle.

Types of Menstrual Disorders

1. Premenstrual Syndrome (PMS)
2. Amenorrhea
3. Dysmenorrhea
4. Menorrhagia
5. Treatments

Premenstrual Syndrome (PMS)

PMS is any unpleasant or uncomfortable symptom during your cycle that may temporarily disturb normal functioning. These symptoms may last from a few hours tomany days, and the types and intensity of symptoms can vary in individuals.

PMS Symptoms

1. Psychological symptoms (depression, anxiety, irritability)
2. Gastrointestinal symptoms (bloating)
3. Fluid retention (swelling of fingers, ankles and feet)
4. Skin problems (acne)
5. Headache
6. Vertigo
7. Fainting
8. Muscle spasms
9. Heart palpitations
10. Allergies
11. Infections
12. Vision problems
13. Eye infections
14. Decreased coordination
15. Diminished libido (sex drive)

16. Changes in appetite
17. Hot flashes

Amenorrhea

Amenorrhea is characterized by absent menstrual periods for more than three monthlymenstrual cycles.

Types of Amenorrhea

1. Primary amenorrhea: Menstruation does not begin at puberty.
2. Secondary amenorrhea: Normal and regular menstrual periods that become increasingly abnormal and irregular or absent. This may be due to a physicalcause typically of later onset.

Amenorrhea can occur for a number of reasons as part of the normal course of life, such as pregnancy, breastfeeding or menopause. Or, it may occur as a result of medications ora medical problem including:

1. Ovulation abnormality
2. Birth defect, anatomical abnormality or other medical condition
3. Eating disorder
4. Obesity
5. Excessive or strenuous exercise
6. Thyroid disorder

Dysmenorrhea

Dysmenorrhea is characterized by severe and frequent menstrual cramps and painassociated with menstruation.

The cause of dysmenorrhea is dependent on if the condition is primary or secondary. With primary dysmenorrheal, women experience abnormal uterine contractions resultingfrom a chemical imbalance in the body. Secondary dysmenorrhea is caused by other medical conditions, most often endometriosis. Other possible causes may include:

1. pelvic inflammatory disease (PID)
2. uterine fibroids
3. abnormal pregnancy (i.e., miscarriage, ectopic)
4. infection, tumors, or polyps in the pelvic cavity

Dysmenorrhea Symptoms

The most common symptoms may include:

- Cramping or pain in the lower abdomen 2MO -
- Low back pain or pain radiating down the legs
- Nausea

- Vomiting
- Diarrhea
- Fatigue
- Weakness
- Fainting
- Headaches

Menorrhagia: is the most common type of abnormal uterine bleeding and ischaracterized by heavy and prolonged menstrual bleeding.

Menorrhagia Causes

There are several possible causes of menorrhagia, including:

1. Hormonal imbalance
2. Pelvic inflammatory disease (PID)
3. Uterine fibroids
4. Abnormal pregnancy; i.e., miscarriage, ectopic (tubal pregnancy)
5. Infection, tumors or polyps in the pelvic cavity
6. Certain birth control devices; i.e., intrauterine devices (IUDs)
7. Bleeding or platelet disorders
8. High levels of prostaglandins (chemical substances used to control musclecontractions of the uterus)
9. High levels of endothelins (chemical substances used to dilate blood vessels)
10. Liver, kidney or thyroid disease

Polymenorrhea: Too frequent menstruation.
Oligomenorrhea: Infrequent or light menstrual cycles
Metrorrhagia: Any irregular, non-menstrual bleeding as in bleeding which occursbetween menstrual periods
Postmenopausal bleeding: Any bleeding that occurs more than one year after the lastnormal menstrual period at menopause

Infertility: inability of couples to conceive a clinical pregnancy after 1 year or more oftrying.

There are 2 types of infertility:

- **Primary infertility** refers to couples who have not become pregnant after at least 1 yearhaving sex without using birth control methods.
- **Secondary infertility** refers to couples who have been able to get pregnant at least once,but now are unable.

Causes

Many physical and emotional factors can cause infertility. It may be due to problems inthe woman, man, or both.

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Female infertility may occur when:

1. A fertilized egg or embryo does not survive once it attaches to the lining of thewomb (uterus).
2. The fertilized egg does not attach to the lining of the uterus.
3. The eggs cannot move from the ovaries to the uterus.
4. The ovaries have problems producing eggs.

Female infertility may be caused by:

1. Autoimmune disorders, such as antiphospholipid syndrome (APS)
2. Birth defects that affect the reproductive tract
3. Cancer or tumor
4. Clotting disorders
5. Drinking too much alcohol
6. Eating disorders or poor nutrition
7. Growths (such as fibroids or polyps) in the uterus and cervix
8. Medicines such as chemotherapy drugs
9. Hormone imbalances
10. Being overweight or underweight
11. Older age
12. Ovarian cysts and polycystic ovary syndrome (PCOS)
13. Pelvic infection pelvic inflammatory disease (PID)
14. Thyroid disease

Male Infertility

Male infertility may be due to:

1. Decreased number of sperm
2. Blockage that prevents the sperm from being released
3. Defects in the sperm

Male infertility can be caused by:

1. Birth defects
2. Cancer treatments, including chemotherapy and radiation
3. Exposure to high heat for prolonged periods
4. Heavy use of alcohol, marijuana, or cocaine
5. Hormone imbalance
6. Infection
7. Obesity
8. Older age
9. Retrograde ejaculation
10. Toxins in the environment

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Fertility Treatments for Females

- Clomiphene or Clomiphene Citrate
- Letrozole
- Gonadotropins or Human Chorionic Gonadotropin (hCG)
- Bromocriptine or Cabergoline

Clomiphene or Clomiphene Citrate

Clomiphene is a medication patients take by mouth (orally). It causes the body to make more of the hormones that cause the eggs to mature in the ovaries.2 If a woman does notbecome pregnant after taking clomiphene for six menstrual cycles, a health care providermay prescribe other fertility treatments.

- Patients take clomiphene in the beginning of the menstrual cycle.
- Clomiphene causes ovulation to occur in 80% of women treated. About half ofthose who ovulate are able to achieve a pregnancy or live birth.2
- Use of clomiphene increases the risk of having a multiple pregnancy. There is a 10% chance of twins, but having triplets or more is rare—less than 1% of cases.2

Letrozole

Letrozole is an oral pill that decreases the amount of estrogen a woman makes,stimulating her ovaries to release eggs.

- Patients take letrozole toward the end of their menstrual cycle for around 5 days.
- letrozole may work better than clomiphene in women with polycystic ovarysyndrome.5

Gonadotropins and Human Chorionic Gonadotropin (hCG)

Gonadotropins such as follicle-stimulating hormone (FSH) are hormones that are injectedin a woman to directly stimulate eggs to grow in the ovaries, leading to ovulation.2 Health care providers normally prescribe gonadotropins when a woman doesnot respond to clomiphene or to stimulate follicle growth for assisted reproductive technology (ART).

- Gonadotropins are injected in the early part of the menstrual cycle for 7 to 12days.
- While a woman is treated with gonadotropins, a health care provider uses transvaginal ultrasound to monitor the size of the developing eggs, which growinside tiny sacs called follicles. The health care providers also draw blood frequently to check the ovarian production of estrogen.
- The chance of a multiple birth is higher with gonadotropins than with clomiphene,and 30% of women who conceive a pregnancy with this medication have multiplebirths.2 About two-thirds of multiple births are twins. Triplets or larger multiple births account for the remaining third.

hCG is a hormone similar to luteinizing hormone that can be used to trigger release of theegg after the follicles have developed.

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Bromocriptine or Cabergoline

Bromocriptine and cabergoline are pills taken orally to treat abnormally high levels of thehormone prolactin, which can interfere with ovulation. Pituitary growths; certain medications, including antidepressants; kidney disease; and thyroid disease can cause high levels of prolactin.

- Bromocriptine or cabergoline allow 90% of women to have normal prolactinlevels.
- Once prolactin levels become normal, 85% of women using bromocriptine orcabergoline ovulate.
-

Surgery to remove patches of endometriosis has been found to double the chances forpregnancy. Surgery can also be used to remove uterine fibroids, polyps, or scarring, which can affect fertility.

1. medical treatment

a. Gonadotropin

b. clomiphene citrate

c. letrozole

2. surgical treatment

a. laparoscopic surgery

b. tubal ligation reversal

c. tubal surgeries

3. reproductive assistance

a. intrauterine insemination IUI

b. in vitro fertilization IVF

c. therapeutic donor insemination TDI

male infertility treatement

With modern technology and methods, the number of treatment options for male infertility has expanded. Depending on the cause of infertility, treatments may include:

Medications:

- Hormone therapy to increase the number of sperm.

Lifestyle changes:

- Get and maintain a healthy body weight by exercising and eating a healthy diet.
- Stop smoking.
- Stop drinking.
- Stop using marijuana.
- Stop any illegal drug use.

Surgeries:

- **Vasectomy reversal:** This common procedure is an outpatient surgery. The surgeon reconnects your vas deferens which is the tube in the scrotum through which your sperm passes. Viewing the vas deferens through a high-power surgicalmicroscope, the surgeon carefully sews the ends back

together.

- **Vasopididymostomy**: Blockages in your vas deferens are repaired with a similartechnique. Your vas deferens is surgically split, the blockage is removed and the ends of the tube are reconnected. When the original vasectomy was performed many years previously, an additional blockage may have formed in the epididymis, the coiled tube that lies against your testicle where sperm cells mature. Blockage at the epididymis also can occur due to infection or injury.

Whatever the cause, your surgeon will fix the problem by bypassing the blockagein the epididymis.

- **Sperm Retrieval**: In some severe cases, a biopsy of the testicle is required to findsperm.

- **Intracytoplasmic sperm injection:** Artificial techniques of reproduction have advanced to the point where a single sperm can be physically injected into an egg.This procedure, called intracytoplasmic sperm injection (ICSI) has dramatically changed the treatment available for even the most severe male factor infertility. Because of this technique, 90% of all infertile males have the potential to conceive their own genetic child.
- **In vitro fertilization:** For some couples dealing with male infertility, in vitro fertilization (IVF) is the treatment of choice. During the IVF process, the ovariesare stimulated with injectable fertility medications to cause multiple eggs to mature. When the eggs are ready, they are collected in a minor procedure. Fertilization is accomplished by exposing the eggs to sperm in a culture dish, or by directly injecting a single sperm into each mature egg, a process called intracytoplasmic sperm injection (see above). After fertilization, embryo development is monitored over the next three to five days, and two to three embryos are then placed into the uterus by way of a small catheter inserted through the cervix

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