CHAPTER 17 –FEMALE REPRODUCTION SYSTEM

OBJECTIVES

On completion of this chapter, you will be able to:

- Describe the uterus and state its functions.
- Describe the fallopian tubes and state their functions.
- Describe the ovaries and state their functions.
- Describe the vagina and state its functions.
- Describe the breast.
- Describe the menstrual cycle.
- Analyze, build, spell, and pronounce medical words.
- Comprehend the drugs highlighted in this chapter.
- Describe diagnostic and laboratory tests related to the female reproductive system.
- Identify and define selected abbreviations.
- Describe each of the conditions presented in the Pathology Spotlights.
- Review the Pathology Checkpoint
- Complete the Study and Review section, and the Chart Note Analysis.

OUTLINE

I. Anatomy and Physiology Overview (Fig 17–1, p. 565)
The female reproductive system consists of a left and right ovary, which are the female’s primary sex organs, and the following accessory organs: two fallopian tubes, the uterus, the vagina, the vulva, and two breasts. The function of the female reproductive system is to perpetuate the species through sexual or germ cell reproduction.

A. Uterus (Figs. 17–2 and 17–3, pp. 565, 566) – a muscular, hollow, pear-shaped organ that is suspended in the anterior part of the pelvic cavity halfway between the sacrum and symphysis pubis, above the bladder, and in front of the rectum. Several ligaments support the uterus and hold it in position. The normal position of the uterus, known as anteflexion, is with the cervix pointing toward the lower end of the sacrum and the fundus toward the suprapublic region. The uterus can be divided into anatomical regions to include:

- **Body** – the uterine body or corpus is the larger upper portion. The fundus is the rounded portion of the uterine body above the openings of the fallopian tubes. The body ends at a constricted central area known as the isthmus.
- **Cervix** – the lowermost cylindrical portion of the uterus that extends from the isthmus to the vagina.

1. **Uterine Wall** – consist of three layers:
   a. **Perimetrium** – outer layer.
b. **Myometrium** – muscular middle layer.

c. **Endometrium** (Fig. 17–3, p. 566) – the mucous membrane lining the inner surface of the uterus, composed of columnar epithelium and connective tissue and is supplied with blood by both straight and spiral arteries. The uterine lining is affected by hormonal changes during the menstrual cycle.

2. **Functions of the Uterus** – the uterus has three primary functions:

   a. It is the organ of uterine cyclic changes that occur in the structure of the endometrium. The lining of the uterus is shed every 21 to 40 days accompanied by bleeding (except during pregnancy and menopause).

   b. The uterus functions as a place for the protection and nourishment of the fetus during pregnancy.

   c. During labor, the muscular uterine wall contracts rhythmically and powerfully to expel the fetus from the uterus.

3. **Abnormal Positions of the Uterus** (Fig. 17–4, p. 567) – the uterus may become malpositioned because of weakness of any of its supporting ligaments. Trauma, disease processes of the uterus, or multiple pregnancies can contribute to the weakening of the supporting ligaments. The following terms describe some of the abnormal positions of the uterus:

   a. **Retroversion** – turned backward with the cervix pointing forward toward the symphysis pubis.

   b. **Retroflexion** – bent backward at an angle with the cervix usually unchanged from its normal position.

   c. **Anteversion** – fundus turned forward toward the pubis with the cervix tilted up towards the sacrum.

B. **Fallopian Tubes** – also known as the uterine tubes or oviducts, the fallopian tubes extend laterally from either side of the uterus and end near each ovary. Their walls are composed of three layers:

   - **Serosa** – outermost layer that is composed of connective tissue.
   - **Muscular** – containing inner circular and outer longitudinal layers of smooth muscle.
   - **Mucosa** – inner layer consisting of simple columnar epithelium.

1. **Anatomical Features of the Fallopian Tubes** (Fig. 17–3, p. 566)

   a. **Isthmus** – the constricted portion of the tube nearest the uterus.

   b. **Ampulla** – the widened area that extends from the isthmus laterally.

   b. **Infundibulum** – the end of the expanded area beyond the ampulla.

   c. **Ostium** – the funnel-shaped opening.
d. **Fimbriae** – *fingerlike structures* that surround each ostium. They work to propel the discharged ovum into the tube, where ciliary action aids in moving it toward the uterus. If the ovum is impregnated by a spermatozoon while in the tube, **fertilization** occurs.

2. **Functions of the Fallopian Tubes** – there are two basic functions are as follows:
   a. To serve as ducts to convey the ovum from the ovary to the uterus.
   b. To serve as ducts to convey spermatozoa from the uterus toward each ovary.

C. **Ovaries (Fig. 17–5, p. 568)** – located on either side of the uterus, they are almond-shaped organs attached to the uterus by **ovarian ligament** and lie close to the **fimbriae** of the fallopian tubes. The anterior border of each ovary is connected to the posterior layer of the **broad ligament** by the **mesovarium** (portion of the peritoneal fold). Each ovary is attached to the side of the pelvis by the **suspensory ligaments**.

1. **Microscopic Anatomy** – each ovary consist of two distinct areas:
   a. **Cortex** – the outer layer, which contains small **secretory sacs** or **follicles** in three stages of development. These stages are known as primary, growing, and graafian or mature stage.
   b. **Medulla** – the inner portion that contains connective tissue, nerves, blood and lymphatic vessels, and some smooth muscle tissue in the regions of the hilus.

2. **Function of the Ovaries** – these organs are primarily controlled by the anterior lobe of the pituitary gland, which produce **gonadotropic hormones**, FSH and LH. These follicle-stimulating hormones are instrumental in development of the **ovarian follicles**, and **luteinizing hormone**, which stimulates the development of the **corpus luteum**, a small yellow mass of cells that develops within a ruptured ovarian follicle. The ovaries have two major functions:
   a. **Production of the Ova** – each month a **graafian follicle** ruptures on the **ovarian cortex**, and an **ovum** is discharged into the pelvic cavity, where it enters the fallopian tube. This process is known as **ovulation**. A woman produces approximately 400 ova during her reproductive years.
   b. **Production of Hormones** – the ovaries are also endocrine glands that produce **estrogen** and **progesterone**.
      - **Estrogen** – female sex hormone secreted by the follicle.
      - **Progesterone** – steroid hormone secreted by the corpus luteum and is important in the maintenance of pregnancy.
These hormones are essential for:

- Promoting growth and development and maintaining the female secondary sex organs and characteristics.
- Preparing the uterus for pregnancy.
- Promoting development of the mammary glands.
- The emotional well-being and sexual drive of a woman.

D. **Vagina (Fig. 17–3, p. 566)** – a musculomembranous tube extending from the vestibule to the uterus. It is situated between the bladder and the rectum and is lined by mucous membrane made up of **squamous epithelium**. A fold of mucous membrane, the **hymen**, partially covers the external opening of the vagina.

1. **Functions of the Vagina** – three basic functions are:
   a. Receives the seminal fluid from the male penis; it is the female organ of copulation.
   b. Serves as a passageway for the discharge of menstruation.
   c. Serves as a passageway for the birth of the fetus.

E. **Vulva (Fig. 17–6, p. 570)** – the external female genitalia that consists of five organs. Between the vulva and the anus is an external region known as the **perineum**, a muscular sheet that forms the pelvic floor and during childbirth, it can be torn and cause injury to the anal sphincter. To avoid such an injury, an **episiotomy** is usually performed.

The five organs that comprise the external female genitalia are:

1. **Mons Pubis** – referred to as the mons veneris or *mound of Venus*, it is a pad of fatty tissue of triangular shape. After puberty the mons pubis is covered with pubic hair and is the rounded area over the symphysis pubis.
2. **Labia Majora** – two folds of adipose tissue, which are large liplike structures, lying on either side of the vaginal opening.
3. **Labia Minora** – two folds of skin that lie within the labia majora and enclose the vestibule.
4. **Vestibule** – the cleft between the labia minora. Four major structures open into the vestibule:
   a. Urethra
   b. Vagina
   c. Two Excretory Ducts of the Bartholin Glands
5. **Clitoris** – a small organ consisting of sensitive erectile tissue that is homologous to the penis of the male. It is located between the anterior labial commissure and partially hidden by the anterior portion of the labia minora.

F. **Breasts (Fig. 17–7, p. 571)** – **mammary glands** are alveolar structures consisting of 15 to 20 glandular tissue lobes separated by septa of
connective tissue. The breasts lie anterior to the pectoral muscles and curve outward from the lateral margins of the sternum to the anterior border of the axilla. The size of the breast can greatly vary according to age, heredity, and adipose tissue present.

1. **Areola** – the dark, pigmented area found in the skin over each breast, and the **nipple** is the elevated area in the center of each areola. During pregnancy, the areola changes from its pinkish color to a dark brown or reddish color. It is supplied with sebaceous glands that secrete an oily substance to keep it resilient.

2. **Lactiferous Glands** – consist of 20 to 24 glands in the areola of the nipple and, during lactation, secrete and convey milk to a suckling infant.

3. **Prolactin** – the hormone that stimulates the mammary glands to produce milk after childbirth. Insulin and glucocorticoids are other hormones that play a role in milk production.

4. **Colostrum** – a thin yellowish secretion, is the first milk and contains serum and white blood cells.

5. **Oxytocin** – produced by the stimulation of suckling. It acts on the mammary glands to stimulate the release of milk and stimulates the uterus to contract during parturition.

G. **Menstrual Cycle (Fig. 17–8, p. 572)** – the menstrual cycle is a periodic recurrent series of changes occurring in the uterus, ovaries, vagina, and breast. It is regulated by the complex interaction of hormones, **luteinizing hormone** (LH) and **follicle-stimulating hormone** (FSH), which are produced by the pituitary gland, and the female hormones **estrogen** and **progesterone**, which are produced by the ovaries. The onset of the menstrual cycle occurs at the age of **puberty** and its cessation is at **menopause**. Menstruation occurs during a woman’s reproductive years, except during pregnancy. The first day of bleeding is counted as the beginning of each menstrual cycle and ends just before the next menstrual period. It occurs every 21 to 40 days and has three phases.

1. **Follicular Phase** – menstruation marks the first day of the follicular phase, is characterized by the discharge of a bloody fluid from the uterus accompanied by a shedding of the endometrium. This phase averages 4 to 5 days and is considered to be the first to the fifth days of the cycle.

2. **Ovulatory Phase** – occurs about 14 days before the onset of menstruation and is characterized by the stimulation of estrogen, the thickening and vascularization of the endometrium, along with the maturing of the ovarian follicle. This phase begins about the fifth day and ends at the rupture of the graafian follicle (release of the egg), usually 36 hours after the surge in luteinizing hormone begins. About 12 to 24 hours after the egg is released, this surge can be detected by measuring LH levels in urine. An egg can be fertilized at this time for about 12 hours.
3. **Luteal or Secretory Phase** – follows ovulation and lasts about 14 days, unless fertilization occurs, and ends just before a menstrual period. During this phase the corpus luteum in the ovary is developing and secreting progesterone, which is highest during this phase as the estrogen level decreases. The function of the **corpus luteum** is to prepare the uterus in case fertilization occurs. The progesterone produced causes:
   a. The endometrium to thicken, filling with fluids and nutrients in preparation for a potential fetus.
   b. The mucus in the cervix to thicken, making the entry of sperm or bacteria into the uterus less likely.
   c. Body temperature to increase slightly during the luteal phase and remain elevated until a menstrual period begins (a sign that ovulation has occurred).

In the second part of the luteal phase, the estrogen level increases, also stimulating the endometrium to thicken. In response to the estrogen and progesterone increase, the breasts may swell and become tender. If the egg is not fertilized, the corpus luteum degenerates after 14 days and a new menstrual cycle begins.

4. **Premenstrual or Ischemic Phase** – this phase last about 2 days and ends with the occurrence of menstruation. During this phase the:
   a. Coiled arteries become constricted.
   b. The endometrium becomes anemic and begins to shrink.
   c. The corpus luteum decreases in functional activity.

II. **Life Span Considerations**

A. **The Child** – the sex of the child is determined at **fertilization** (X-bearing ovum + X-bearing spermatozoon = female) or (X + Y = male). Sex differentiation occurs early in the embryo. At 16 weeks, the fetus is recognizable male or female (Fig, 17–9 p. 574). At birth the genitals are not fully developed. They may be slightly swollen, and in the female, blood-tinged mucus may be discharged from the vagina, due to the mother’s hormones, and the labia minora may protrude beyond the labia majora. Sex organs do not mature until the onset of **puberty**. At puberty the female experiences breast development, vaginal secretions, and menarche.

B. **The Older Adult** – in women at about the age of 50, the ovaries cease to produce estrogen and progesterone. Women enter a phase of life known as **menopause**. The signs and symptoms of menopause vary in occurrence and severity but can include
   - Irregular periods
   - Hot flashes
   - Vaginal dryness
   - Insomnia
   - Joint pain
- Headaches.
- Emotional instability
- Irritability
- Depression
- Breast tissue may lose firmness
- Pubic and axillary hair becomes sparse
- The uterus becomes smaller and vagina shorter and dryer because of the lack of estrogen
- Osteoporosis

III. Building Your Medical Vocabulary

A. Medical Words and Definitions – this section provides the foundation for learning medical terminology. Medical words can be made up of four types of word parts:

1. Prefix (P)
2. Root (R)
3. Combining Forms (CF)
4. Suffixes (S)

By connecting various word parts in an organized sequence, thousands of words can be built and learned. In the text, the word list is alphabetized so one can see the variety of meanings created when common prefixes and suffixes are repeatedly applied to certain word roots and/or combining forms. Words shown in pink are additional words related to the content of this chapter that have not been divided into word parts. Definitions identified with an asterisk icon (*) indicate terms that are covered in the Pathology Spotlights section of the chapter.

IV. Drug Highlights

A. Female Hormones

1. Estrogens – used to treat a variety of conditions such as amenorrhea, dysfunctional bleeding (DUB), hirsutism, palliative therapy for breast cancer in women and prostate cancer in men, hormone replacement therapy (HRT) for symptoms related to menopause.

2. Progestogens/Progestins – synthetic progesterones used to prevent uterine bleeding; combined with estrogen for treatment of amenorrhea. They may be used in cases of infertility and threatened or habitual miscarriage.

B. Contraceptives

1. Birth Control Pills (BCP) – pills that contain mixtures of estrogen and progestin in various levels of strength that are nearly 100% effective when used as directed. The estrogen in the pill inhibits ovulation and the progestin inhibits pituitary secretion of LH, which causes changes in the cervical mucus that renders it unfavorable for the penetration of sperm and alters the nature of the endometrium.
2. **Birth Control Patch** – *Ortho Evra* is the first transdermal birth control patch that continuously delivers two synthetic hormones, progestin (norelgestromin) and estrogen (ethinyl estradiol). It prevents pregnancy by preventing ovulation and thickening the cervical mucus. It is applied directly to the skin and has a 95% effectiveness rate.

3. **Injectable** – *Depo-Provera* is an injectable contraceptive that is given four times a year. It contains medroxyprogesterone acetate, a synthetic drug that is similar to progesterone. It prevents pregnancy by preventing ovulation and thickening the cervical mucus. When used correctly, it is more than 99% effective.

4. **Intrauterine Device (IUD)** (Fig. 17–16, p. 581) – small device that is placed in the uterus to prevent pregnancy. Made of soft, flexible, ultra-light plastic and is 99.2 to 99.9% effective as birth control. IUDs do not protect against STDs or HIV. There are two available types:
   a. **ParaGard** – uses copper around the plastic.
   b. **Mirena** – releases small amounts of synthetic progesterone over time and can be left in place for up to 5 years.

V. **Diagnostic and Lab Tests**
   A. **Breast Examination** – visual and manual examination of the breast for changes in contour, symmetry, dimpling of skin, retraction of nipple(s), and for the presence of lumps.
   B. **Colposcopy** – visual examination of the vagina and cervix via a colposcope. Abnormal results may indicate cervical or vaginal erosion, tumors, or dysplasia.
   C. **Culdoscopy** – visual examination of the viscera of the female pelvis via a culdoscope through the wall of the posterior fornix of the vagina; performed in suspected ectopic pregnancy, unexplained pelvic pain, and to check for pelvic masses.
   D. **Estrogens** – urine or blood serum test to determine the level of estrone, estradiol, and estriol.
   E. **Hysterosalpingography (HSG)** – x-ray examination of the uterus and fallopian tubes after the injection of a radiopaque substance. Size and structure of these organs can be evaluated; performed to detect uterine tumors, fibroids, tubal pregnancy, and tubal occlusion. Also used for treatment of an occluded fallopian tube.
   F. **Laparoscopy** – visual examination of the abdominal cavity via a laparoscope. Used to examine the ovaries and fallopian tubes.
   G. **Mammography** – process of obtaining images of the breast by use of x-rays. This procedure is able to locate breast tumors before they grow to 1 cm and is the most effective means of detecting early breast cancers.
   H. **Papanicolaou (Pap Smear)** – screening technique to aid in the detection of cervical/uterine cancer and cancer precursors. It is not a diagnostic procedure. Both false-positive and false-negative results have been
experienced with Pap smears. Any lesion should be biopsied unless not indicated clinically. The Pap smear should not be used as a sole means to diagnose or exclude malignant and premalignant lesions. Results are reported as follows:

1. Within Normal Limits (WNL)
2. Abnormal Squamous Cells of Undetermined Significance (ASCUS)
3. Mild Dysplasia (CIN I – cervical intraepithelial neoplasia)
4. Moderate Dysplasia (CIN II)
5. Severe Dysplasia and/or Carcinoma in-situ (CIN III)

I. **Pregnaneediol** – urine test to determine menstrual disorders or possible abortion.

J. **Wet Mat or Wet-Prep** – examination of vaginal discharge for the presence of bacteria and yeast.

VI. **Abbreviations (p. 583)**

VII. **Pathology Spotlights**

A. **Endometriosis** – condition in which endometrial tissue occurs in various sites in the abdominal or pelvic cavity. This tissue responds to cyclic hormonal signals and cannot be cast off each month like the tissue in the uterus. The bleeding tissue causes the formation of scars and adhesions causing daily or monthly cyclic pain. Symptoms include:

- **Hematuria** – blood in urine.
- **Dysuria** – difficulty urinating.
- **Dyspareunia** – painful intercourse.
- **Menorrhagia** – excessive menstrual bleeding.
- **Irregular or More Frequent Periods**
- **Nausea and Vomiting**
- **Pain with Bowel Movements**
- **Spotty Bleeding**
- **Dysmenorrhea** – increasingly painful periods – the most common symptom.

Early diagnosis and treatment can limit cell growth and help prevent adhesions, while pregnancy, oral contraceptives, and other hormones seem to delay the onset of endometriosis. To confirm a diagnosis a **laparoscopy** can be performed. Treatment can include:

1. **Analgesic Therapy** – for the relief of the discomfort of the disease.
2. **Surgery** – reserved for women with severe endometriosis.

B. **Hysterectomy** – surgical procedure to remove a woman’s uterus. When the entire uterus, including the cervix, fallopian tubes, and ovaries are removed, it is referred to as **panhysterosalpingo-oophorectomy**. A hysterectomy stops menstruation (monthly periods), as well as ending her ability to become pregnant. The different types of hysterectomy are:
1. **Complete or Total Hysterectomy** – removes the cervix as well as the uterus; most common type.

2. **Partial or Subtotal Hysterectomy** – also called a supracervical hysterectomy removes the upper part of the uterus and leaves the cervix in place.

3. **Radical Hysterectomy** – removes the uterus, the cervix, upper part or the vagina, and supporting tissue; used in some cases of cancer.

A hysterectomy can be performed through an incision in the abdomen (abdominal hysterectomy [AH]) – most common, or the vagina (vaginal hysterectomy). Sometimes a laparoscope is used to view inside the abdomen. The type of surgery performed depends on the reason for the surgery. Some of the reasons are:

- Uterine fibroids, benign tumors that grow in the muscle of the uterus. If fibroids only are removed the surgery is called a myomectomy.
- Endometriosis.
- Cancer – approximately 10% of all hysterectomies.
- Chronic pelvic pain.
- Heavy bleeding between periods.
- Chronic pelvic inflammatory disease (PID).

**Bilateral salpingo-oophorectomy** is when both ovaries and both fallopian tubes are removed. This procedure can cause surgical menopause in women who are premenopausal.

**C. Pelvic Inflammatory Disease (PID)** – most common and serious complication of sexually transmitted diseases (STDs). This condition is an infection of the upper genital area and occurs when disease-causing organisms migrate upward from the vagina and cervix into the upper genital area. PID can affect the uterus, ovaries, and fallopian tubes. If untreated, it can cause scarring, which can lead to infertility, tubal pregnancy, chronic pelvic pain, and other serious consequences. Most cases are associated with gonorrhea and genital chlamydial infections. The major symptoms of PID include:

- Lower abdominal pain
- Abnormal vaginal discharge
- Fever
- Painful intercourse
- Irregular menstrual bleeding

Because PID can mimic other serious problems, test such as a sonogram, endometrial biopsy, or laparoscopy are ordered. Treatment consists of two antibiotics that are effective against a wide range of infectious agents. The antibiotics must be taken as ordered to acquire an effective cure. About one-fourth of women with suspected PID must be hospitalized.
D. Premenstrual Syndrome (PMS) (Fig. 17–17, p. 585) – a condition that causes a group of symptoms that may begin approximately two weeks before the onset of menstruation. PMS could be due to:
• The amount of prostaglandin produced.
• A deficient or excessive amount of estrogen or progesterone.
• An interrelationship between these factors.

F. Uterine Fibroids (Fig. 17–18, p. 586) – benign tumors or growths made up of muscle cells and other tissues that grow within the wall of the uterus. Fibroids can grow as a single growth or in clusters. Their size can vary from small such as an apple seed to even larger than a grapefruit. Fibroids are the most common benign tumor in woman of childbearing age. Most fibroids do not cause any symptoms, but some women with fibroids experience the following:
• Heavy bleeding or painful periods.
• Bleeding between periods.
• Feeling of fullness in the pelvic area.
• Frequent urination.
• Pain during sex.
• Lower back pain.
• Reproductive problems such as infertility, or early onset of labor during pregnancy.

Treatments for uterine fibroids can include:
• Over-the-Counter (OTC) Pain Medications – for mild pain.
• Gonadotropin Releasing Hormone Agonists (GnRHa) – used to shrink the size of fibroids; used prior to surgery.
• Surgery – consists of the following:
  o Dilation and Curettage (D&C) – procedure that involves enlarging the cervix (dilation) and then scraping (curettage) out portions of the lining of the uterus. When used for fibroids or polyps, the procedure stops the bleeding for a short period of time. Mainly used to take tissue samples and remove tissue following an incomplete miscarriage.
  o Myomectomy – surgical removal of fibroids without taking out the healthy tissue of the uterus.
  o Hysterectomy – surgical removal of the uterus and the only sure way to cure uterine fibroids.

VIII. Pathology Checkpoint

XI. Study and Review (pp. 588–594)

X. Practical Application: SOAP: Chart Note Analysis