CHAPTER 20 – ONCOLOGY

OBJECTIVES

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

• Describe cancer.
• Describe cell differentiation.
• Identify the staging system that evaluates the spread of a tumor.
• Describe methods that can be used in diagnosing cancer.
• List the various forms of treatment for cancer.
• Define radiation therapy.
• Describe important factors that must be considered when determining the use of radiotherapy for the cancer patient.
• Analyze, build, spell, and pronounce medical words.
• 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. Overview of Cancer (CA) (Fig 20–1, p. 668) – was first identified around 400 BC during the time of Hippocrates and is a Latin word meaning crab. Today, cancer refers to any malignant tumor (neoplasm, oncoma). More than 200 different types of cancer have been identified. Even though the incidence of cancer is now five times greater than it was 100 years ago, there is better hope for those afflicted. Cancer has become one of the most curable of the major diseases in the United States, and those tumors that cannot be cured can be controlled through treatment, thereby giving the patient an extended life span. With early detection followed by immediate treatment, the cure rate for cancer is now 1 in every 2. Treatment options include:

• Surgical Techniques – highly advanced surgeries are being used to remove cancerous tissue, and it is usually possible to excise all the cancer cells when the malignancy is discovered in its earliest stages.
• Chemotherapy – agents employed to kill cancerous cells that remain after surgery or in malignancies deemed inoperable.
• Radiation Therapy – radiation treatments employed to kill cancerous cells that remain after surgery or in malignancies deemed inoperable.
• Immunotherapy – newer methods employed in the treatment of cancer.
• Photodynamic Therapy – newer methods employed in the treatment of cancer.

Although the exact cause or causes remain unknown, research has shown that some cancers can be prevented, especially those associated with environmental factors. Oncologists searching for the causes of cancer have identified numerous
factors that play a role in the development of cancer. These factors are generally grouped under three main classifications:

- **Environmental**
- **Hereditary**
- **Biological**

The American Cancer Society recommends various safeguards against cancer, which encourages individuals to take specific steps to safeguard their health and also aid in the early detection of cancer. (See Site and Action Table, p. 669.)

A. **Classification of Cancer** – classification of cancer helps determine appropriate treatment and prognosis. Tumors are classified according:

1. **Anatomic Site (Fig. 20–2, p. 669)** – indicates where the cancer originated in the body.
   - **Carcinomas** – the great majority of all cancers, they are malignant tumors of epithelial tissues. Epithelial tissue lines body surfaces including those of glands and organs; therefore, carcinomas make up the majority of the glandular cancers and are generally found in the breast, stomach, uterus, tongue, and skin. They are named according to the type of epithelial cell in which the malignancy occurs or the primary site of the tumor.
     - **Squamous Carcinoma (Fig. 20–2, p. 669) (Fig. 5–32, p. 88)** – cancer of squamous epithelium.
     - **Basal Cell Carcinoma (Fig. 20–4, p. 682)** – a type of skin cancer.
     - **Bronchogenic Carcinoma** – a cancer originating in the bronchus of the respiratory tract.
   - **Sarcomas** – originate in connective or supportive tissues of the body such as the muscles, tendons, fat, joints, and bone. They are named by adding the suffix – *oma* (tumor) with the root *sarc* (flesh) to the word part that identifies the tissue of origin. For example: osteosarcoma – a cancer of the bone.
   - **Cancers of lymphatic tissue, bone marrow, and blood cells** are called:
     - **Leukemias** – cancers of blood-forming tissues.
     - **Lymphomas** – cancers of lymphoid tissue.
     - **Myelomas** – cancers of the bone marrow.

B. **Cell Differentiation and Grading** – normal cells reproduce themselves through mitosis, an orderly process that assures growth, tissue repair, and cell reproduction. Normal cells have a distinct appearance and changes as they mature and assume their specialized functions in a process called differentiation. This knowledge allows a pathologist or histologist, looking at a sample of tissue through a microscope, to identify the body area from which the tissue was removed. In cancer, there is an abnormal process wherein a cell or group of cells undergoes changes and no longer
carries on normal cell functions. This failure of immature cells to develop specialized functions is called **dedifferentiation**. It is believed that this process involves a disturbance in the DNA of the affected cells. **Malignant cells** usually multiply rapidly, forming a mass of abnormal cells that enlarges, ulcerates, and sheds malignant cells to surrounding tissues. This process destroys the normal cells, with malignant cells taking their places. Microscopic analysis of a malignant cell reveals a loss of differentiation, anaplasia, nuclei of various sizes that are hyperchromatic, and cells in the process of rapid and disorderly division. This analysis allows for a tumor grading system as follows:

- **Grade I** – describes the most differentiated and the least malignant tumors. Only a few cells are undergoing mitosis; however, some abnormality does exist.
- **Grade II** – cells are moderately undifferentiated with more cells undergoing mitosis; pattern is fairly irregular.
- **Grade III** – many cells are undifferentiated, and tissue origin may be difficult to recognize; many cells are undergoing mitosis.
- **Grade IV** – describes the least differentiated tumor with a high degree of malignancy.

This system of grading tumors is used to report the prognosis of the disease and also to determine whether the tumor is likely to respond to radiation therapy.

C. **Invasive Process** – two ways in which malignant cells spread to body parts are by **invasive growth**, by active migration or direct extension and **metastasis**.

1. **Invasive Growth (Fig. 20–8, p. 687)** – the spreading process of a malignant tumor into adjacent normal tissue. Young malignant cells divide at the periphery of the tumor and spread by active migration or direct extension.
   a. **Active Migration** – the malignant cells break away from the neoplasm, invade surrounding tissue, divide, form secondary neoplasms, and then reunite with the primary tumor as growth continues.
   b. **Direct Extension** – multiplication of malignant cells is rapid, and there is subsequent spreading into surrounding tissues via the interstitial spaces accompanied by engulfment and destruction of normal cells. As a tumor’s mass enlarges, its weight is supported by connective fibers that attach to surrounding structures. Adjacent veins and lymph vessels are invaded by these fibers and become pathways for the spread of malignant cells.

2. **Metastasis (Fig. 20–10, p. 691)** – the process whereby cancer cells are spread from a primary site to distant secondary sites elsewhere in the body. This process usually occurs when malignant cells invade the bloodstream or lymph system and are transported to a
secondary site where they become lodged and form a neoplasm. Malignant cells carried in the bloodstream may lodge in highly vascular organs such as the lungs or liver, and the development of a secondary neoplasm depends on the viability and the receptivity of the organ.

D. **Staging** – allows for further reporting of the development and spread of cancer cells through the use of a system that evaluates the spread of the tumor. The staging system uses the letters T (tumor), N (node), and M (metastasis) to indicate spread and uses numerical subscripts to indicate degree of tumor involvement. For example: T2N1M0 indicates a primary tumor at stage II, abnormality of regional lymph nodes at stage I, and no evidence of distant metastasis.

A numerical system is also used to classify the staging of cancer. This system describes the various stages according to the extent of the spreading process.

- **Stage 0** – cancer *in situ* (limited to inner lining surface of the organ and not invading the organ).
- **Stage I** – cancer limited to the tissue of origin and has not spread past the tissue or organ where it started.
- **Stage II** – limited local spread of cancerous cells, sometimes to lymph nodes.
- **Stage III** – extensive local and regional spread of cancer, usually to draining lymph nodes.
- **Stage IV** – distant metastasis, has spread beyond the regional lymph nodes to distant parts of the body.

E. **Characteristics of Neoplasms (see Table, p. 672)** – neoplasms or tumors may be **benign** or **malignant**. As malignant cells proliferate and begin the invasive process, the patient is unaware of the development of the cancer. In its early stages, cytologic changes are occurring that could be detected if a tissue sample were taken and analyzed by a pathologist. With the proliferation of malignant cells and the continuation of the invasive process, tissues, organs, and surrounding structures become compressed, and ischemia may occur, causing necrosis, inflammation, ulceration, and bleeding. This bleeding is usually occult (hidden) and is not noted by the patient. The enlarging tumor eventually causes sufficient pressure on surrounding tissues and organs to create a feeling of numbness, tingling, and pain. Because the tumor itself does not have nerve endings, pain is not an early symptom of its development. Because of the silent development of cancer, the patient does not usually become aware of its symptoms until its systemic effects are evident. These systemic effects depend on the site and type of cancer but usually result in an imbalance in the patient’s physiology, leading to subtle but noticeable changes that may warn of the disease. The American Cancer Society lists seven warning signals of cancer. The first letters of each warning signal
combine to spell the word CAUTION, and persons who develop any of the following symptoms should bring it to the attention of a physician immediately:

- Change in bowel or bladder habits.
- A sore that does not heal
- Unusual bleeding or discharge
- Thickening or lump in breast or elsewhere
- Indigestion or difficulty in swallowing
- Obvious change in a wart or mole
- Nagging cough or hoarseness

F. Diagnosis – a variety of diagnostic tools and procedures is used to detect the possible presence of cancer. Principal among these are:

1. **Examination** – an **annual physical examination** could be the best means of protecting one's state of health. The American Cancer Society publishes a cancer detection examination that recommends certain tests be included in an annual physical examination in addition to the medical history and usual tests. For more specific information visit the American Cancer Society’s Web site at www.cancer.org.

2. **Visualization by Endoscopy** – endoscopy provides the physician with a direct view of certain portions of the body. Endoscopic procedures used to assess specific locations within the body are as follows:
   - **Sigmoidoscopy** – use of a sigmoidoscope to examine the lower 10 inches of the large intestines.
   - **Laryngoscopy** – use of a laryngoscope to examine the interior of the larynx.
   - **Bronchoscopy** – use of a bronchoscope to examine the bronchi.
   - **Gastroscopy** – use of a gastroscope to examine the interior of the stomach.
   - **Cystoscopy** – use of a cystoscope to examine the bladder.
   - **Colposcopy** – use of a colposcope to examine the cervix and vagina.
   - **Proctoscopy** – use of a proctoscope to examine the anus and rectum.
   - **Colonoscopy** – use of a colonoscope to examine the colon.
   - **Laparoscopy** – use of a laparoscope to examine the abdomen.

3. **Laboratory Analysis** – laboratory analysis plays a key role in detecting specific types of cancer. The following are some of the laboratory tests that may be used to diagnose cancer:
- **Pap Smear/Test** – cytologic screening test developed by Dr. George Papanicolaou and used to detect the presence of abnormal or cancerous cells from the cervix and vagina.

- **Fecal Occult Blood Test** – test used to detect occult blood; can be used to check for cancer of the colon.

- **Sputum Cytology Test** – microscopic examination of sputum to detect abnormal or cancerous cells of the bronchi and lungs.

- **Blood Serum Test** – analysis of blood serum provides useful information about certain proteins synthesized by cancer.

- **Alpha-Fetoprotein Test (AFT)** – used to diagnose or monitor fetal distress or fetal abnormalities, diagnose some liver disorders, and to screen for and monitor some cancers; greater than normal levels may indicate cancer in testes, ovaries, biliary tract, stomach or pancreas.

- **Human Chorionic Gonadotropin (HCG) Test** – abnormal results can indicate ectopic pregnancy, miscarriage, testicular cancer, or trophoblastic tumor; used to monitor treatment in certain patients with cancer. During therapy, a falling HCG level indicates that the cancer is responding to treatment, while rising levels can indicate that the cancer is not responding to therapy. Increased levels after treatment can indicate a recurrence of disease.

- **Bone Marrow Study** – test used to detect abnormal bone marrow cells, which can indicate leukemia.

- **Urine Assay Test** – provides useful information about catecholamines, which can indicate pheochromocytoma of the adrenal medulla.

- **Cancer Antigen 125 (CA-125)** – measures the amount of this protein in the blood. CA-125 is found on the surface of many ovarian cancer cells. It also can be found in other cancers and in small amounts in normal tissue.

- **Carcinoembryonic Antigen (CEA)** – measures the amount of a protein that may appear in the blood of some people who have certain kinds of cancers, especially cancer of the large intestine. It can also be present in people with cancer of the pancreas, breast, ovary, or lung.

- **Human Epidermal Growth Factor Receptor-2 (HER-2/neu)** – genetic protein that is in part responsible for how certain cancer cells grow, divide, and repair themselves. Tests can be performed on breast cancer cells to determine whether HER-2/neu protein is present. This information is useful when making treatment decisions.

- **Prostate-Specific Antigen (PSA)** – substance produced by the prostate gland. This test measures the amount of PSA in
the bloodstream and should be offered every year to men 50 years of age or older. The American Cancer Society recommends that screening tests start at the age of 40 years for African American men or men with a family history of prostate cancer.

4. Biopsy (Bx) – the surgical removal of a small piece of tissue for microscopic examination. It is the method of providing the proof of cancer in the diagnosis of the disease. The following different types of biopsy can be used for tissue removal:

- **Excisional Biopsy** – surgical removal of a piece of tissue from the suspected body site.
- **Incisional Biopsy** – surgical incision to remove a section or wedge of tissue from the suspected body site.
- **Needle Biopsy** – puncture of a tumor for the removal of a core of tissue through the lumen of a needle.
- **Fine Needle Aspiration (FNA)** – form of breast biopsy in which a small needle is used to withdraw a sample of cells from the breast lump. If the lump is a cyst, removal of the fluid will cause the cyst to collapse. If the lump is solid, cells can be smeared onto slides for examination.
- **Stereotactic Biopsy** – alternative to traditional surgical biopsy; the procedure, which uses a mammogram-guided needle, is performed by a radiologist and assisted by mammography technologists. It is most helpful when mammography shows a mass, a cluster of microcalcifications (tiny calcium deposits that are closely grouped together), or an area of abnormal tissue change but no lump can be felt on careful breast examination.
- **Core Biopsy** – uses a large-bore needle to remove a generous sample of breast tissue and a **vacuum-assisted needle biopsy device (VAD)**, which uses vacuum suction to obtain a tissue sample.
- **Cone Biopsy** – removal of a cone of tissue from the uterine cervix.
- **Sternal Biopsy** – removal of a piece of bone marrow from the sternum.
- **Endoscopic Biopsy** – removal of a piece of tissue through an endoscope.
- **Punch Biopsy** – removal of a plug of tissue (epidermis, dermis, and subcutaneous tissue) from the skin.
- **Sentinel Node Biopsy** – allows the physician to pinpoint the first lymph node into which a tumor drains (the sentinel node), and remove only the nodes most likely to contain cancer cells. A radioactive tracer is injected in the area around the tumor to locate this node. The tracer travels the same path to the lymph nodes that cancer cells would take,
making it possible for the surgeon to determine the one or two nodes most likely to test positive. The surgeon then removes the nodes most likely to be cancerous.

5. Diagnostic Radiology – includes a wide range of tests and procedures, diagnostic radiology can reveal tumors that were not detected by other diagnostic procedures (see Chapter 21, Radiology and Nuclear Medicine, p. 707).

G. Treatment (Fig. 20–3, p. 675) – treatment choices will depend on the type of cancer present, its location, its invasive process, and the state of health of the patient. The ultimate outcome of treatment is the killing of every cancer cell. Therefore the need to treat tumors at an early stage is critical. The treatment of cancer can be any one or a combination of the following methods:

1. Surgery – can be the treatment of choice when the tumor is small and localized and the surrounding tissue is accessible for removal. The aim of surgery is the removal of all cancerous tissue plus some of the surrounding normal tissue. Surgery may also be used to alleviate some of the complications of cancer, such as the obstruction of an area caused by the enlargement of a tumor.

2. Chemotherapy (Chemo) – can be the treatment of choice when the cancer is disseminated (wide spread) and cannot be surgically removed. It is also used when a tumor fails to respond to radiation therapy. Antineoplastic drugs do injury to individual cells, interfere with their vital functions, and kill or destroy malignant cells. In rendering cancerous cells harmless, certain normal cells may also be destroyed. The normal cells with the greatest sensitivity to destruction are the hematopoietic cells, epithelial cells, and the hair follicles. The plan of treatment for patients undergoing chemotherapy is individualized. The aim of chemotherapy is to put the patient in remission so that life may continue without exacerbation of symptoms. Combination chemotherapy (the combination of certain antineoplastic agents) has proven to be effective in treating certain types of cancer.

3. Radiation Therapy (Fig. 20–6, p. 685) – treatment of disease by the use of ionizing radiation is called radiotherapy, x-ray therapy, cobalt treatment, or simply radiation therapy. In all cases, the aim of this treatment is to deliver a precise, calculated dose of radiation to diseased tissue, such as a tumor, while causing the least possible damage to surrounding normal tissue. Radiation can be defined as the process whereby energy is beamed from its source through space and matter to a selected target area. Substances that emit radiation are said to be radioactive.

4. Radiotherapy and Cancer – malignant cells are more sensitive to radiation than are normal cells. They seem less able to repair themselves; therefore, radiation is frequently used in the treatment
of patients with cancer, as either a curative or a palliative mode of therapy. Certain types of cancer cells can be destroyed by radiation therapy, thus preventing the unrestrained growth of such tumors. In other cancers, radiation has only a palliative effect, preventing cell growth, reducing pain, pressure, and bleeding, but not providing complete tumor destruction. Important factors that must be considered when determining the use of radiotherapy for the cancer patient include the following:

- The tumor must be surrounded by normal tissue that can tolerate the radiation and then repair itself.
- The tumor must not be widely spread. If the tumor has metastasized, radiation may be used as a palliative form of treatment.
- The tumor must be moderately sensitive to radiation (a radiosensitive tumor).

Radiotherapy is often the treatment of choice for cancers of the skin, uterus, cervix, or larynx or those located within the oral cavity. With other types of cancer, radiotherapy is frequently used in combination with other forms of treatment, including surgery and chemotherapy.

5. Techniques of Radiotherapy – there are two methods for the administration of radiation

a. **External Radiation Therapy (ERT)** – the patient receives calculated doses of radiation from a machine located at some distance from the site of the tumor. The patient is carefully prepared for treatment by a radiation therapist, sometimes assisted by the dosimetrist or a radiation physicist. The precise size and location of the tumor are determined, and the port, or point of entry for the radiation, is marked using a dye or tattoo. In formulating the treatment plan, a computer is used to calculate the radiation dosage that will be needed to effect maximal destruction of malignant cells and minimal damage to surrounding normal tissue. Special lead blockers or shields can be construct by a radiation physicist to protect surrounding normal tissue from the harmful effects of radiation.

b. **Internal Radiation Therapy (IRT)** – the IRT method of treatment can have two forms of administration known as sealed and unsealed radiation therapy.

- **Sealed Radiation Therapy** – involves the implantation of sealed containers of radioactive material near the tumor site within the body. Radioactive material such as radium, cesium-137, cobalt-60, and iridium-192 is sealed in small gold containers called seeds or within molds, plaques,
needles, or other devices designed to hold the radioactive substance near the malignancy. In some cases, the radiation source may be implanted within the diseased tissue. In other cases, special devices or applicators have been designed to hold the implant in position for the desired period of treatment.

- **Unsealed Radiation Therapy** – involves the introduction of a liquid containing a radioactive substance into the patient through the mouth, via the bloodstream, or by instillation into a body cavity. *Radioactive iodine-131, radioactive phosphorus-32, and radioactive gold-198* are some of the substances used in the unsealed form of internal radiation therapy. *Phosphorus-32* may be intravenously administered for use in the treatment of leukemia or lymphoma. *Gold-198* and/or *phosphorus-32* may be placed in colloidal suspension and instilled in a body cavity for the palliative treatment of certain malignancies. *Iodine131* may be orally administered, usually in conjunction with a thyroidectomy.

6. **Side Effects of Radiation** – radiotherapy affects normal tissue while destroying malignant cells, so patients usually experience some unpleasant side effects. The degree of severity associated with the side effects will depend on the individual, the cancer, its location, and the amount of radiation. The following are some side effects that may occur as a result of radiation therapy:

- Anorexia
- Nausea
- Vomiting
- Diarrhea
- Malaise
- Mild erythema
- Edema
- Ulcers
- Alopecia
- Taste blindness
- Stomatitis
- Mucositis
- Xerostomia

7. **Immunotherapy** – treatment of disease by stimulation of the body’s immune system. It may be used as an adjuvant to other types of treatment. There are three types of immunotherapy:

- **Active Specific** – the use of various agents to produce a specific host-immune response.
• **Passive** – the use of serum or other products from an immunocompetent individual that are given to an immunodeficient individual to produce an immune response.

• **Adoptive** – the process of transferring a form of specific immune response from a donor to a recipient.

8. **Photodynamic Therapy (PDT)** – a type of laser therapy that involves the use of a special chemical that is injected into the bloodstream and absorbed by cells all over the body. The chemical rapidly leaves normal cells but remains in cancer cells for a longer time. A laser light aimed at the cancer activates the chemical, which then kills the cancer cells that have absorbed it. Photodynamic therapy may be used to reduce symptoms of lung cancer and may also be used to treat very small tumors in patients for whom the usual treatments for lung cancer are not appropriate.

**H. Prevention of Cancer**

1. **Stop Smoking or Don’t Start** – smoking is the most preventable cause of death in humans. In the United States, tobacco use is responsible for more than 1 in 6 deaths. Cigarette smoking is responsible for 90% of lung cancer among men and 79% among women. Smoking accounts for about 30% of all cancer deaths. According to the World Health Organization (WHO), approximately 2.5 million people each year worldwide die as a result of smoking.

2. **Stop Using Smokeless Tobacco or Don’t Start** – there has been resurgence in the use of all forms of smokeless tobacco. The greatest cause of concern centers on the increased use of dipping snuff. In this practice, tobacco that has been processed into a coarse, moist powder is placed between the cheek and gum, and nicotine, along with a number of carcinogens, is absorbed through the oral mucosa. Use of chewing tobacco or snuff increases the risk of cancer of the mouth, larynx, pharynx, and esophagus.

3. **Avoid Direct Sunlight and/or Use Protective Sunscreen** – it has been shown that the exposure to the sun is a major factor in the development of melanoma and that incidence increases for those living near the equator. Almost all of the cases of basal and squamous cell skin cancer diagnosed each year in the United States are related to the ultraviolet radiation of the sun.

4. **Avoid Ionizing Radiation and/or Limit Exposure** – excessive exposure to ionizing radiation can increase cancer risk. Excessive radon exposure in homes, schools, and the workplace may increase the risk of lung cancer, especially in cigarette smokers.

5. **Proper Nutrition and Diet** – there is evidence that shows that proper nutrition and diet can help prevent disease. One may reduce his or her cancer risk by:
- **Maintaining Desirable Weight** – individuals 40% or more overweight increase their risk of colon, breast, prostate, gallbladder, ovary, and uterus cancer.

- **Eat a Variety of Vegetables and Fruits Each Day** – the National Cancer Institute (NCI) suggests eating at least 5 servings of fruits and vegetables each day. Studies have shown that daily consumption of vegetables and fruits can decrease the risk of lung, prostate, esophageal, colorectal, and stomach cancers.

- **Eat More Food That Are High in Fiber** – these include whole grains, breads, vegetables, and fruits. May reduce the risk of colon cancer.

- **Cut Down on Total Fat Intake** – it is recommended that only 30% or less of one’s daily intake be from fat. A high-fat diet can contribute to breast, colon, and prostate cancer.

- **Limit the Consumption of Alcohol to a Minimum**.

- **Limit the Consumption of Salt-Cured, Smoked, and Nitrite-Cured Foods** – those who eat these items frequently have higher incidence of cancer of the esophagus and stomach.

6. **Avoid Occupational Hazards** – exposure to several different industrial agents (nickel, chromate, asbestos, vinyl chloride, etc.) increase risk of various cancers. Risks of lung cancer from asbestos is greatly increased when combined with cigarette smoking.

### II. Life Span Considerations

#### A. The Child

- the impact of a diagnosis of cancer in a child can be very distressing, not only to the parents and other family members, but especially to the child. How much information and the best way to relate information on cancer depends on the child’s age and level of understanding. Children up to 2 years of age do not understand cancer, but they worry about being away from their parents. Children between 2 and 7 may link events to them and think that their cancers are caused by their misbehavior. Children 7 to 12 years of age are starting to understand links between things and events and are less likely to think that cancer is caused by anything they did. Children over 12 years old can often understand complicated relationships between events. The following are suggestions for talking to children about cancer or other serious illnesses:

  - Communicate at the level of the child’s understanding.
  - Do not overload the child with too much information at one time.
  - Tell the child about his or her disease soon after the diagnosis; the child usually knows that something is wrong and may imagine worse things than the truth.
  - Encourage the child to ask questions, and answer the questions openly and honestly.
- Plan ahead how to answer questions about what the child can expect over the course of the illness, treatments, and outcome.
- As long as possible, keep the child involved in daily living and helping activities; use the good times to talk about the child’s illness and to explain the treatment program. When the time is right, explain about hair loss, medicines, radiation therapy, and surgery.
- Give the child lots of love with hugs and kisses.
- Taperecord some favorite stories that can be played while the child is in the hospital for surgery or treatment. Have siblings participate in this project.
- Keep household routines as normal as possible, as this provides stability to all family members.

B. The Older Adult – more than 60% of cancers in the United States occur in people over the age of 65. It is estimated that by the year 2050, there will be 79 million people older than 65. Cancers of the skin, breast, bladder, colon, rectum, lung, pancreas, prostate, and stomach are the most common cancers in people over 65. Older adults with cancer frequently have distinctive medical, emotional, physical, and financial issues. It is important for the older adult to be fully informed about his or her diagnosis, treatment regimen, and follow-up care. There may be financial limitations, as older adults are more likely to have limited resources, which may cause them to refuse procedures or treatment due to cost. Other considerations for the older adult with cancer are:

- Diagnosis and treatment can be more difficult, because of multiple health conditions, such as heart disease, hypertension, arthritis, and diabetes.
- Anxiety and depression should be anticipated and treated.
- Modifications in lifestyle may be challenging to accomplish.
- Getting adequate nutrition may be difficult, especially for those living alone.
- Finding a responsible caregiver may be difficult and cause anxiety.
- Loss of personal independence may trigger depression or despair.
- Arranging transportation to appointments and treatments can be difficult.

Planning for additional needs after surgery, chemotherapy, and discharge from a hospital should include information on supportive services, such as home health aides, visiting nurses, physical therapy, social work, support groups, and community resource referrals.

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. Abbreviations (p. 690)

V. Pathology Spotlights  
A. Breast Cancer (Figs. 20–10, p. 691) – the leading cause of death in women between the ages of 32 and 52. Early detection of breast cancer is extremely important. The 5-year survival rate for women with localized and properly treated breast cancer is 92%. If cancer is not detected and treated early, it will continue to grow, invade, and destroy adjacent tissue, and spread into surrounding lymph nodes. It can be carried by the lymph and/or blood to other areas of the body, and once this process, known as **metastasis**, has occurred, the cancer is usually advanced and/or disseminated and the 5-year survival rate is low. Approximately one-half of malignant breast tumors appear in the upper, outer quadrant and extend into the armpit; 18% of breast cancers occur in the nipple area, 11% in the lower outer quadrant, and 6% in the inner quadrant. Signs and symptoms of breast cancer are generally insidious and may include:

- Unusual secretions from the nipple
- Changes in the nipple’s appearance
- Nontender, movable lump
- Well-localized discomfort that may be described as burning, stinging, or aching sensation
- Dimpling or **peau d’orange** (orange-peel appearance) may be present over the area of cancer of the breast
- Asymmetry and an elevation of the affected breast
- Nipple retraction
- Pain in the later stages

Stages of breast cancer indicate the size of a tumor and how far the cancer has spread within the breast, to nearby tissues, and to other organs. Specific treatment is most often determined by the following stages of the disease:

1. **Carcinoma in situ** (CIS) – cancer is confined to the **lobules** (milk-producing glands) or **ducts** (passages connecting milk-producing glands to the nipple) and has not invaded nearby breast tissue; also referred to as **ductal carcinoma in situ** (DCIS).
2. **Stage I** – tumor is smaller than or equal to 2 cm in diameter and axillary (underarm) lymph nodes test negative for cancer.

3. **Stage II** – tumor is between 2 and 5 cm in diameter with or without positive lymph nodes, or tumor is greater than 5 cm without positive lymph nodes.

4. **Stage III** – this stage is divided into substages:
   a. **IIIA** – tumor is larger than 5 cm with positive movable lymph nodes or tumor is any size with lymph nodes that adhere to one another or surrounding tissue.
   b. **IIIB** – tumor of any size has spread to the skin, chest wall, or internal mammary lymph nodes.

5. **Stage IV** – tumors, regardless of size, has metastasized (spread) to distant sites such as bones, lungs, or lymph nodes not near the breast.

6. **Recurrent breast cancer** – the disease has returned in spite of initial treatment.

Two genes, **BRCA-1** and **BRCA-2**, have been identified as breast cancer genes that when changed, place a woman at greater risk of developing breast cancer compared to women who do not have either mutation. One single genetic mishap is not enough for a cell to become cancerous. It takes several changes. Women who have inherited mutations within the BRCA-1 and BRCA-2 genes are at higher risk for breast cancer than those who don’t have the mutations. However, it still takes further events for cancer to occur in these women. There are internal factors, such as the hormone estrogen, and external factors that can contribute to this chain of events. More than 90% of all breast lumps are discovered by women themselves. The majority of these lumps are benign, but for those that are not, early detection and treatment are essential.

- **Breast Self-Examination (BSE)** (Fig. 20–11, p. 693) (Chapter 21 SOAP: Chart Note Analysis, p. 735) – a woman should examine her breasts every month to check for appearance, size, shape, symmetry, tenderness, thickening, and texture changes.

B. **Hodgkin’s Disease (HD) or Hodgkin’s Lymphoma** – a cancer that starts in lymphatic tissue. Because lymphatic tissue is present in many parts of the body, Hodgkin’s disease can start almost anywhere, but most often starts in lymph nodes in the upper part of the body. The most common sites are in the chest, neck, or under the arms. Hodgkin’s disease enlarges the lymphatic tissue, which can then cause pressure on important structures. It can spread through the lymphatic vessels to other lymph nodes. Most Hodgkin’s disease spreads to nearby lymph node sites in the body, not distant ones. It rarely gets into the blood vessels, but when it does, it can spread to almost any other site in the body, including the liver and lungs. There are two kinds of lymphomas:
1. **Hodgkin’s Disease** – the disease is named after Dr. Thomas Hodgkin, who first recognized it in 1832. The cancer cells in Hodgkin’s disease are called **Reed-Sternberg cells**, after the two doctors who first described them in detail. Under a microscope they look different from cells of non-Hodgkin’s lymphomas and other cancers. It is believed that Reed-Sternberg cells are a type of malignant **B lymphocyte**. Normal B lymphocytes are the cells that make antibodies that help fight infections. Today, more than 80% of people who receive initial treatment experience a complete remission. Advances in diagnosis, staging, and treatment of Hodgkin’s disease have helped to make this once uniformly fatal disease highly treatable with potential for full recovery.

2. **Non-Hodgkin’s lymphoma (NHL)** – is cancer that begins in the lymphatic system, usually in a **B cell in a lymph node**. The abnormal cell divides and makes copies of itself. The new cells divide again and again, making more and more abnormal (cancer) cells. The cancer cells can spread to nearly any other part of the body. Symptoms of non-Hodgkin’s lymphoma include swollen, painless lymph nodes in the neck, armpits, or groin; unexplained weight loss; fever; soaking night sweats; coughing, trouble breathing or chest pain; weakness and tiredness that doesn’t go away; and pain, swelling, or a feeling of fullness in the abdomen. Non-Hodgkin’s lymphoma is more common than Hodgkin’s disease.

Diagnosis is confirmed by either an **excisional biopsy**, entire lymph node is removed, or **incisional biopsy**, where only part of a lymph node is removed. The type is reported upon discovery with the most common types including **diffuse large B-cell lymphoma** and **follicular lymphoma**. Lymphomas can also be grouped by how quickly they are likely to grow: **indolent** (low-grade) lymphomas grow slowly and **aggressive** (intermediate-grade and high-grade) lymphomas grow and spread more quickly. Survival rates are good with early diagnosis.

### C. **Leukemia** – cancer that usually affects the white blood cells. White blood cells develop from stem cells in the bone marrow. Leukemia results when something goes wrong with the process of maturation from stem cell to white blood cell, and a cancerous change occurs. The change often involves a rearrangement of pieces of chromosomes. Because the chromosomal rearrangements disturb the normal control of cell division, the affected cells multiply without restraint, becoming cancerous. They ultimately occupy the bone marrow, replacing the cells that produce normal blood cells. These leukemic cells may also invade other organs, including the liver, spleen, lymph nodes, kidneys, and brain. There are four major types of leukemia, named for how quickly they progress and which kind of white blood cell they affect. The categories are:

1. **Acute Leukemias** – leukemia that progress rapidly and include:
a. Acute Lymphocytic Leukemia (ALL), Acute Lymphoid Leukemia or Acute Lymphoblastic Leukemia – lymphocytic leukemias affect lymphocytes. ALL is a life-threatening disease in which the cells that normally develop into lymphocytes become cancerous and rapidly replace normal cells in the bone marrow. It is the most common type of leukemia in children and young people under the age of 19. Children are most likely to develop the disease, but it can occur at any age.

b. Acute Myeloid Leukemia (AML), or Myelocytic, Myelogenous, Myeloblastic, and Myelomonocytic Leukemia – AML is a life-threatening disease in which myelocytes become cancerous and rapidly replace normal cells in the bone marrow. This type of leukemia affects people of all ages, but mostly adults. Exposure to large doses of radiation and use of some cancer chemotherapy drugs increase the likelihood of developing acute myeloid leukemia.

2. Chronic Leukemia – leukemias that progress slowly and include:
   a. Chronic Lymphocytic Leukemia (CLL) or Chronic Lymphoid Leukemia – characterized by a large number of cancerous mature lymphocytes (a type of white blood cell) and enlarged lymph nodes. More than three-fourths of the people who have this type of leukemia are over age 60; it affects men two to three times more often than women.
   b. Chronic Myelocytic Leukemia (CML), or Myeloid, Myelogenous, Granulocytic Leukemia – a disease in which a cell in the bone marrow becomes cancerous and produces a large number of abnormal granulocytes. This disease can affect people of any age and of either sex but is uncommon in children under 10 years old.

D. Lung Cancer (Fig. 20–12, p. 695) – cancers that begin in the lungs are divided into two major types, each named for the cells in which the cancer develops. For each type there is a different growth and spread pattern so each is treated differently. They are:

1. Nonsmall Cell Lung Cancer
   • Squamous Cell Carcinoma or Epidermoid Carcinoma
   • Adenocarcinoma
   • Large Cell Carcinoma

2. Small Cell Lung Cancer or Oat Cell Cancer – less common than nonsmall cell, it grows quickly and is more likely to spread to other organs of the body.

The common signs and symptoms of lung cancer are listed, but is it important to note that they can be caused by other conditions. Because of this, it is important to see a physician if any of these symptoms persist:
   • Cough that does not go away and gets worse over time
• Constant chest pain
• Coughing up blood
• Shortness of breath, wheezing, or hoarseness
• Repeated problems with pneumonia or bronchitis
• Swelling of the neck and face
• Loss of appetite or weight loss
• Fatigue

To diagnose lung cancer, the listed information and/or test results are needed by the physician:

• Medical History
• Smoking History
• Exposure to Environmental and Occupational Substances
• Family History of Cancer
• Physical Exam
• Chest X-ray
• Sputum Cytology – the microscopic examination of cells obtained from a deep-cough sample of mucus in the lungs.
• Biopsy – to examine the diseased tissue from the affected lung.

Treatment depends on a number of factors, including the type of lung cancer (nonsmall or small cell lung cancer), size, location, and extent of the tumor, and the patient’s general health. Many different treatments and combinations of treatments can be used for lung cancer such as surgery, chemotherapy, radiation therapy, or photodynamic therapy (PDT). The best way to prevent lung cancer is to quit (or never start) smoking. Researchers have discovered several causes of lung cancer, most are related to the use of tobacco, such as smoking cigarettes, cigars, pipes, and exposure to environmental tobacco smoke (ETS) or secondhand smoke. Other causes include exposure to radon, asbestos, and pollution.

E. Testicular Cancer (TC) – a disease in which malignant cells form in the tissues of one or both testicles. It is the most common cancer in men aged 20 to 35. The disease is about four times more common in white men than in black men. Some risk factors associated with testicular cancer include having had an undescended testicle, having had abnormal development of the testicles, and a personal or family history of testicular cancer. Most testicular tumors are discovered by patients:

• Testicular Self-Examination (TSE) (Fig. 20–13, p. 697) – it is most important that testicular cancer be diagnosed early, so young men should be taught how to examine their testicles.

The most common signs and symptoms of testicular cancer include:

1. An enlarged, painless lump or swelling in either testicle – the lump is typically the size of a pea but can be as big as a marble or even an egg.
2. Occasionally Pain – a dull ache in the lower abdomen or groin.
3. Enlarged testicle.
4. **Feeling of heaviness** – can include a sudden collection of fluid in the scrotum.

The origin and nature of scrotal masses must be determined as soon as possible because most testicular masses are malignant. Prognosis depends on the histology and extent of the tumor. With early detection, the survival rates for testicular cancer are approximately 95% at 5 years for **seminomas** and **nonseminomas** localized to the testis. Nearly all testicular tumors stem from germ cells, the special sperm-forming cells within the testicles. These tumors fall into one of two types, **seminomas** or **nonseminomas**. Other forms of testicular cancer, such as sarcomas or lymphomas, are extremely rare. Testicular cancer is diagnosed by a number of methods:

- **Medical History**
- **Physical Examination**
- **Ultrasound**
- **Serum Tumor Marker Test**
- **Radical Inguinal Orchidectomy** – including a tissue biopsy.
- **Diagnostic Imaging Tests** – such as a chest x-ray, computed tomography (CT), magnetic resonance imaging (MRI), lymphangiogram, and positron emission tomography (PET), are often utilized to assess the spread of the disease and the staging of the cancer.

Staging allows the doctor to plan the most appropriate treatment for each patient. Stages of testicular cancer are as follows:

a. **Stage I** – cancer confined to the testicle.

b. **Stage II** – disease spread to retroperitoneal lymph nodes, located in the rear of the body below the diaphragm.

c. **Stage III** – cancer spread beyond the lymph nodes to remote sites in the body, such as the lungs and/or liver.

d. **Recurrent** – this means that the cancer has come back after it has been treated. It may come back in the same place or in another part of the body.

No one treatment works for all testicular cancers. Seminomas and nonseminomas differ in their tendency to spread, their patterns of spread, and response to radiation therapy. Thus, they often require different treatment strategies, which doctors choose based on the type of tumor and the stage of disease. Because they are slow growing and tend to stay localized, seminomas generally are diagnosed in Stage I or II. Treatment could be a combination of testicle removal, radiation, or chemotherapy. Stage III seminomas are usually treated with a combination of chemotherapy drugs. Because certain treatments can cause infertility, the patient who wishes to have children, should consider sperm banking before beginning treatment. For more information on testicular cancer, visit the Lance Armstrong Foundation Web site at www.livestrong.org.

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**VI. Pathology Checkpoint**
VII. Study and Review (pp. 699–702)

VIII. Practical Application: SOAP: Chart Note Analysis