Chapter 16

Oncology: Nursing Management in Cancer Care

LEARNING OBJECTIVES

On completion of this chapter, the learner will be able to:

1. Compare the structure and function of the normal cell and the cancer cell.
2. Differentiate between benign and malignant tumors.
3. Identify agents and factors that have been found to be carcinogenic.
4. Describe the significance of health education and preventive care in decreasing the incidence of cancer.
5. Differentiate among the purposes of surgical procedures used in cancer treatment, diagnosis, prophylaxis, palliation, and reconstruction.
6. Describe the roles of surgery, radiation therapy, chemotherapy, bone marrow transplantation, and other therapies in treating cancer.
7. Describe the special nursing needs of patients receiving chemotherapy.
8. Describe common nursing diagnoses and collaborative problems of patients with cancer.
9. Use the nursing process as a framework for care of patients with cancer.
10. Describe the concept of hospice in providing care for patients with advanced cancer.
11. Discuss the role of the nurse in assessment and management of common oncologic emergencies.

Cancer nursing practice covers all age groups and nursing specialties and is carried out in a variety of health care settings, including the home, community, acute care institutions, and rehabilitation centers. The scope, responsibilities, and goals of cancer nursing, also called **oncology** nursing, are as diverse and complex as those of any nursing specialty. Because many people associate cancer with pain and death, nurses need to identify their own reactions to cancer and set realistic goals to meet the challenges inherent in caring for patients with cancer.

In addition, the cancer nurse must be prepared to support the patient and family through a wide range of physical, emotional, social, cultural, and spiritual crises. Chart 16-1 identifies major areas of responsibility for nurses caring for patients with cancer.

Epidemiology

Although cancer affects every age group, most cancers occur in people older than 65 years of age. Overall, the incidence of cancer is higher in men than in women and higher in industrialized sectors and nations.

More than 1.2 million Americans are diagnosed each year with a cancer affecting one of various body sites (Fig. 16-1). Cancer is second only to cardiovascular disease as a leading cause of death in the United States. Each year, more than 550,000 Americans die of a malignant process. In order of frequency, the leading causes of cancer deaths in the United States are lung, prostate, and colorectal cancer in men and lung, breast, and colorectal cancer in women (Jemal, Thomas, Murray & Thun, 2002).

Relative 5-year survival rates for African Americans are lower for every cancer site when compared to whites. In the United States, cancer mortality in African Americans is higher than in any other racial group. This finding is related to the higher incidence and later stage of diagnosis among African Americans. The increased cancer morbidity and mortality for this group are largely related to economic factors, education, and barriers to health care rather than to racial characteristics (Greenlee et al., 2000).

Pathophysiology of the Malignant Process

Cancer is a disease process that begins when an abnormal cell is transformed by the genetic mutation of the cellular DNA. This abnormal cell forms a clone and begins to proliferate abnormally, ignoring growth-regulating signals in the environment surrounding the cell. The cells acquire invasive characteristics, and changes occur in surrounding tissues. The cells infiltrate these tissues and gain access to lymph and blood vessels, which carry the cells to other areas of the body. This phenomenon is called **metastasis** (cancer spread to other parts of the body).

Cancer is not a single disease with a single cause; rather, it is a group of distinct diseases with different causes, manifestations, treatments, and prognoses.

PROLIFERATIVE PATTERNS

During the life span, various body tissues normally experience periods of rapid or proliferative growth that must be distinguished from malignant growth activity. Several patterns of cell growth exist: **hyperplasia, metaplasia, dysplasia, anaplasia,** and **neoplasia** (see Glossary).

Cancerous cells are described as **malignant** neoplasms. They demonstrate uncontrolled cell growth that follows no physiologic

Glossary

alopecia: hair loss
anaplasia: cells that lack normal cellular characteristics and differ in shape and organization with respect to their cells of origin; usually, anaplastic cells are malignant.
biologic response modifier (BRM) therapy: use of agents or treatment methods that can alter the immunologic relationship between the tumor and the host to provide a therapeutic benefit
biopsy: a diagnostic procedure to remove a small sample of tissue to be examined microscopically to detect malignant cells
brachytherapy: delivery of radiation therapy through internal implants
cancer: a disease process whereby cells proliferate abnormally, ignoring growth-regulating signals in the environment surrounding the cells
carcinogenesis: process of transforming normal cells into malignant cells
chemotherapy: use of drugs to kill tumor cells by interfering with cellular functions and reproduction
control: containment of the growth of cancer cells
cure: prolonged survival and disappearance of all evidence of disease so that the patient has the same life expectancy as anyone else in his or her age group
cytokines: substances produced by cells of the immune system to enhance production and functioning of components of the immune system
dysplasia: bizarre cell growth resulting in cells that differ in size, shape, or arrangement from other cells of the same type of tissue
extravasation: leakage of medication from the veins into the subcutaneous tissues
grading: identification of the type of tissue from which the tumor originated and the degree to which the tumor cells retain the functional and structural characteristics of the tissue of origin
hyperplasia: increase in the number of cells of a tissue; most often associated with periods of rapid body growth
malignant: having cells or processes that are characteristic of cancer
metaplasia: conversion of one type of mature cell into another type of cell
metastasis: spread of cancer cells from the primary tumor to distant sites
myelosuppression: suppression of the blood cell–producing function of the bone marrow
nadir: lowest point of white blood cell depression after therapy that has toxic effects on the bone marrow
neoplasia: uncontrolled cell growth that follows no physiologic demand
neutropenia: abnormally low absolute neutrophil count
oncology: field or study of cancer
palliation: relief of symptoms associated with cancer
radiation therapy: use of ionizing radiation to interrupt the growth of malignant cells
stomatitis: inflammation of the oral tissues, often associated with some chemotherapeutic agents
staging: process of determining the size and spread, or metastasis, of a tumor
thrombocytopenia: decrease in the number of circulating platelets; associated with the potential for bleeding
tumor-specific antigen (TSA): protein on the membrane of cancer cells that distinguishes the malignant cell from a benign cell of the same tissue type
vesicant: substance that can cause tissue necrosis and damage, particularly when extravasated
xerostomia: dry oral cavity resulting from decreased function of salivary glands

Chart 16-1 Responsibilities of the Nurse in Cancer Care

- Support the idea that cancer is a chronic illness that has acute exacerbations rather than one that is synonymous with death and suffering.
- Assess own level of knowledge relative to the pathophysiology of the disease process.
- Make use of current research findings and practices in the care of the patient with cancer and his or her family.
- Identify patients at high risk for cancer.
- Participate in primary and secondary prevention efforts.
- Assess the nursing care needs of the patient with cancer.
- Assess the learning needs, desires, and capabilities of the patient with cancer.
- Identify nursing problems of the patient and the family.
- Assess the social support networks available to the patient.
- Plan appropriate interventions with the patient and the family.
- Assist the patient to identify strengths and limitations.
- Assist the patient to design short-term and long-term goals for care.
- Implement a nursing care plan that interfaces with the medical care regimen and that is consistent with the established goals.
- Collaborate with members of a multidisciplinary team to foster continuity of care.
- Evaluate the goals and resultant outcomes of care with the patient, the family, and members of the multidisciplinary team.
- Reassess and redesign the direction of the care as determined by the evaluation.

demand. Benign and malignant growths are classified and named by tissue of origin, as described in Table 16-1.

Benign and malignant cells differ in many cellular growth characteristics, including the method and rate of growth, ability to metastasize or spread, general effects, destruction of tissue, and ability to cause death. These differences are summarized in Table 16-2. The degree of anaplasia (lack of differentiation of cells) ultimately determines the malignant potential.

CHARACTERISTICS OF MALIGNANT CELLS

Despite their individual differences, all cancer cells share some common cellular characteristics in relation to the cell membrane, special proteins, the nuclei, chromosomal abnormalities, and the rate of mitosis and growth. The cell membranes are altered in cancer cells, which affects fluid movement in and out of the cell. The cell membrane of malignant cells also contains proteins called **tumor-specific antigens** (for example, carcinoembryonic antigen and prostate-specific antigen), which develop as they become less differentiated (mature) over time. These proteins distinguish the malignant cell from a benign cell of the same tissue type. They may be useful in measuring the extent of disease in a person and in tracking the course of illness during treatment or relapse. Malignant cellular membranes also contain less fibronectin, a cellular cement. They are therefore less cohesive and do not adhere to adjacent cells readily.

FIGURE 16-1 Estimated leading sites of cancer incidences and deaths, 2002. *Cancer Facts and Figures, 2002.* American Cancer Society, Atlanta, Georgia.

GENETICS IN NURSING PRACTICE—Concepts and Challenges in Patient Management

Cancer is a genetic disease. Every phase of carcinogenesis is affected by multiple genetic mutations. Some of these mutations are inherited (present in germ-line cells), but most (90%) are somatic mutations that are acquired mutations in specific cells.

EXAMPLES OF CANCERS INFLUENCED BY GENETIC FACTORS

- Cowden syndrome
- Familial adenomatous polyposis
- Familial melanoma syndrome
- Hereditary breast and ovarian cancer
- Hereditary non-polyposis colon cancer
- Neurofibromatosis type 1
- Retinoblastoma

NURSING ASSESSMENTS

FAMILY HISTORY

- Obtain information about both maternal and paternal sides of family.
- Obtain cancer history of at least three generations.
- Look for clustering of cancers that occur at earlier ages, multiple primary cancers in one individual, cancer in paired organs, and two or more close relatives with the same type of cancer suggestive of hereditary cancer syndromes.

PHYSICAL ASSESSMENT

- Physical findings that may predispose the patient to cancer, such as multiple colonic polyps, suggestive of a polyposis syndrome
- Skin findings, such as atypical moles, that may be related to familial melanoma syndrome
- Multiple café au lait spots, axillary freckling, and two or more neurofibromas associated with neurofibromatosis type I
- Facial trichilemmomas, mucosal papillomatosis, multinodular thyroid goiter or thyroid adenomas, macrocephaly, fibrocystic breasts and other fibromas or lipomas related to Cowden syndrome

MANAGEMENT ISSUES SPECIFIC TO GENETICS

- Assess patient's understanding of genetic factors related to his or her cancer.
- Refer for cancer risk assessment when a hereditary cancer syndrome is suspected so that patient and family can discuss inheritance, risk with other family members and availability of genetic testing.
- Offer appropriate genetics information and resources.
- Assess patient's understanding of genetics information.
- Provide support to patient and families with known genetic test results for hereditary cancer syndromes.
- Participate in the management and coordination of risk-reduction measures for those with known genetic mutations.

RESOURCES AND WEBSITES

American Cancer Society http://www.cancer.org—offers general information about cancer and support resources for families

Gene Clinics http://www.geneclinics.org—a listing of common genetic disorders with up-to-date clinical summaries, genetic counseling, and testing information

National Organization of Rare Disorders http://www.rarediseases.org—a directory of support groups and information for patients and families with rare genetic disorders

National Cancer Institute http://www.cancernet.nci.nih.gov—a listing of cancers with clinical summaries and treatment reviews, information on genetic risks for cancer, listing of cancer centers providing genetic cancer risk assessment services

Genetic Alliance http://www.geneticalliance.org—a directory of support groups for patients and families with genetic conditions

OMIM: Online Mendelian Inheritance in Man http://www.ncbi.nlm.nih.gov/omim/stats/html—a complete listing of known inherited genetic conditions

Typically, nuclei of cancer cells are large and irregularly shaped (pleomorphism). Nucleoli, structures within the nucleus that house ribonucleic acid (RNA), are larger and more numerous in malignant cells, perhaps because of increased RNA synthesis. Chromosomal abnormalities (translocations, deletions, additions) and fragility of chromosomes are commonly found when cancer cells are analyzed.

Mitosis (cell division) occurs more frequently in malignant cells than in normal cells. As the cells grow and divide, more glucose and oxygen are needed. If glucose and oxygen are unavailable, malignant cells use anaerobic metabolic channels to produce energy, which makes the cells less dependent on the availability of a constant oxygen supply.

INVASION AND METASTASIS

Malignant disease processes have the ability to allow the spread or transfer of cancerous cells from one organ or body part to another by invasion and metastasis. Patterns of metastasis can be partially explained by circulatory patterns and by specific affinity for certain malignant cells to bind to molecules in specific body tissue.

Invasion, which refers to the growth of the primary tumor into the surrounding host tissues, occurs in several ways. Mechanical pressure exerted by rapidly proliferating neoplasms may force fingerlike projections of tumor cells into surrounding tissue and interstitial spaces. Malignant cells are less adherent and may break off from the primary tumor and invade adjacent structures. Malignant cells are thought to possess or produce specific destructive enzymes (proteinases), such as collagenases (specific to collagen), plasminogen activators (specific to plasma), and lysosomal hydrolyses. These enzymes are thought to destroy surrounding tissue, including the structural tissues of the vascular basement membrane, facilitating invasion of malignant cells. The mechanical pressure of a rapidly growing tumor may enhance this process.

Metastasis is the dissemination or spread of malignant cells from the primary tumor to distant sites by direct spread of tumor cells to body cavities or through lymphatic and blood circulation. Tumors growing in or penetrating body cavities may shed cells or emboli that travel within the body cavity and seed the surfaces of other organs. This can occur in ovarian cancer when malignant cells enter the peritoneal cavity and seed the peritoneal surfaces of such abdominal organs as the liver or pancreas.

Table 16-1 • Tumors and Tissue Types

TISSUE TYPE	BENIGN TUMORS	MALIGNANT TUMORS
Epithelial		
Surface	Papilloma	Squamous cell carcinoma
Glandular	Adenoma	Adenocarcinoma
Connective		
Fibrous	Fibroma	Fibrosarcoma
Adipose	Lipoma	Liposarcoma
Cartilage	Chondroma	Chondrosarcoma
Bone	Osteoma	Osteosarcoma
Blood vessels	Hemangioma	Hemangiosarcoma
Lymph vessels	Lymphangioma	Lymphangiosarcoma
Lymph tissue		Lymphosarcoma
Muscle		
Smooth	Leiomyoma	Leiomyosarcoma
Striated	Rhabdomyoma	Rhabdomyosarcoma
Neural Tissue		
Nerve cell	Neuroma	Neuroblastoma
Glial tissue	Glioma (benign)	Glioblastoma, astrocytoma, medulloblastoma, oligodendroglioma
Nerve sheaths	Neurilemmoma	Neurilemmal sarcoma
Meninges	Meningioma	Meningeal sarcoma
Hematologic		
Granulocytic		Myelocytic leukemia
Erythrocytic		Erythrocytic leukemia
Plasma cells		Multiple myeloma
Lymphocytic		Lymphocytic leukemia or lymphoma
Monocytic		Monocytic leukemia
Endothelial Tissue		
Blood vessels	Hemangioma	Hemangiosarcoma
Lymph vessels	Lymphangioma	Lymphangiosarcoma
Endothelial lining		Ewing's sarcoma

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Table 16-2 • Characteristics of Benign and Malignant Neoplasms

CHARACTERISTICS	BENIGN	MALIGNANT
Cell characteristics	Well-differentiated cells that resemble normal cells of the tissue from which the tumor originated	Cells are undifferentiated and often bear little resemblance to the normal cells of the tissue from which they arose
Mode of growth	Tumor grows by expansion and does not infiltrate the surrounding tissues; usually encapsulated	Grows at the periphery and sends out processes that infiltrate and destroy the surrounding tissues
Rate of growth	Rate of growth is usually slow	Rate of growth is variable and depends on level of differentiation; the more anaplastic the tumor, the faster its growth
Metastasis	Does not spread by metastasis	Gains access to the blood and lymphatic channels and metastasizes to other areas of the body
General effects	Is usually a localized phenomenon that does not cause generalized effects unless its location interferes with vital functions	Often causes generalized effects, such as anemia, weakness, and weight loss
Tissue destruction	Does not usually cause tissue damage unless its location interferes with blood flow	Often causes extensive tissue damage as the tumor outgrows its blood supply or encroaches on blood flow to the area; may also produce substances that cause cell damage
Ability to cause death	Does not usually cause death unless its location interferes with vital functions	Usually causes death unless growth can be controlled

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Metastatic Mechanisms

Lymph and blood are key mechanisms by which cancer cells spread. Angiogenesis, a mechanism by which the tumor cells are ensured a blood supply, is another important process.

LYMPHATIC SPREAD

The most common mechanism of metastasis is lymphatic spread, which is transport of tumor cells through the lymphatic circulation. Tumor emboli enter the lymph channels by way of the interstitial fluid that communicates with lymphatic fluid. Malignant cells also may penetrate lymphatic vessels by invasion. After entering the lymphatic circulation, malignant cells either lodge in the lymph nodes or pass between lymphatic and venous circulation. Tumors arising in areas of the body with rapid and extensive lymphatic circulation are at high risk for metastasis through lymphatic channels. Breast tumors frequently metastasize in this manner through axillary, clavicular, and thoracic lymph channels.

HEMATOGENOUS SPREAD

Another metastatic mechanism is hematogenous spread, by which malignant cells are disseminated through the bloodstream. Hematogenous spread is directly related to the vascularity of the tumor. Few malignant cells can survive the turbulence of arterial circulation, insufficient oxygenation, or destruction by the body's immune system. In addition, the structure of most arteries and arterioles is far too secure to permit malignant invasion. Those malignant cells that do survive this hostile environment are able to attach to endothelium and attract fibrin, platelets, and clotting factors to seal themselves from immune system surveillance. The endothelium retracts, allowing the malignant cells to enter the basement membrane and secrete lysosomal enzymes. These enzymes then destroy surrounding body tissues and thereby allow implantation.

ANGIOGENESIS

Malignant cells also have the ability to induce the growth of new capillaries from the host tissue to meet their needs for nutrients and oxygen. This process is referred to as angiogenesis. It is through this vascular network that tumor emboli can enter the systemic circulation and travel to distant sites. Large tumor emboli that become trapped in the microcirculation of distant sites may further metastasize to other sites. Research into ways to prevent angiogenesis is ongoing.

Carcinogenesis

Malignant transformation, or **carcinogenesis**, is thought to be at least a three-step cellular process: initiation, promotion, and progression.

In *initiation,* the first step, initiators (carcinogens), such as chemicals, physical factors, and biologic agents, escape normal enzymatic mechanisms and alter the genetic structure of the cellular DNA. Normally, these alterations are reversed by DNA repair mechanisms, or the changes initiate programmed cellular suicide (apoptosis). Occasionally, cells escape these protective mechanisms, and permanent cellular mutations occur. These mutations usually are not significant to cells until the second step of carcinogenesis.

During *promotion,* repeated exposure to promoting agents (co-carcinogens) causes the expression of abnormal or mutant genetic information even after long latency periods. Latency periods for the promotion of cellular mutations vary with the type of agent and the dosage of the promoter as well as the innate characteristics of the target cell.

Cellular oncogenes, present in all mammalian systems, are responsible for the vital cellular functions of growth and differentiation. Cellular proto-oncogenes are present in cells and act as an "on switch" for cellular growth. Similarly, cancer suppressor genes "turn off" or regulate unneeded cellular proliferation. When the suppressor genes become mutated, rearranged, or amplified or lose their regulatory capabilities, malignant cells are allowed to reproduce. The p53 gene is a tumor suppressor gene that is frequently mutated in many human cancers. This gene regulates whether cells will repair or die after DNA damage. Mutant p53 gene is associated with a poor prognosis and may be associated with determining response to treatment. Once this genetic expression occurs in cells, the cells begin to produce mutant cell populations that are different from their original cellular ancestors.

Progression is the third step of cellular carcinogenesis. The cellular changes formed during initiation and promotion now exhibit increased malignant behavior. These cells now show a propensity to invade adjacent tissues and to metastasize. Agents that initiate or promote cellular transformation are referred to as carcinogens.

ETIOLOGY

Certain categories of agents or factors implicated in carcinogenesis include viruses and bacteria, physical agents, chemical agents, genetic or familial factors, dietary factors, and hormonal agents.

Viruses and Bacteria

Viruses as a cause of human cancers are hard to determine because viruses are difficult to isolate. Infectious causes are considered or suspected, however, when specific cancers appear in clusters. Viruses are thought to incorporate themselves in the genetic structure of cells, thus altering future generations of that cell population—perhaps leading to a cancer. For example, the Epstein-Barr virus is highly suspect as a cause in Burkitt's lymphoma, nasopharyngeal cancers, and some types of non-Hodgkin's lymphoma and Hodgkin's disease.

Herpes simplex virus type II, cytomegalovirus, and human papillomavirus types 16, 18, 31, and 33 are associated with dysplasia and cancer of the cervix. The hepatitis B virus is implicated in cancer of the liver; the human T-cell lymphotropic virus may be a cause of some lymphocytic leukemias and lymphomas; and the human immunodeficiency virus (HIV) is associated with Kaposi's sarcoma. The bacterium *Helicobacter pylori* has been associated with an increased incidence of gastric malignancy, perhaps secondary to inflammation and injury of gastric cells.

Physical Agents

Physical factors associated with carcinogenesis include exposure to sunlight or radiation, chronic irritation or inflammation, and tobacco use.

Excessive exposure to the ultraviolet rays of the sun, especially in fair-skinned, blue- or green-eyed people, increases the

risk for skin cancers. Factors such as clothing styles (sleeveless shirts or shorts), use of sunscreens, occupation, recreational habits, and environmental variables, including humidity, altitude, and latitude, all play a role in the amount of exposure to ultraviolet light.

Exposure to ionizing radiation can occur with repeated diagnostic x-ray procedures or with radiation therapy used to treat disease. Fortunately, improved x-ray equipment appropriately minimizes the risk for extensive radiation exposure. Radiation therapy used in disease treatment or exposure to radioactive materials at nuclear weapon manufacturing sites or nuclear power plants is associated with a higher incidence of leukemias, multiple myeloma, and cancers of the lung, bone, breast, thyroid, and other tissues. Background radiation from the natural decay processes that produce radon has also been associated with lung cancer. Homes with high levels of trapped radon should be ventilated to allow the gas to disperse into the atmosphere.

Chemical Agents

About 75% of all cancers are thought to be related to the environment. Tobacco smoke, thought to be the single most lethal chemical carcinogen, accounts for at least 30% of cancer deaths (Heath & Fontham, 2001). Smoking is strongly associated with cancers of the lung, head and neck, esophagus, pancreas, cervix, and bladder. Tobacco may also act synergistically with other substances, such as alcohol, asbestos, uranium, and viruses, to promote cancer development.

Chewing tobacco is associated with cancers of the oral cavity and primarily occurs in men younger than 40 years of age. Many chemical substances found in the workplace have proved to be carcinogens or co-carcinogens. The extensive list of suspected chemical substances continues to grow and includes aromatic amines and aniline dyes; pesticides and formaldehydes; arsenic, soot, and tars; asbestos; benzene; betel nut and lime; cadmium; chromium compounds; nickel and zinc ores; wood dust; beryllium compounds; and polyvinyl chloride.

Most hazardous chemicals produce their toxic effects by altering DNA structure in body sites distant from chemical exposure. The liver, lungs, and kidneys are the organ systems most often affected, presumably because of their roles in detoxifying chemicals.

Genetic and Familial Factors

Almost every cancer type has been shown to run in families. This may be due to genetics, shared environments, cultural or lifestyle factors, or chance alone. Genetic factors play a role in cancer cell development. Abnormal chromosomal patterns and cancer have been associated with extra chromosomes, too few chromosomes, or translocated chromosomes. Specific cancers with underlying genetic abnormalities include Burkitt's lymphoma, chronic myelogenous leukemia, meningiomas, acute leukemias, retinoblastomas, Wilms' tumor, and skin cancers, including malignant melanoma.

Approximately 5% to 10% of cancers of adulthood and childhood display a familial predisposition. Inherited cancer syndromes, such as premenopausal breast cancer, tend to occur at an early age and at multiple sites in one organ or pair of organs. In cancers with a familial predisposition, individuals may develop multiple cancers; commonly, two or more first-degree relatives share the same cancer type. Cancers associated with familial inheritance include retinoblastomas, nephroblastomas, pheochromocytomas, malignant neurofibromatosis, and breast, ovarian, endometrial, colorectal, stomach, prostate, and lung cancers. In 1994, the BRCA-1 gene was identified; it is linked to breast and ovarian cancer syndrome. The BRCA-2 gene, which has also been identified, is associated with early-onset breast cancer (Nogueira & Appling, 2000). Work continues to identify other specific genes related to cancer incidence (Greco, 2000).

Dietary Factors

Dietary factors are thought to be related to 35% of all environmental cancers (Heath & Fontham, 2001). Dietary substances can be proactive (protective), carcinogenic, or co-carcinogenic. The risk for cancer increases with long-term ingestion of carcinogens or co-carcinogens or chronic absence of proactive substances in the diet.

Dietary substances associated with an increased cancer risk include fats, alcohol, salt-cured or smoked meats, foods containing nitrates and nitrites, and a high caloric dietary intake. Food substances that appear to reduce cancer risk include high-fiber foods, cruciferous vegetables (cabbage, broccoli, cauliflower, Brussels sprouts, kohlrabi), carotenoids (carrots, tomatoes, spinach, apricots, peaches, dark-green and deep-yellow vegetables), and possibly vitamins E and C, zinc, and selenium.

Obesity is associated with endometrial cancer and possibly postmenopausal breast cancers. Obesity may also increase the risk for cancers of the colon, kidney, and gallbladder.

Hormonal Agents

Tumor growth may be promoted by disturbances in hormonal balance either by the body's own (endogenous) hormone production or by administration of exogenous hormones. Cancers of the breast, prostate, and uterus are thought to depend on endogenous hormonal levels for growth. Diethylstilbestrol (DES) has long been recognized as a cause of vaginal carcinomas. Oral contraceptives and prolonged estrogen replacement therapy are associated with increased incidence of hepatocellular, endometrial, and breast cancers, whereas they appear to decrease the risk for ovarian and endometrial cancers. The combination of estrogen and progesterone appears safest in decreasing the risk for endometrial cancers. Hormonal changes with reproduction are also associated with cancer incidence. Increased numbers of pregnancies are associated with a decreased incidence of breast, endometrial, and ovarian cancers.

ROLE OF THE IMMUNE SYSTEM

In humans, malignant cells are capable of developing on a regular basis. Some evidence indicates, however, that the immune system can detect the development of malignant cells and destroy them before cell growth becomes uncontrolled. When the immune system fails to identify and stop the growth of malignant cells, clinical cancer develops.

Patients who for various reasons are immunoincompetent have been shown to have an increased incidence of cancer. Organ transplant recipients who receive immunosuppressive therapy to prevent rejection of the transplanted organ have an increased

incidence of lymphoma, Kaposi's sarcoma, squamous cell cancer of the skin, and cervical and anogenital cancers. Patients with immunodeficiency diseases, such as AIDS, have an increased incidence of Kaposi's sarcoma, lymphoma, and rectal and head and neck cancers. Some patients who have received alkylating chemotherapeutic agents to treat Hodgkin's disease have an increased incidence of secondary malignancies. Autoimmune diseases, such as rheumatoid arthritis and Sjögren's syndrome, are associated with increased cancer development. Finally, age-related changes, such as declining organ function, increased incidence of chronic diseases, and diminished immunocompetence, may contribute to an increased incidence of cancer in older people.

Normal Immune Responses

Normally, an intact immune system has the ability to combat cancer cells in several ways. Usually, the immune system recognizes as foreign certain antigens on the cell membranes of many cancer cells. These antigens are known as tumor-associated antigens (also called tumor cell antigens) and are capable of stimulating both cellular and humoral immune responses.

Along with the macrophages, T lymphocytes, the soldiers of the cellular immune response, are responsible for recognizing tumor-associated antigens. When T lymphocytes recognize tumor antigens, other T lymphocytes that are toxic to the tumor cells are stimulated. These lymphocytes proliferate and are released into the circulation. In addition to possessing cytotoxic (cell-killing) properties, T lymphocytes can stimulate other components of the immune system to rid the body of malignant cells.

Certain lymphokines, which are substances produced by lymphocytes, are capable of killing or damaging various types of malignant cells. Other lymphokines can mobilize other cells, such as macrophages, that disrupt cancer cells. Interferon (IFN), a substance produced by the body in response to viral infection, also possesses some antitumor properties. Antibodies produced by B lymphocytes, associated with the humoral immune response, also defend the body against malignant cells. These antibodies act either alone or in combination with the complement system or the cellular immune system.

Natural killer (NK) cells are a major component of the body's defense against cancer. NK cells are a subpopulation of lymphocytes that act by directly destroying cancer cells or by producing lymphokines and enzymes that assist in cell destruction.

Immune System Failure

How is it, then, that malignant cells can survive and proliferate despite the elaborate immune system defense mechanisms? Several theories suggest how tumor cells can evade an apparently intact immune system. If the body fails to recognize the malignant cell as different from "self" (non-self or foreign), the immune response may not be stimulated. When tumors do not possess tumor-associated antigens that label them as foreign, the immune response is not alerted. The failure of the immune system to respond promptly to the malignant cells allows the tumor to grow too large to be managed by normal immune mechanisms.

Tumor antigens may combine with the antibodies produced by the immune system and hide or disguise themselves from normal immune defense mechanisms. These tumor antigen–antibody complexes can suppress further production of antibodies. Tumors are also capable of changing their appearance or producing substances that impair usual immune responses. These substances not only promote tumor growth but also increase the patient's susceptibility to infection by various pathogenic organisms. As a result of prolonged contact with a tumor antigen, the patient's body may be depleted of the specific lymphocytes and no longer able to mount an appropriate immune response.

Abnormal concentrations of host suppressor T lymphocytes may play a role in developing cancers. Suppressor T lymphocytes normally assist in regulating antibody production and diminishing immune responses when they are no longer required. Low levels of serum antibodies and high levels of suppressor cells have been found in patients with multiple myeloma, a cancer associated with hypogammaglobulinemia (low amounts of serum antibodies). Carcinogens, such as viruses and certain chemicals, including chemotherapeutic agents, may weaken the immune system and ultimately enhance tumor growth.

Detection and Prevention of Cancer

Nurses and physicians have traditionally been involved with tertiary prevention, the care and rehabilitation of the patient after cancer diagnosis and treatment. In recent years, however, the American Cancer Society, the National Cancer Institute, clinicians, and researchers have placed greater emphasis on primary and secondary prevention of cancer. Primary prevention is concerned with reducing the risks of cancer in healthy people. Secondary prevention involves detection and screening to achieve early diagnosis and prompt intervention to halt the cancer process.

PRIMARY PREVENTION

By acquiring the knowledge and skills necessary to educate the community about cancer risk, nurses in all settings play a key role in cancer prevention. Assisting patients to avoid known carcinogens is one way to reduce the risk for cancer. Another way involves adopting dietary and various lifestyle changes that epidemiologic and laboratory studies show influence the risk for cancer. Several clinical trials have been undertaken to identify medications that may help to reduce the incidence of certain types of cancer. Recently, a breast cancer prevention study supported by the National Cancer Institute was conducted at multiple medical centers throughout the country. The results of this study indicated that the medication tamoxifen can reduce the incidence of breast cancer by 49% in postmenopausal women identified as at high risk for breast cancer (Fisher et al., 1998). Nurses can use their teaching and counseling skills to encourage patients to participate in cancer prevention programs and to promote healthful lifestyles.

SECONDARY PREVENTION

The evolving understanding of the role of genetics in cancer cell development has contributed to prevention and screening efforts. Individuals who have inherited specific genetic mutations have an increased susceptibility to cancer. For example, individuals who have familial adenomatosis polyposis have an increased risk for colon cancer. Women in whom the BRCA-1 and BRCA-2 genes have been identified have an increased risk for breast and ovarian cancer. To provide individualized education and recommendations for continued surveillance and care in high-risk populations, nurses need to be familiar with ongoing developments in the field of genetics and cancer (Greco, 2000). Many centers across the country are offering innovative cancer risk evaluation programs that provide in-depth screening and follow-up for individuals who are found to be at high risk for cancer.

Numerous factors, such as race, cultural influences, access to care, physician–patient relationship, level of education, income, and age, influence the knowledge, attitudes, and beliefs people have about cancer. These factors also influence the type of health-promoting behaviors they practice. For example, Phillips, Cohen, and Moses (1999) examined beliefs, attitudes, and practices related to breast cancer and breast cancer screening in African American women (Nursing Research Profile 16-1). They found that cultural, spiritual, and socioeconomic factors seen in the women studied could be identified as barriers to breast health screening behaviors. Nurses can use this type of information in planning education, prevention, and screening programs.

Public awareness about health-promoting behaviors can be increased in a variety of ways. Health education and health maintenance programs are sponsored by community organizations such as churches, senior citizen groups, and parent–teacher associations. Although primary prevention programs may focus on the hazards of tobacco use or the importance of nutrition, secondary prevention programs may promote breast and testicular self-examination and Papanicolaou (Pap) tests. Many organizations conduct cancer screening events that focus on cancers with the highest incidence rates or those that have improved survival rates if diagnosed early, such as breast or prostate cancers. These events offer education and examinations such as mammograms, digital rectal examinations, and prostate-specific antigen blood tests for minimal or no cost. Programs of this nature are often targeted to individuals who lack access to health care or cannot afford to participate on their own.

Similarly, nurses in all settings can develop programs that identify risks for patients and families and that incorporate teaching and counseling into all educational efforts, particularly for patients and families with a high incidence of cancer. The American Cancer Society has developed a public education program, "Taking Control," that integrates diet, exercise, and general health habit tips that people can follow to reduce their risk for cancer (Chart 16-2). Nurses and physicians can encourage individuals to comply with detection efforts as suggested by the American Cancer Society (Table 16-3).

Chart 16-2
Risk Factors: Taking Steps to Reduce Cancer Risk

When teaching individual patients or groups, nurses can recommend the following cancer prevention strategies:

1. Increase consumption of fresh vegetables (especially those of the cabbage family) because studies indicate that roughage and vitamin-rich foods help to prevent certain kinds of cancer.
2. Increase fiber intake because high-fiber diets may reduce the risk for certain cancers (eg, breast, prostate, and colon).
3. Increase intake of vitamin A, which reduces the risk for esophageal, laryngeal, and lung cancers.
4. Increase intake of foods rich in vitamin C, such as citrus fruits and broccoli, which are thought to protect against stomach and esophageal cancers.
5. Practice weight control because obesity is linked to cancers of the uterus, gallbladder, breast, and colon.
6. Reduce intake of dietary fat because a high-fat diet increases the risk for breast, colon, and prostate cancers.
7. Practice moderation in consumption of salt-cured, smoked, and nitrate-cured foods; these have been linked to esophageal and gastric cancers.
8. Stop smoking cigarettes and cigars, which are carcinogens.
9. Reduce alcohol intake because drinking large amounts of alcohol increases the risk of liver cancer. (*Note:* People who drink heavily and smoke are at greater risk for cancers of the mouth, throat, larynx, and esophagus.)
10. Avoid overexposure to the sun, wear protective clothing, and use a sunscreen to prevent skin damage from ultraviolet rays that increase the risk of skin cancer.

Adapted from the "Taking Control" program of the American Cancer Society.

Diagnosis of Cancer and Related Nursing Considerations

A cancer diagnosis is based on assessment for physiologic and functional changes and results of the diagnostic evaluation. Patients with suspected cancer undergo extensive testing to (1) determine the presence of tumor and its extent, (2) identify possible spread (metastasis) of disease or invasion of other body tissues, (3) evaluate the function of involved and uninvolved body systems and organs, and (4) obtain tissue and cells for analysis, including evaluation of tumor stage and grade. The diagnostic evaluation is guided by information obtained through a complete history and physical examination. Knowledge of suspicious symptoms and of the behavior of particular types of cancer assists in determining which diagnostic tests are most appropriate (Table 16-4).

A patient undergoing extensive testing is usually fearful of the procedures and anxious about the possible test results. The nurse can help relieve fear and anxiety by explaining the tests to be performed, the sensations likely to be experienced, and the patient's role in the test procedures. The nurse encourages the patient and family to voice their fears about the test results, supports the patient and family throughout the test period, and reinforces and clarifies information conveyed by the physician. The nurse also encourages the patient and family members to communicate and share their concerns and to discuss their questions and concerns with each other.

TUMOR STAGING AND GRADING

A complete diagnostic evaluation includes identifying the stage and grade of the tumor. This is accomplished before treatment begins to provide baseline data for evaluating outcomes of therapy and to maintain a systematic and consistent approach to ongoing diagnosis and treatment. Treatment options and prognosis are determined on the basis of staging and grading.

Staging determines the size of the tumor and the existence of metastasis. Several systems exist for classifying the anatomic extent of disease. The TNM system is frequently used. In this system, T refers to the extent of the primary tumor, N refers to lymph node involvement, and M refers to the extent of metastasis (Chart 16-3). A variety of other staging systems are used to describe the extent of cancers, such as central nervous system cancers, hematologic cancers, and malignant melanoma, that the TNM system does not describe appropriately. Staging systems also provide a convenient shorthand notation that condenses lengthy descriptions into manageable terms for comparisons of treatments and prognoses.

Grading refers to the classification of the tumor cells. Grading systems seek to define the type of tissue from which the tumor originated and the degree to which the tumor cells retain the

Table 16-3 • American Cancer Society Recommendations for Early Detection of Cancer in Asymptomatic, Average-Risk People

SITE	GENDER	AGE	EVALUATION	FREQUENCY
Breast	F	20–39	Clinical breast examination (CBE)	Every 3 years
			Breast self-examination (BSE)	Every month
		≥ 40	Clinical breast examination (CBE)	Every year
			Breast self-examination (BSE)	Every month
			Mammogram	Every year
Colon/rectum	M/F	≥ 50	Fecal occult blood test	Every year
			and	
			Flexible sigmoidoscopy	Every 5 years
			or	
			Colonoscopy	Every 10 years
			or	
			Double-contrast barium enema	Every 5 years
Prostate	M	≥ 50 (or <50 if at high risk)	Prostate-specific antigen and digital rectal examination (DRE)	Every year
Cervix	F	≥ 18 (or younger if sexually active)	Papanicolaou (Pap) test*	Every year
			Pelvic examination	Every year
Cancer-related checkups	M/F	≥20–39	Checkup that includes examination for cancers of the thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin as well as counseling about health practices and risk factors	Every 3 years
		40+		Every year

*After 3 or more consecutive satisfactory normal examinations, the Pap test may be performed less frequently at the discretion of the physician.
Adapted from American Cancer Society (2001). *American Cancer Society's guidelines for the early detection of cancer.* Atlanta: American Cancer Society, Inc.

Table 16-4 • Imaging Tests Used to Detect Cancer

TEST	DESCRIPTION	DIAGNOSTIC USES
Tumor marker identification	Analysis of substances found in blood or other body fluids that are made by the tumor or by the body in response to the tumor	Breast, colon, lung, ovarian, testicular, prostate cancers
Magnetic resonance imaging (MRI)	Use of magnetic fields and radiofrequency signals to create sectioned images of various body structures	Neurologic, pelvic, abdominal, thoracic cancers
Computed tomography (CT scan)	Use of narrow beam x-ray to scan successive layers of tissue for a cross-sectional view	Neurologic, pelvic, skeletal, abdominal, thoracic cancers
Fluoroscopy	Use of x-rays that identify contrasts in body tissue densities; may involve the use of contrast agents	Skeletal, lung, gastrointestinal cancers
Ultrasonography (ultrasound)	High-frequency sound waves echoing off body tissues are converted electronically into images; used to assess tissues deep within the body	Abdominal and pelvic cancers
Endoscopy	Direct visualization of a body cavity or passageway by insertion of an endoscope into a body cavity or opening; allows tissue biopsy, fluid aspiration and excision of small tumors; both diagnostic and therapeutic	Bronchial, gastrointestinal cancers
Nuclear medicine imaging	Uses intravenous injection or ingestion of radioisotope substances followed by imaging of tissues that have concentrated the radioisotopes	Bone, liver, kidney, spleen, brain, thyroid cancers
Positron emission tomography (PET scan)	Computed cross-sectional images of increased concentration of radioisotopes in malignant cells provide information about biologic activity of malignant cells; help distinguish between benign and malignant processes and responses to treatment	Lung, colon, liver, pancreatic, breast, esophagus cancers; Hodgkin's and non-Hodgkin's lymphoma and melanoma
Radioimmunoconjugates	Monoclonal antibodies are labeled with a radioisotope and injected intravenously into the patient; the antibodies that aggregate at the tumor site are visualized with scanners	Colorectal, breast, ovarian, head and neck cancers; lymphoma and melanoma

NURSING RESEARCH PROFILE 16-1

Breast Cancer Screening in African American Women

Phillips, J. P., Cohen, M. Z., & Moses, G. (1999). Breast cancer screening and African American women: Fear, fatalism, and silence. *Oncology Nursing Forum, 26*(3), 561–571.

Purpose

African American women are more likely to develop breast cancer and to be diagnosed later in the disease than Caucasian women. This qualitative study explored beliefs, attitudes, and practices related to breast cancer among African American women.

Study Sample and Design

Three focus groups were conducted with 26 African American women recruited from three employment groups to represent different socioeconomic groups. The focus group discussions were guided by a semistructured guide developed from the literature on breast cancer screening and the Health Belief Model. Topics included African American women and health, breast health, breast cancer beliefs, breast cancer screening, and health-seeking behavior. Women in the focus groups were also asked their opinions of how best to inform African American women about breast cancer screening. Focus group discussions, lasting 90 minutes, were audiotaped and the tapes of the focus groups were transcribed verbatim. The transcriptions were analyzed for themes and for similarities and differences among the three different socioeconomic groups: employed middle-income women, employed low-income women, and unemployed low-income women.

Findings

All three groups spoke of panic and fear as the predominant feelings associated with breast cancer, and all groups associated breast cancer with death. Only the middle-income women identified early detection as useful. Fear, pessimism, and belief that breast cancer is inevitable were common feelings and beliefs that can serve as barriers among African American women to participation in cancer screening. Cost of mammography, problems with transportation, and pain were also identified as barriers to screening. Although unemployed women believed that they were likely to develop breast cancer, the employed low-income women and middle-income women felt that they were somewhat likely and not very likely to develop breast cancer, respectively. The belief that breast cancer is inevitable may contribute to failure to seek screening or early treatment. All three groups indicated that there is limited discussion of breast cancer within the African American community.

Nursing Implications

The results of this study demonstrate the need to consider the beliefs and concerns of African American women when developing education and implementing screening programs. Further, health care providers need to understand the cultural and socioeconomic factors that influence screening in African American women. The findings of the study demonstrate that differences in beliefs and knowledge occur and that stereotyping by culture or ethnic group should be avoided.

functional and histologic characteristics of the tissue of origin. Samples of cells to be used to establish the grade of a tumor may be obtained through cytology (examination of cells from tissue scrapings, body fluids, secretions, or washings), biopsy, or surgical excision.

This information assists the health care team to predict the behavior and prognosis of various tumors. The tumor is assigned a numeric value ranging from I to IV. Grade I tumors, also known as well-differentiated tumors, closely resemble the tissue of origin in structure and function. Tumors that do not clearly resemble the tissue of origin in structure or function are described as poorly differentiated or undifferentiated and are assigned grade IV. These tumors tend to be more aggressive and less responsive to treatment than well-differentiated tumors.

Management of Cancer

Treatment options offered to cancer patients should be based on realistic and achievable goals for each specific type of cancer. The range of possible treatment goals may include complete eradication of malignant disease (**cure**), prolonged survival and containment of cancer cell growth (**control**), or relief of symptoms associated with the disease (**palliation**).

The health care team, the patient, and the patient's family must have a clear understanding of the treatment options and goals. Open communication and support are vital as the patient and family periodically reassess treatment plans and goals when complications of therapy develop or disease progresses.

Multiple modalities are commonly used in cancer treatment. A variety of therapies, including surgery, radiation therapy, chemotherapy, and biologic response modifier (BRM) therapy, may be used at various times throughout treatment. Understanding the principles of each and how they interrelate is important in understanding the rationale and goals of treatment.

SURGERY

Surgical removal of the entire cancer remains the ideal and most frequently used treatment method. The specific surgical approach, however, may vary for several reasons. Diagnostic surgery is the definitive method of identifying the cellular characteristics that influence all treatment decisions. Surgery may be the primary method of treatment, or it may be prophylactic, palliative, or reconstructive.

Diagnostic Surgery

Diagnostic surgery, such as a **biopsy**, is usually performed to obtain a tissue sample for analysis of cells suspected to be malignant. In most instances, the biopsy is taken from the actual tumor. The three most common biopsy methods are the excisional, incisional, and needle methods.

Excisional biopsy is most frequently used for easily accessible tumors of the skin, breast, upper and lower gastrointestinal tract, and upper respiratory tract. In many cases, the surgeon can remove the entire tumor and surrounding marginal tissues as well. This removal of normal tissue beyond the tumor area decreases the possibility that residual microscopic disease cells may lead to a recurrence of the tumor. This approach not only provides the pathologist who stages and grades the cells with the entire tissue specimen but also decreases the chance of seeding the tumor (disseminating cancer cells through surrounding tissues).

Incisional biopsy is performed if the tumor mass is too large to be removed. In this case, a wedge of tissue from the tumor is removed for analysis. The cells of the tissue wedge must be representative of the tumor mass so that the pathologist can provide an accurate diagnosis. If the specimen does not contain representative tissue and cells, negative biopsy results do not guarantee the absence of cancer.

Excisional and incisional approaches are often performed through endoscopy. Surgical incision, however, may be required to determine the anatomic extent or stage of the tumor. For example, a diagnostic or staging laparotomy, the surgical opening of the abdomen to assess malignant abdominal disease, may be necessary to assess malignancies such as gastric cancer.

Needle biopsies are performed to sample suspicious masses that are easily accessible, such as some growths in the breasts, thyroid, lung, liver, and kidney. Needle biopsies are fast, relatively inexpensive, and easy to perform and usually require only local anesthesia. In general, the patient experiences slight and temporary physical discomfort. In addition, the surrounding tissues are disturbed only minimally, thus decreasing the likelihood of seeding cancer cells. Needle aspiration biopsy involves aspirating tissue fragments through a needle guided into an area suspected of bearing disease. Occasionally, radiologic imaging or magnetic resonance imaging is used to help locate the suspected area and guide the placement of the needle. In some instances, the aspiration biopsy does not yield enough tissue to permit accurate diagnosis. A needle core biopsy uses a specially designed needle to obtain a small core of tissue. Most often, this specimen is sufficient to permit accurate diagnosis.

In some situations, it is necessary to biopsy lymph nodes that are near the suspicious tumor. It is well known that many cancers can spread (metastasize) from the primary site to other areas of the body through the lymphatic circulation. Knowing whether adjacent lymph nodes contain tumor cells helps physicians plan for systemic therapies instead of, or in addition to, surgery in order to combat tumor cells that have gone beyond the primary tumor site. The use of injectable dyes and nuclear medicine imaging can assist the surgeon in identifying lymph nodes (sentinel nodes) that process lymphatic drainage for the involved area. This procedure is used in patients with melanoma and is being used with increasing frequency in patients with cancers of the breast, colon, and vulva, although it is still considered investigational.

The choice of biopsy method is based on many factors. Of greatest importance is the type of treatment anticipated if the cancer diagnosis is confirmed. Definitive surgical approaches include the original biopsy site so that any cells disseminated during the biopsy are excised at the time of surgery. Nutrition and hematologic, respiratory, renal, and hepatic function are considered in determining the method of treatment as well. If the biopsy requires general anesthesia and if subsequent surgery is likely, the effects of prolonged anesthesia on the patient are considered.

The patient and family are given an opportunity to discuss the options before definitive plans are made. The nurse, as the patient's advocate, serves as a liaison between the patient and the physician to facilitate this process. Time should be set aside to minimize interruptions. Time should be provided for the patient to ask questions and for thinking through all that has been discussed.

Surgery as Primary Treatment

When surgery is the primary approach in treating cancer, the goal is to remove the entire tumor or as much as is feasible (a procedure sometimes called debulking) and any involved surrounding tissue, including regional lymph nodes.

Two common surgical approaches used for treating primary tumors are local and wide excisions. Local excision is warranted when the mass is small. It includes removal of the mass and a small margin of normal tissue that is easily accessible. Wide or radical excisions (en bloc dissections) include removal of the primary tumor, lymph nodes, adjacent involved structures, and surrounding tissues that may be at high risk for tumor spread. This surgical method can result in disfigurement and altered functioning. Wide excisions are considered, however, if the tumor can be removed completely and the chances of cure or control are good.

In some situations, video-assisted endoscopic surgery is replacing surgeries associated with long incisions and extended recovery periods. In these procedures, an endoscope with intense lighting and an attached multichip minicamera is inserted through a small incision into the body. The surgical instruments are inserted into the surgical field through one or two additional small incisions, each about 3 cm long. The camera transmits the image of the involved area to a monitor so the surgeon can manipulate the instruments to perform the necessary procedure. This type of procedure is now being used for many thoracic and abdominal surgeries.

Salvage surgery is an additional treatment option that uses an extensive surgical approach to treat the local recurrence of the cancer after a less extensive primary approach is used. A mastectomy to treat recurrent breast cancer after primary lumpectomy and radiation is an example of salvage surgery.

In addition to the use of surgical blades or scalpels to excise the mass and surrounding tissues, several other types of surgical interventions are available. Electrosurgery makes use of electrical current to destroy the tumor cells. Cryosurgery uses liquid nitrogen to freeze tissue to cause cell destruction. Chemosurgery uses combined topical chemotherapy and layer-by-layer surgical removal of abnormal tissue. Laser surgery (*l*ight *a*mplification by *s*timulated *e*mission of *r*adiation) makes use of light and energy aimed at an exact tissue location and depth to vaporize cancer cells. Stereotactic radiosurgery (SRS) is a single and highly precise administration of high-dose radiation therapy used in some types of brain and head and neck cancers. This type of radiation has such a dramatic effect on the target area that the changes are considered to be comparable to more traditional surgical approaches (International Radiosurgery Support Association, 2000). (Radiation therapy is discussed later in this chapter.)

A multidisciplinary approach to patient care is essential during and after any type of surgery. The effects of surgery on the patient's body image, self-esteem, and functional abilities are addressed. If

necessary, a plan for postoperative rehabilitation is made before the surgery is performed.

The growth and dissemination of cancer cells may have produced distant micrometastases by the time the patient seeks treatment. Therefore, attempting to remove wide margins of tissue in the hope of "getting all the cancer cells" may not be feasible. This reality substantiates the need for a coordinated multidisciplinary approach to cancer therapy. Once the surgery has been completed, one or more additional (or adjuvant) modalities may be chosen to increase the likelihood of destroying the cancer cells. However, some cancers that are treated surgically in the very early stages are considered to be curable (eg, skin cancers, testicular cancers).

Prophylactic Surgery

Prophylactic surgery involves removing nonvital tissues or organs that are likely to develop cancer. The following factors are considered when electing prophylactic surgery:

- Family history and genetic predisposition
- Presence or absence of symptoms
- Potential risks and benefits
- Ability to detect cancer at an early stage
- Patient's acceptance of the postoperative outcome

Colectomy, mastectomy, and oophorectomy are examples of prophylactic operations. Recent developments in the ability to identify genetic markers indicative of a predisposition to develop some types of cancer may play a role in decisions concerning prophylactic surgeries. Some controversy, however, exists about adequate justification for prophylactic surgical procedures. For example, a strong family history of breast cancer, positive BRCA-1 or BRCA-2 findings, an abnormal physical finding on breast examination such as progressive nodularity and cystic disease, a proven history of breast cancer in the opposite breast, abnormal mammography findings, and abnormal biopsy results may be factors considered in making the decision to proceed with a prophylactic mastectomy (Houshmand, Campbell, Briggs, McFadden & Al-Tweigeri, 2000; Zimmerman, 2002).

Because the long-term physiologic and psychological effects are unknown, prophylactic surgery is offered selectively to patients and discussed thoroughly with the patient and family. Preoperative teaching and counseling, as well as long-term follow-up, are provided.

Palliative Surgery

When cure is not possible, the goals of treatment are to make the patient as comfortable as possible and to promote a satisfying and productive life for as long as possible. Whether the period is extremely brief or lengthy, the major goal is a high quality of life—with quality defined by the patient and family. Honest and informative communication with the patient and family about the goal of surgery is essential to avoid false hope and disappointment.

Palliative surgery is performed in an attempt to relieve complications of cancer, such as ulcerations, obstructions, hemorrhage, pain, and malignant effusions (Table 16-5).

Table 16-5 • Indications for Palliative Surgical Procedures

PROCEDURE	INDICATIONS
Pleural drainage tube placement	Pleural effusion
Peritoneal drainage tube placement (Tenckoff catheter)	Ascites
Abdominal shunt placement (Levine shunt)	Ascites
Pericardial drainage tube placement	Pericardial effusion
Colostomy or ileostomy	Bowel obstruction
Gastrostomy, jejunostomy tube placement	Upper gastrointestinal tract obstruction
Biliary stent placement	Biliary obstruction
Ureteral stent placement	Ureteral obstruction
Nerve block	Pain
Cordotomy	Pain
Venous access device placement (for administering parenteral analgesics)	Pain
Epidural catheter placement (for administering epidural analgesics)	Pain
Hormone manipulation (removal of ovaries, testes, adrenals, pituitary)	Tumors that depend on hormones for growth

Reconstructive Surgery

Reconstructive surgery may follow curative or radical surgery and is carried out in an attempt to improve function or obtain a more desirable cosmetic effect. It may be performed in one operation or in stages. Patients are instructed about possible reconstructive surgical options before the primary surgery by the surgeon who will perform the reconstruction. Reconstructive surgery may be indicated for breast, head and neck, and skin cancers.

The nurse must recognize the patient's needs and the impact that altered functioning and altered body image may have on quality of life. Providing the patient and family with opportunities to discuss these issues is imperative. The needs of the individual must be accurately assessed and validated in each situation for any type of reconstructive surgery.

Nursing Management in Cancer Surgery

The patient undergoing surgery for cancer requires general perioperative nursing care, as described in Unit 4, along with specific care related to the patient's age, organ impairment, nutritional deficits, disorders of coagulation, and altered immunity that may increase the risk for postoperative complications. Combining other treatment methods, such as radiation and chemotherapy, with surgery also contributes to postoperative complications, such as infection, impaired wound healing, altered pulmonary or renal function, and the development of deep vein thrombosis. In these situations, the nurse completes a thorough preoperative assessment for all factors that may affect patients undergoing surgical procedures.

The patient undergoing surgery for the diagnosis or treatment of cancer is often anxious about the surgical procedure, possible findings, postoperative limitations, changes in normal body functions, and prognosis. The patient and family require time and assistance to deal with the possible changes and outcomes resulting from the surgery.

The nurse provides education and emotional support by assessing patient and family needs and exploring with the patient and family their fears and coping mechanisms, encouraging them to take an active role in decision making when possible. When the patient or family asks about the results of diagnostic testing

and surgical procedures, the nurse's response is guided by the information the physician previously conveyed to them. The patient and family may also ask the nurse to explain and clarify information that the physician initially provided but that they did not grasp because they were anxious at the time. It is important for the nurse to communicate frequently with the physician and other health care team members to be certain that the information provided is consistent.

After surgery, the nurse assesses the patient's responses to the surgery and monitors for possible complications, such as infection, bleeding, thrombophlebitis, wound dehiscence, fluid and electrolyte imbalance, and organ dysfunction. The nurse also provides for patient comfort. Postoperative teaching addresses wound care, activity, nutrition, and medication information.

Plans for discharge, follow-up and home care, and treatment are initiated as early as possible to ensure continuity of care from hospital to home or from a cancer referral center to the patient's local hospital and health care provider. Patients and families are also encouraged to use community resources such as the American Cancer Society or Make Today Count for support and information.

RADIATION THERAPY

In **radiation therapy**, ionizing radiation is used to interrupt cellular growth. More than half of patients with cancer receive a form of radiation therapy at some point during treatment. Radiation may be used to cure the cancer, as in Hodgkin's disease, testicular seminomas, thyroid carcinomas, localized cancers of the head and neck, and cancers of the uterine cervix. Radiation therapy may also be used to control malignant disease when a tumor cannot be removed surgically or when local nodal metastasis is present, or it can be used prophylactically to prevent leukemic infiltration to the brain or spinal cord.

Palliative radiation therapy is used to relieve the symptoms of metastatic disease, especially when the cancer has spread to brain, bone, or soft tissue, or to treat oncologic emergencies, such as superior vena cava syndrome or spinal cord compression.

Two types of ionizing radiation—electromagnetic rays (x-rays and gamma rays) and particles (electrons [beta particles], protons, neutrons, and alpha particles)—can lead to tissue disruption. The most harmful tissue disruption is the alteration of the DNA molecule within the cells of the tissue. Ionizing radiation breaks the strands of the DNA helix, leading to cell death. Ionizing radiation can also ionize constituents of body fluids, especially water, leading to the formation of free radicals and irreversibly damaging DNA. If the DNA is incapable of repair, the cell may die immediately, or it may initiate cellular suicide (apoptosis), a genetically programmed cell death.

Cells are most vulnerable to the disruptive effects of radiation during DNA synthesis and mitosis (early S, G2, and M phases of the cell cycle). Therefore, those body tissues that undergo frequent cell division are most sensitive to radiation therapy. These tissues include bone marrow, lymphatic tissue, epithelium of the gastrointestinal tract, hair cells, and gonads. Slower-growing tissues or tissues at rest are relatively radioresistant (less sensitive to the effects of radiation). Such tissues include muscle, cartilage, and connective tissues.

A radiosensitive tumor is one that can be destroyed by a dose of radiation that still allows for cell regeneration in the normal tissue. Tumors that are well oxygenated also appear to be more sensitive to radiation. In theory, therefore, radiation therapy may be enhanced if more oxygen can be delivered to tumors. In addition, if the radiation is delivered when most tumor cells are cycling through the cell cycle, the number of cancer cells destroyed (cell-killing) is maximal.

Certain chemicals, including chemotherapy agents, act as radiosensitizers and sensitize more hypoxic (oxygen-poor) tumors to the effects of radiation therapy. Radiation is delivered to tumor sites by external or internal means.

External Radiation

If external radiation therapy is used, one of several delivery methods may be chosen, depending on the depth of the tumor. Depending on the amount of energy they contain, x-rays can be used to destroy cancerous cells at the skin surface or deeper in the body. The higher the energy, the deeper the penetration into the body. Kilovoltage therapy devices deliver the maximal radiation dose to superficial lesions, such as lesions of the skin and breast, whereas linear accelerators and betatron machines produce higher-energy x-rays and deliver their dosage to deeper structures with less harm to the skin and less scattering of radiation within the body tissues. Gamma rays are another form of energy used in radiation therapy. This energy is produced from the spontaneous decay of naturally occurring radioactive elements such as cobalt 60. The gamma rays also deliver this radiation dose beneath the skin surface, sparing skin tissue from adverse effects.

Some centers nationwide treat more hypoxic, radiation-resistant tumors with particle-beam radiation therapy. This type of therapy accelerates subatomic particles (neutrons, pions, heavy ions) through body tissue. This therapy, which is also known as high linear energy transfer radiation, damages target cells as well as cells in its pathway.

A few centers are using intraoperative radiation therapy (IORT), which involves delivering a single dose of high-fraction radiation therapy to the exposed tumor bed while the body cavity is open during surgery. Cancers for which IORT is being used include gastric, pancreatic, colorectal, bladder, and cervical cancers and sarcomas. Toxicity with IORT is minimized because the radiation is precisely targeted to the diseased areas, and exposure to overlying skin and structures is avoided.

Internal Radiation

Internal radiation implantation, or **brachytherapy**, delivers a high dose of radiation to a localized area. The specific radioisotope for implantation is selected on the basis of its half-life, which is the time it takes for half of its radioactivity to decay. This internal radiation can be implanted by means of needles, seeds, beads, or catheters into body cavities (vagina, abdomen, pleura) or interstitial compartments (breast). Brachytherapy may also be administered orally as with the isotope I^{131}, used to treat thyroid carcinomas.

Intracavitary radioisotopes are frequently used to treat gynecologic cancers. In these malignancies, the radioisotopes are inserted into specially positioned applicators after the position is verified by x-ray. These radioisotopes remain in place for a prescribed period and then are removed. Patients are maintained on bed rest and log-rolled to prevent displacement of the intracavitary delivery device. An indwelling urinary catheter is inserted to ensure that the bladder remains empty. Low-residue diets and antidiarrheal agents, such as diphenoxylate (Lomotil), are provided to prevent bowel movement during therapy, to prevent the radioisotopes from being displaced.

Interstitial implants, used in treating such malignancies as prostate, pancreatic, or breast cancer, may be temporary or permanent, depending on the radioisotopes used. These implants usually consist of seeds, needles, wires, or small catheters positioned to provide a local radiation source and are less frequently dislodged. With internal radiation therapy, the farther the tissue is from the radiation source, the lower the dosage. This spares the noncancerous tissue from the radiation dose.

Because patients receiving internal radiation emit radiation while the implant is in place, contacts with the health care team are guided by principles of time, distance, and shielding to minimize exposure of personnel to radiation. Safety precautions used in caring for the patient receiving brachytherapy include assigning the person to a private room, posting appropriate notices about radiation safety precautions, having staff members wear dosimeter badges, making sure that pregnant staff members are not assigned to this patient's care, prohibiting visits by children or pregnant visitors, limiting visits from others to 30 minutes daily, and seeing that visitors maintain a 6-foot distance from the radiation source.

Radiation Dosage

The radiation dosage is dependent on the sensitivity of the target tissues to radiation and on the tumor size. The lethal tumor dose is defined as that dose that will eradicate 95% of the tumor yet preserve normal tissue. The total radiation dose is delivered over several weeks to allow healthy tissue to repair and to achieve greater cell kill by exposing more cells to the radiation as they begin active cell division. Repeated radiation treatments over time (fractionated doses) also allow for the periphery of the tumor to be reoxygenated repeatedly because tumors shrink from the outside inward. This increases the radiosensitivity of the tumor, thereby increasing tumor cell death.

Toxicity

Toxicity of radiation therapy is localized to the region being irradiated. Toxicity may be increased when concomitant chemotherapy is administered. Acute local reactions occur when normal cells in the treatment area are also destroyed and cellular death exceeds cellular regeneration. Body tissues most affected are those that normally proliferate rapidly, such as the skin, the epithelial lining of the gastrointestinal tract, including the oral cavity, and the bone marrow. Altered skin integrity is a common effect and can include alopecia (hair loss), erythema, and shedding of skin (desquamation). After treatments have been completed, reepithelialization occurs.

Alterations in oral mucosa secondary to radiation therapy include stomatitis, **xerostomia** (dryness of the mouth), change and loss of taste, and decreased salivation. The entire gastrointestinal mucosa may be involved, and esophageal irritation with chest pain and dysphagia may result. Anorexia, nausea, vomiting, and diarrhea may occur if the stomach or colon is in the irradiated field. Symptoms subside and gastrointestinal reepithelialization occurs after treatments are complete.

Bone marrow cells proliferate rapidly, and if bone marrow–producing sites are included in the radiation field anemia, leukopenia (decreased white blood cells [WBCs]), and **thrombocytopenia** (a decrease in platelets) may result. Patients are then at increased risk for infection and bleeding until blood cell counts return to normal. Chronic anemia may occur. Research continues to develop radioprotective agents that can protect normal tissue from radiation damage.

Certain systemic side effects are also commonly experienced by patients receiving radiation therapy. These manifestations, which are generalized, include fatigue, malaise, and anorexia. This syndrome may be secondary to substances released when tumor cells break down. The effects are temporary and subside with the cessation of treatment.

Late effects of radiation therapy may also occur in various body tissues. These effects are chronic, usually produce fibrotic changes secondary to a decreased vascular supply, and are irreversible. These late effects can be most severe when they involve vital organs such as the lungs, heart, central nervous system, and bladder. Toxicities may intensify when radiation is combined with other treatment modalities.

Nursing Management in Radiation Therapy

The patient receiving radiation therapy and the family often have questions and concerns about its safety. To answer questions and allay fears about the effects of radiation on others, on the tumor, and on the patient's normal tissues and organs, the nurse can explain the procedure for delivering radiation and describe the equipment, the duration of the procedure (often minutes only), the possible need for immobilizing the patient during the procedure, and the absence of new sensations, including pain, during the procedure. If a radioactive implant is used, the nurse informs the patient and family about the restrictions placed on visitors and health care personnel and other radiation precautions. Patients also need to understand their own role before, during, and after the procedure. See Chapter 47 for further discussion of radiation treatment for gynecologic cancers.

PROTECTING THE SKIN AND ORAL MUCOSA

The nurse assesses the patient's skin, nutritional status, and general feeling of well-being. The skin and oral mucosa are assessed frequently for changes (particularly if radiation therapy is directed to these areas). The skin is protected from irritation, and the patient is instructed to avoid using ointments, lotions, or powders on the area.

Gentle oral hygiene is essential to remove debris, prevent irritation, and promote healing. If systemic symptoms, such as weakness and fatigue, occur, the patient may need assistance with activities of daily living and personal hygiene. Additionally, the nurse offers reassurance by explaining that these symptoms are a result of the treatment and do not represent deterioration or progression of the disease.

PROTECTING THE CAREGIVERS

When a patient has a radioactive implant in place, nurses and other health care providers need to protect themselves as well as the patient from the effects of radiation. Specific instructions are usually provided by the radiation safety officer from the x-ray department. The instructions identify the maximum time that can be spent safely in the patient's room, the shielding equipment to be used, and special precautions and actions to be taken if the implant is dislodged. The nurse should explain the rationale for these precautions to keep the patient from feeling unduly isolated.

CHEMOTHERAPY

In **chemotherapy**, antineoplastic agents are used in an attempt to destroy tumor cells by interfering with cellular functions and reproduction. Chemotherapy is used primarily to treat systemic disease rather than lesions that are localized and amenable to

surgery or radiation. Chemotherapy may be combined with surgery or radiation therapy, or both, to reduce tumor size preoperatively, to destroy any remaining tumor cells postoperatively, or to treat some forms of leukemia. The goals of chemotherapy (cure, control, palliation) must be realistic because they will define the medications to be used and the aggressiveness of the treatment plan.

Cell Kill and the Cell Cycle

Each time a tumor is exposed to a chemotherapeutic agent, a percentage of tumor cells (20% to 99%, depending on dosage) is destroyed. Repeated doses of chemotherapy are necessary over a prolonged period to achieve regression of the tumor. Eradication of 100% of the tumor is nearly impossible, but a goal of treatment is to eradicate enough of the tumor so that the remaining tumor cells can be destroyed by the body's immune system.

Actively proliferating cells within a tumor (growth fraction) are the most sensitive to chemotherapeutic agents. Nondividing cells capable of future proliferation are the least sensitive to antineoplastic medications and consequently are potentially dangerous. The nondividing cells must be destroyed, however, to eradicate a cancer completely. Repeated cycles of chemotherapy are used to kill more tumor cells by destroying these nondividing cells as they begin active cell division.

Reproduction of both healthy and malignant cells follows the cell cycle pattern (Fig. 16-2). The cell cycle time is the time required for one tissue cell to divide and reproduce two identical daughter cells. The cell cycle of any cell has four distinct phases, each with a vital underlying function:

1. G_1 phase—RNA and protein synthesis occur.
2. S phase—DNA synthesis occurs.
3. G_2 phase—premitotic phase; DNA synthesis is complete, mitotic spindle forms.
4. Mitosis—cell division occurs.

The G_0 phase, the resting or dormant phase of cells, can occur after mitosis and during the G_1 phase. In the G_0 phase are those dangerous cells that are not actively dividing but have the potential for replicating. The administration of certain chemotherapeutic agents (as well as administration of some other forms of therapy) is coordinated with the cell cycle.

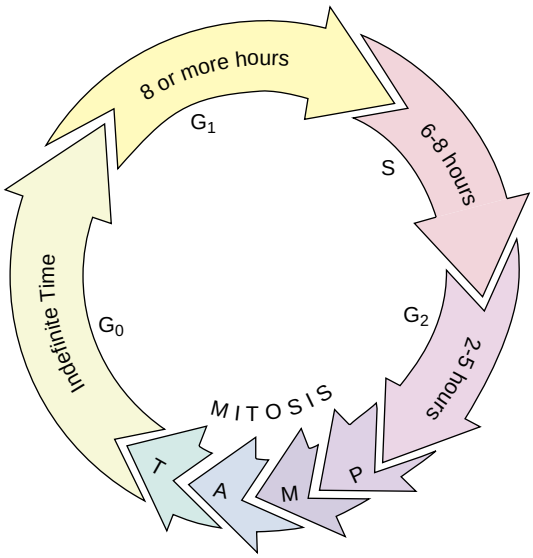

FIGURE 16-2 Phases of the cell cycle extend over the interval between the midpoint of mitosis to the subsequent end point in mitosis in a daughter cell. G_1 is the postmitotic phase during which ribonucleic acid (RNA) and protein synthesis are increased and cell growth occurs. G_0 is the resting, or dormant, phase of the cell cycle. In the S phase, nucleic acids are synthesized and chromosomes replicated in preparation for cell mitosis. During G_2, RNA and protein synthesis occurs as in G_1. (P = prophase, M = metaphase, A = anaphase, T = telophase.) From Porth, C. M. (2002). *Pathophysiology: Concepts of altered health states* (6th ed). Philadelphia: Lippincott Williams & Wilkins.

Classification of Chemotherapeutic Agents

Certain chemotherapeutic agents (cell cycle–specific drugs) destroy cells actively reproducing by means of the cell cycle. Many of these agents are specific to certain phases of the cell cycle. Most affect cells in the S phase by interfering with DNA and RNA synthesis. Others, such as the vinca or plant alkaloids, are specific to the M phase, where they halt mitotic spindle formation.

Chemotherapeutic agents that act independently of the cell cycle phases are termed cell cycle–nonspecific agents. These agents usually have a prolonged effect on cells, leading to cellular damage or death. Many treatment plans combine cell cycle–specific and cell cycle–nonspecific agents to increase the number of vulnerable tumor cells killed during a treatment period.

Chemotherapeutic agents are also classified according to various chemical groups, each with a different mechanism of action. These include the alkylating agents, nitrosureas, antimetabolites, antitumor antibiotics, plant alkaloids, hormonal agents, and miscellaneous agents. The classification, mechanism of action, common drugs, cell cycle specificity, and common side effects of antineoplastic agents are listed in Table 16-6.

Chemotherapeutic agents from each category may be used to enhance the tumor cell kill during therapy by creating multiple cellular lesions. Combined medication therapy relies on medications of differing toxicities and with synergistic actions. Using combination drug therapy also prevents development of drug-resistant mechanisms.

Combining older medications with other agents, such as levamisole, leucovorin, hormones, or interferons (IFN), has shown some benefit in combating resistance of cells to chemotherapeutic agents. Newer investigational agents are being studied for effectiveness in resistant tumor lines. For more information about investigative drugs, see Chart 16-4.

Administration of Chemotherapeutic Agents

Chemotherapeutic agents may be administered in the hospital, clinic, or home setting by topical, oral, intravenous, intramuscular, subcutaneous, arterial, intracavitary, and intrathecal routes. The administration route usually depends on the type of agent, the required dose, and the type, location, and extent of tumor being treated. Guidelines for the administration of chemotherapy have been developed by the Oncology Nursing Society. Patient education is essential to maximize safety if chemotherapy is administered in the patient's home (Chart 16-5).

DOSAGE

Dosage of antineoplastic agents is based primarily on the patient's total body surface area, previous response to chemotherapy or radiation therapy, and major organ function.

Table 16-6 • Antineoplastic Agents

DRUG CLASS AND EXAMPLES	MECHANISM OF ACTION	CELL CYCLE SPECIFICITY	COMMON SIDE EFFECTS
Alkylating Agents			
busulfan, carboplatin, chlorambucil, cisplatin, cyclophosphamide, dacarbazine, hexamethyl melamine, ifosfamide, melphalan, nitrogen mustard, thiotepa	Alter DNA structure by misreading DNA code, initiating breaks in the DNA molecule, cross-linking DNA strands	Cell cycle–nonspecific	Bone marrow suppression, nausea, vomiting, cystitis (cyclophosphamide, ifosfamide), stomatitis, alopecia, gonadal suppression, renal toxicity (cisplatin)
Nitrosureas			
carmustine (BCNU), lomustine (CCNU), semustine (methyl CCNU), streptozocin	Similar to the alkylating agents; cross the blood–brain barrier	Cell cycle–nonspecific	Delayed and cumulative myelosuppression, especially thrombocytopenia; nausea, vomiting
Topoisomerase I Inhibitors			
irinotecan, topotecan	Induce breaks in the DNA strand by binding to enzyme topoisomerase I, preventing cells from dividing	Cell cycle–specific	Bone marrow suppression, diarrhea, nausea, vomiting, hepatotoxicity
Antimetabolites			
5-azacytadine, cytarabine, edatrexate fludarabine, 5-fluorouracil (5-FU), FUDR, gemcitabine, hydroxyurea, leustatin, 6-mercaptopurine, methotrexate, pentostatin, 6-thioguanine	Interfere with the biosynthesis of metabolites or nucleic acids necessary for RNA and DNA synthesis	Cell cycle–specific (S phase)	Nausea, vomiting, diarrhea, bone marrow suppression, proctitis, stomatitis, renal toxicity (methotrexate), hepatotoxicity
Antitumor Antibiotics			
bleomycin, dactinomycin, daunorubicin, doxorubicin (Adriamycin), idarubicin, mitomycin, mitoxantrone, plicamycin	Interfere with DNA synthesis by binding DNA; prevent RNA synthesis	Cell cycle–nonspecific	Bone marrow suppression, nausea, vomiting, alopecia, anorexia, cardiac toxicity (daunorubicin, doxorubicin)
Mitotic Spindle Poisons			
Plant alkaloids: etoposide, teniposide, vinblastine, vincristine (VCR), vindesine, vinorelbine	Arrest metaphase by inhibiting mitotic tubular formation (spindle); inhibit DNA and protein synthesis	Cell cycle–specific (M phase)	Bone marrow suppression (mild with VCR), neuropathies (VCR), stomatitis
Taxanes: paclitaxel, docetaxel	Arrest metaphase by inhibiting tubulin depolymerization	Cell cycle–specific (M phase)	Bradycardia, hypersensitivity reactions, bone marrow suppression, alopecia, neuropathies
Hormonal Agents			
androgens and antiandrogens, estrogens and antiestrogens, progestins and antiprogestins, aromatase inhibitors, luteinizing hormone–releasing hormone analogs, steroids	Bind to hormone receptor sites that alter cellular growth; block binding of estrogens to receptor sites (antiestrogens); inhibit RNA synthesis; suppress aromatase of P450 system, which decreases estrogen level	Cell cycle–nonspecific	Hypercalcemia, jaundice, increased appetite, masculinization, feminization, sodium and fluid retention, nausea, vomiting, hot flashes, vaginal dryness
Miscellaneous Agents			
asparaginase, procarbazine	Unknown or too complex to categorize	Varies	Anorexia, nausea, vomiting, bone marrow suppression, hepatotoxicity, anaphylaxis, hypotension, altered glucose metabolism

SPECIAL PROBLEMS: EXTRAVASATION

Special care must be taken whenever intravenous vesicant agents are administered. **Vesicants** are those agents that, if deposited into the subcutaneous tissue (**extravasation**), cause tissue necrosis and damage to underlying tendons, nerves, and blood vessels. Although the complete mechanism of tissue destruction is unclear, it is known that the pH of many antineoplastic drugs is responsible for the severe inflammatory reaction as well as the ability of these drugs to bind to tissue DNA. Sloughing and ulceration of the tissue may be so severe that skin grafting may be necessary. The full extent of tissue damage may take several weeks to become apparent. Medications classified as vesicants include dactinomycin,

Chart 16-4 • PHARMACOLOGY
Investigational Antineoplastic Therapies and Clinical Trials

Evaluation of the effectiveness and toxic potential of promising new modalities for preventing, diagnosing, and treating cancer is accomplished through clinical trials. Before new chemotherapy agents are approved for clinical use, they are subjected to rigorous and lengthy evaluations to identify beneficial effects, adverse effects, and safety.

- *Phase I* clinical trials determine optimal dosing, scheduling, and toxicity.
- *Phase II* trials determine effectiveness with specific tumor types and further define toxicities. Participants in these early trials are most often those who have not responded to standard forms of treatment. Because phase I and II trials may be viewed as last-chance efforts, patients and families are fully informed about the experimental nature of the trial therapies. Although it is hoped that investigational therapy will effectively treat the disease, the purpose of early phase trials is to gather information concerning maximal tolerated doses, adverse effects, and effects of the antineoplastic agents on tumor growth.
- *Phase III* clinical trials establish the effectiveness of new medications or procedures as compared with conventional approaches. Nurses may assist in the recruitment, consent, and education processes for patients who participate. In many cases, nurses are instrumental in monitoring adherence, assisting patients to adhere to the parameters of the trial, and documenting data describing patients' responses. The physical and emotional needs of patients in clinical trials are addressed in much the same way as those of patients who receive standard forms of cancer treatment.
- *Phase IV* testing further investigates medications in terms of new uses, dosing schedule, and toxicities.

daunorubicin, doxorubicin (Adriamycin), nitrogen mustard, mitomycin, vinblastine, vincristine, and vindesine.

Only specially trained physicians and nurses should administer vesicants. Careful selection of peripheral veins, skilled venipuncture, and careful administration of medications are essential. Indications of extravasation during administration of vesicant agents include the following:

- Absence of blood return from the intravenous catheter
- Resistance to flow of intravenous fluid
- Swelling, pain, or redness at the site

If extravasation is suspected, the medication administration is stopped immediately, and ice is applied to the site (unless the extravasated vesicant is a vinca alkaloid). The physician may aspirate any infiltrated medication from the tissues and inject a neutralizing solution into the area to reduce tissue damage. Selection of the neutralizing solution depends on the extravasated agent. Examples of neutralizing solutions include sodium thiosulfate, hyaluronidase, and sodium bicarbonate. Recommendations and guidelines for managing vesicant extravasation have been issued by individual medication manufacturers, pharmacies, and the Oncology Nursing Society, and they differ from one medication to the next.

When frequent, prolonged administration of antineoplastic vesicants is anticipated, right atrial Silastic catheters or venous access devices may be inserted to promote safety during medication administration and reduce problems with access to the circulatory system (Figs. 16-3 and 16-4). Complications associated with their use include infection and thrombosis.

TOXICITY

Toxicity associated with chemotherapy can be acute or chronic. Cells with rapid growth rates (eg, epithelium, bone marrow, hair follicles, sperm) are very susceptible to damage, and various body systems may be affected as well.

Gastrointestinal System. Nausea and vomiting are the most common side effects of chemotherapy and may persist for up to 24 hours after its administration. The vomiting centers in the brain are stimulated by (1) activation of the receptors found in the chemoreceptor trigger zone (CTZ) of the medulla; (2) stimulation of peripheral autonomic pathways (gastrointestinal tract and pharynx); (3) stimulation of the vestibular pathways (inner ear imbalances, labyrinth input); (4) cognitive stimulation (central nervous system disease, anticipatory nausea and vomiting); and (5) a combination of these factors.

Medications that can decrease nausea and vomiting include serotonin blockers, such as ondansetron, granisetron, and dolasetron, which block serotonin receptors of the gastrointestinal tract and CTZ, and dopaminergic blockers, such as metoclopramide (Reglan), which block dopamine receptors of the CTZ. Phenothiazines, sedatives, corticosteroids, and histamines are used in combination with serotonin blockers with the more emetogenic chemotherapeutic regimens (Bremerkamp, 2000).

Chart 16-5
Home Care Checklist • Chemotherapy Administration

At the completion of the home care instruction, the patient or caregiver will be able to:	Patient	Caregiver
• Demonstrate how to administer the chemotherapy agent in the home.	✓	✓
• Demonstrate safe disposal of needles, syringes, IV supplies, or unused chemotherapy medications.	✓	✓
• List possible side effects of chemotherapeutic agents.	✓	✓
• List complications of medications necessitating a call to the nurse or physician.	✓	✓
• List complications of medications necessitating a visit to the emergency department.	✓	✓
• List names and telephone numbers of resource personnel involved in care (ie, home care nurse, infusion services, IV vendor, equipment company).	✓	✓
• Explain treatment plan (protocol) and importance of upcoming visits to physician.	✓	✓

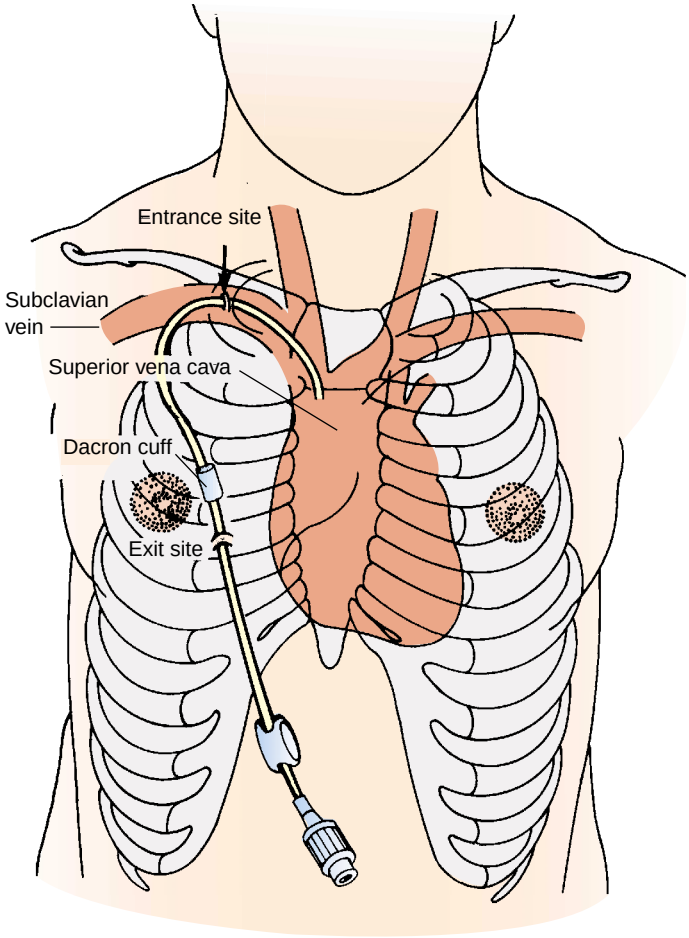

FIGURE 16-3 Right atrial catheter. The right atrial catheter is inserted into the subclavian vein and advanced until its tip lies in the superior vena cava just above the right atrium. The proximal end is then tunneled from the entry site through the subcutaneous tissue of the chest wall and brought out through an exit site on the chest. The Dacron cuff anchors the catheter in place and serves as a barrier to infection.

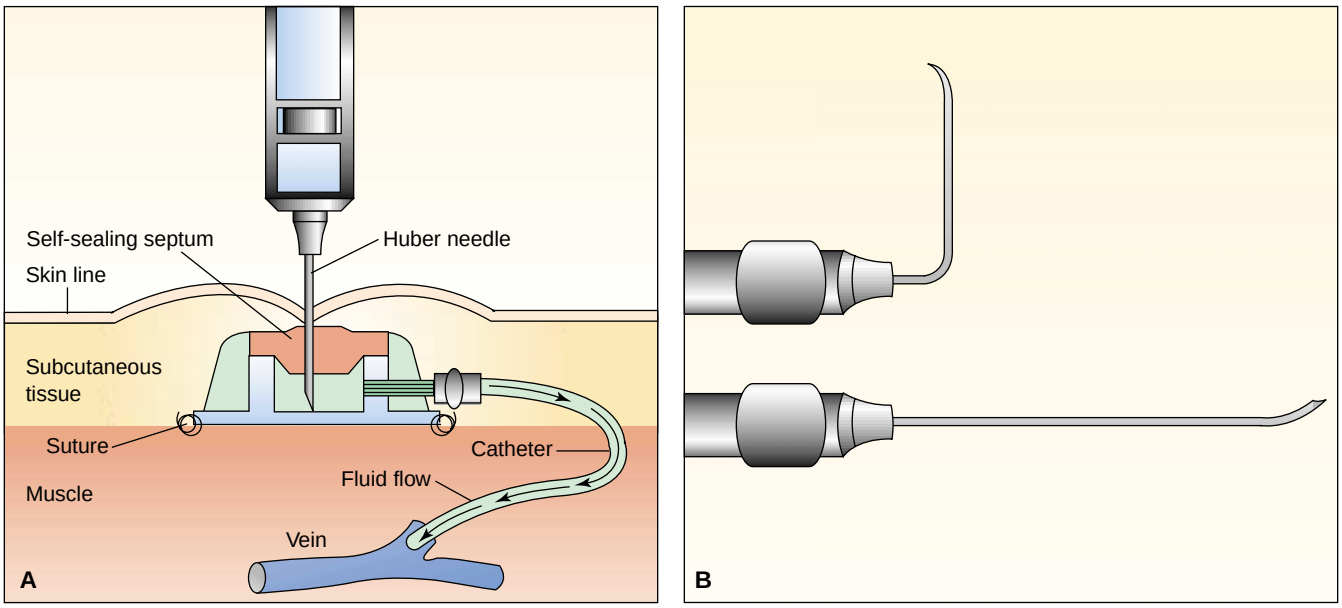

FIGURE 16-4 Implanted vascular access device. (**A**) A schematic diagram of an implanted vascular access device used for administering medication, fluids, blood products, and nutrition. The self-sealing septum permits repeated puncture by Huber needles without damage or leakage. (**B**) Two Huber needles used to enter the implanted vascular port. The 90-degree needle is used for top-entry ports for continuous infusions.

Delayed nausea and vomiting that occur later than 48 to 72 hours after chemotherapy are troublesome for some patients. To minimize discomfort, some antiemetic medications are necessary for the first week at home after chemotherapy. Relaxation techniques and imagery can also help to decrease stimuli contributing to symptoms. Altering the patient's diet to include small frequent meals, bland foods, and comfort foods may reduce the frequency or severity of these symptoms.

Although the epithelium that lines the oral cavity quickly renews itself, its rapid rate of proliferation makes it susceptible to the effects of chemotherapy. As a result, stomatitis and anorexia are common. The entire gastrointestinal tract is susceptible to mucositis (inflammation of the mucosal lining), and diarrhea is a common result. Antimetabolites and antitumor antibiotics are the major culprits in mucositis and other gastrointestinal symptoms. Irinotecan is responsible for causing diarrhea, which can be severe in some patients.

Hematopoietic System. Most chemotherapeutic agents cause **myelosuppression** (depression of bone marrow function), resulting in decreased production of blood cells. Myelosuppression decreases the number of WBCs (leukopenia), red blood cells (anemia), and platelets (thrombocytopenia) and increases the risk for infection and bleeding. Depression of these cells is the usual reason for limiting the dose of the chemotherapeutic agents. Monitoring blood cell counts frequently is essential, as is protecting the patient from infection and injury, particularly while the blood cell counts are depressed.

Other agents, called colony-stimulating factors (granulocyte colony-stimulating factor [G-CSF], granulocyte-macrophage colony-stimulating factor [GM-CSF], and erythropoietin [EPO]), can be administered after chemotherapy. G-CSF and GM-CSF stimulate the bone marrow to produce WBCs, especially neutrophils, at an accelerated rate, thus decreasing the duration of neutropenia. The colony-stimulating factors decrease the episodes of infection and the need for antibiotics and allow for more timely cycling of chemotherapy with less need to reduce the dosage. EPO stimulates red blood cell production, thus decreasing the symptoms of chronic administered anemia.

Renal System. Chemotherapeutic agents can damage the kidneys because of their direct effects during excretion and the accumulation of end products after cell lysis. Cisplatin, methotrexate, and mitomycin are particularly toxic to the kidneys. Rapid tumor cell lysis after chemotherapy results in increased urinary excretion of uric acid, which can cause renal damage. In addition, intracellular contents are released into the circulation, resulting in excessive levels of potassium and phosphates (hyperkalemia and hyperphosphatemia) and diminished levels of calcium (hypocalcemia). (See later discussion of tumor lysis syndrome.)

Monitoring blood urea nitrogen, serum creatinine, creatinine clearance, and serum electrolyte levels is essential. Adequate hydration, alkalinization of the urine to prevent formation of uric acid crystals, and the use of allopurinol are frequently indicated to prevent these side effects.

Cardiopulmonary System. Antitumor antibiotics (daunorubicin and doxorubicin) are known to cause irreversible cumulative cardiac toxicities, especially when total dosage reaches 550 mg/m^2. Cardiac ejection fraction (volume of blood ejected from the heart with each beat) and signs of congestive heart failure must be monitored closely. Bleomycin, carmustine (BCNU), and busulfan are known for their cumulative toxic effects on lung function. Pulmonary fibrosis can be a long-term effect of prolonged dosage with these agents. Therefore, the patient is monitored closely for changes in pulmonary function, including pulmonary function test results. Total cumulative doses of bleomycin are not to exceed 400 units.

Reproductive System. Testicular and ovarian function can be affected by chemotherapeutic agents, resulting in possible sterility. Normal ovulation, early menopause, or permanent sterility may result. In men, temporary or permanent azoospermia (absence of spermatozoa) may develop. Reproductive cells may be damaged during treatment, resulting in chromosomal abnormalities in offspring. Banking of sperm is recommended for men before treatments are initiated to protect against sterility or any mutagenic damage to sperm.

Patients and their partners need to be informed about potential changes in reproductive function resulting from chemotherapy. They are advised to use reliable methods of birth control while receiving chemotherapy and not to assume that sterility has resulted.

Neurologic System. The taxanes and plant alkaloids, especially vincristine, can cause neurologic damage with repeated doses. Peripheral neuropathies, loss of deep tendon reflexes, and paralytic ileus may occur. These side effects are usually reversible and disappear after completion of chemotherapy. Cisplatin is also responsible for peripheral neuropathies; hearing loss due to damage to the acoustic nerve can also occur.

Miscellaneous. Fatigue is a distressing side effect for most patients that greatly affects quality of life. Fatigue can be debilitating and last for months after treatment.

Nursing Management in Chemotherapy

The nurse has an important role in assessing and managing many of the problems experienced by the patient undergoing chemotherapy. Because of the systemic effects on normal as well as malignant cells, these problems are often widespread, affecting many body systems.

ASSESSING FLUID AND ELECTROLYTE STATUS

Anorexia, nausea, vomiting, altered taste, and diarrhea put the patient at risk for nutritional and fluid and electrolyte disturbances. Changes in the mucosa of the gastrointestinal tract may lead to irritation of the oral cavity and intestinal tract, further threatening the patient's nutritional status. Therefore, it is important for the nurse to assess the patient's nutritional and fluid and electrolyte status frequently and to use creative ways to encourage an adequate fluid and dietary intake.

MODIFYING RISKS FOR INFECTION AND BLEEDING

Suppression of the bone marrow and immune system is an expected consequence of chemotherapy and frequently serves as a guide in determining appropriate chemotherapy dosage. However, this effect also increases the risk for anemia, infection, and bleeding disorders. Therefore, nursing assessment and care focus on identifying and modifying factors that further increase the patient's risk. Aseptic technique and gentle handling are indicated to prevent infection and trauma. Laboratory test results, particularly blood cell counts, are monitored closely. Untoward changes in blood test results and signs of infection and bleeding must be reported promptly. The patient and family members are instructed about measures to prevent these problems at home (see Plan of Nursing Care for more information).

(text continues on page 343)

Plan of Nursing Care
The Patient With Cancer

Nursing Interventions	Rationale	Expected Outcomes
Nursing Diagnosis: Risk for infection related to altered immunologic response **Goal:** Prevention of infection		
1. Assess patient for evidence of infection: a. Check vital signs every 4 hours. b. Monitor WBC count and differential each day. c. Inspect all sites that may serve as entry ports for pathogens (intravenous sites, wounds, skin folds, bony prominences, perineum, and oral cavity).	1. Signs and symptoms of infection may be diminished in the immunocompromised host. Prompt recognition of infection and subsequent initiation of therapy will reduce morbidity and mortality associated with infection.	• Demonstrates normal temperature and vital signs. • Exhibits absence of signs of inflammation: local edema, erythema, pain, and warmth. • Exhibits normal breath sounds on auscultation. • Takes deep breaths and coughs every 2 hours to prevent respiratory dysfunction and infection.
2. Report fever ≥38.3°C (101°F), chills, diaphoresis, swelling, heat, pain, erythema, exudate on any body surfaces. Also report change in respiratory or mental status, urinary frequency or burning, malaise, myalgias, arthralgias, rash, or diarrhea.	2. Early detection of infection facilitates early intervention.	• Exhibits absence of pathologic bacteria on cultures. • Avoids contact with others with infections. • Avoids crowds. • All personnel carry out hand hygiene after each voiding and bowel movement.
3. Obtain cultures and sensitivities as indicated before initiation of antimicrobial treatment (wound exudate, sputum, urine, stool, blood).	3. These tests identify the organism and indicate the most appropriate antimicrobial therapy. Use of inappropriate antibiotics enhances proliferation of additional flora and encourages growth of antibiotic-resistant organisms.	• Excoriation and trauma of skin are avoided. • Trauma to mucous membranes is avoided (avoidance of rectal thermometers, suppositories, vaginal tampons, perianal trauma).
4. Initiate measures to minimize infection. a. Discuss with patient and family (1) Placing patient in private room if absolute WBC count <1,000/mm^3 (2) Importance of patient avoiding contact with people who have known or recent infection or recent vaccination	4. Exposure to infection is reduced. a. Preventing contact with pathogens helps prevent infection.	• Uses recommended procedures and techniques if participating in management of invasive lines or catheters. • Uses electric razor. • Is free of skin breakdown and stasis of secretions. • Adheres to dietary and environmental restrictions.
b. Instruct all personnel in careful hand hygiene before and after entering room.	b. Hands are significant source of contamination.	• Exhibits no signs of septicemia or septic shock.
c. Avoid rectal or vaginal procedures (rectal temperatures, examinations, suppositories; vaginal tampons).	c. Incidence of rectal and perianal abscesses and subsequent systemic infection is high. Manipulation may cause disruption of membrane integrity and enhance progression of infection.	• Exhibits normal vital signs, cardiac output, and arterial pressures when monitored.
d. Use stool softeners to prevent constipation and straining.	d. This minimizes trauma to tissues.	• Demonstrates ability to administer colony-stimulating factor.
e. Assist patient in practice of meticulous personal hygiene.	e. This prevents skin irritation.	
f. Instruct patient to use electric razor.	f. Minimizes skin trauma.	
g. Encourage patient to ambulate in room unless contraindicated.	g. Minimizes chance of skin breakdown and stasis of pulmonary secretions.	
h. Avoid fresh fruits, raw meat, fish, and vegetables if absolute WBC count <1,000/mm^3; also remove fresh flowers and potted plants.	h. Fresh fruits and vegetables harbor bacteria not removed by ordinary washing. Flowers and potted plants are also sources of organisms.	
i. Each day: change drinking water, denture cleaning fluids, and respiratory equipment containing water.	i. Stagnant water is a source of infection.	
5. Assess intravenous sites every day for evidence of infection:	5. Nosocomial staphylococcal septicemia is closely associated with intravenous catheters.	
a. Change intravenous sites every other day.	a. Incidence of infection is increased when catheter is in place >72 hr.	

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
b. Cleanse skin with povidone-iodine before arterial puncture or venipuncture.	b. Povidone-iodine is effective against many gram-positive and gram-negative pathogens.	
c. Change central venous catheter dressings every 48 hours.	c. Allows observation of site and removes source of contamination.	
d. Change all solutions and infusion sets every 48 hours.	d. Once introduced into the system, microorganisms are capable of growing in infusion sets despite replacement of container and high flow rates.	
6. Avoid intramuscular injections.	6. Reduces risk for skin abscesses.	
7. Avoid insertion of urinary catheters; if catheters are necessary, use strict aseptic technique.	7. Rates of infection *greatly* increase after urinary catheterization.	
8. Teach patient or family member to administer granulocyte (or granulocyte-macrophage) colony-stimulating factor when prescribed.	8. Granulocyte colony-stimulating factor decreases the duration of neutropenia and the potential for infection.	
Nursing Diagnosis: Impaired skin integrity: erythematous and wet desquamation reactions to radiation therapy **Goal:** Maintenance of skin integrity		
1. In erythematous areas: a. Avoid the use of soaps, cosmetics, perfumes, powders, lotions and ointments, deodorants.	1. Care to the affected areas must focus on preventing further skin irritation, drying, and damage	• Avoids use of soaps, powders, and other cosmetics on site of radiation therapy. • States rationale for special care of skin. • Exhibits minimal change in skin. • Avoids trauma to affected skin region (avoids shaving, constricting and irritating clothing, extremes of temperature, and use of adhesive tape). • Reports change in skin promptly. • Demonstrates proper care of blistered or open areas. • Exhibits absence of infection of blistered and opened areas.
b. Use only lukewarm water to bathe the area.		
c. Avoid rubbing or scratching the area.		
d. Avoid shaving the area with a straight-edged razor.		
e. Avoid applying hot-water bottles, heating pads, ice, and adhesive tape to the area.		
f. Avoid exposing the area to sunlight or cold weather.		
g. Avoid tight clothing in the area. Use cotton clothing.	g. Allows air circulation to affected area.	
h. Apply vitamin A&D ointment to the area.	h. Aids healing.	
2. If wet desquamation occurs: a. Do not disrupt any blisters that have formed.	2. Open weeping areas are susceptible to bacterial infection. Care must be taken to prevent introduction of pathogens.	
b. Avoid frequent washing of the area.		
c. Report any blistering.		
d. Use *prescribed* creams or ointments.	d. Decreases irritation and inflammation of the area.	
e. If area weeps, apply a thin layer of gauze dressing.	e. Enhances drying.	
Nursing Diagnosis: Impaired oral mucous membrane: stomatitis **Goal:** Maintenance of intact oral mucous membranes		
1. Assess oral cavity daily.	1. Provides baseline for later evaluation.	• States rationale for frequent oral assessment and hygiene.
2. Instruct patient to report oral burning, pain, areas of redness, open lesions on the	2. Identification of initial stages of stomatitis will facilitate prompt interventions,	

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
lips, pain associated with swallowing, or decreased tolerance to temperature extremes of food.	including modification of treatment as prescribed by physician.	• Identifies signs and symptoms of stomatitis to report to nurse or physician.
3. Encourage and assist in oral hygiene.		• Participates in recommended oral hygiene regimen.
Preventive		• Avoids mouthwashes with alcohol.
a. Avoid commercial mouthwashes.	a. Alcohol content of mouthwashes will dry oral tissues and potentiate breakdown.	• Brushes teeth and mouth with soft toothbrush.
b. Brush with soft toothbrush; use nonabrasive toothpaste after meals and bedtime; floss every 24 h unless painful or platelet count falls below 40,000 cu/mm.	b. Limits trauma and removes debris.	• Uses lubricant to keep lips soft and nonirritated.
		• Avoids hard-to-chew, spicy, and hot foods.
Mild stomatitis (generalized erythema, limited ulcerations, small white patches: *Candida*)		• Exhibits clean, intact oral mucosa.
		• Exhibits no ulcerations or infections of oral cavity.
		• Exhibits no evidence of bleeding.
		• Reports absent or decreased oral pain.
		• Reports no difficulty swallowing.
c. Use normal saline mouth rinses every 2 h while awake; every 6 h at night.	c. Assists in removing debris, thick secretions, and bacteria.	• Exhibits healing (reepithelialization) of oral mucosa within 5 to 7 days (mild stomatitis).
d. Use soft toothbrush or toothette.	d. Minimizes trauma.	
e. Remove dentures except for meals; be certain dentures fit well.	e. Minimizes friction and discomfort.	• Exhibits healing of oral tissues within 10 to 14 days (severe stomatitis).
f. Apply lip lubricant.	f. Promotes comfort.	• Exhibits no bleeding or oral ulceration.
g. Avoid foods that are spicy or hard to chew and those with extremes of temperature.	g. Prevents local trauma.	• Consumes adequate fluid and food.
		• Exhibits absence of dehydration and weight loss.
Severe stomatitis (confluent ulcerations with bleeding and white patches covering more than 25% of oral mucosa)		
h. Obtain tissue samples for culture and sensitivity tests of areas of infection.	h. Assists in identifying need for antimicrobial therapy.	
i. Assess ability to chew and swallow; assess gag reflex.	i. Patient may be in danger of aspiration.	
j. Use oral rinses as prescribed or place patient on side and irrigate mouth; have suction available (may combine in solution saline, anti-*Candida* agent, such as Mycostatin, and topical anesthetic agent as described below).	j. Facilitates cleansing, provides for safety and comfort.	
k. Remove dentures.	k. Prevents trauma from ill-fitting dentures.	
l. Use toothette or gauze soaked with solution for cleansing.	l. Limits trauma, promotes comfort.	
m. Use lip lubricant.	m. Promotes comfort.	
n. Provide liquid or pureed diet.	n. Ensures intake of easily digestible foods.	
o. Monitor for dehydration.	o. Decreased oral intake and ulcerations potentiate fluid deficits.	
4. Minimize discomfort.		
a. Consult physician for use of topical anesthetic, such as dyclonine and diphenhydramine, or viscous lidocaine.	a. Alleviates pain and increases sense of well-being; promotes participation in oral hygiene and nutritional intake.	
b. Administer systemic analgesics as prescribed.		
c. Perform mouth care as described.	c. Promotes removal of debris, healing, and comfort.	

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
Nursing Diagnosis: Impaired tissue integrity: alopecia **Goal:** Maintenance of tissue integrity; coping with hair loss		
1. Discuss potential hair loss and regrowth with patient and family.	1. Provides information so patient and family can begin to prepare cognitively and emotionally for loss.	• Identifies alopecia as potential side effect of treatment. • Identifies positive and negative feelings and threats to self-image. • Verbalizes meaning that hair and possible hair loss have for him or her. • States rationale for modifications in hair care and treatment. • Uses mild shampoo and conditioner and shampoos hair only when necessary. • Avoids hair dryer, curlers, sprays, and other stresses on hair and scalp. • Wears hat or scarf over hair when exposed to sun. • Takes steps to deal with possible hair loss before it occurs; purchases wig or hairpiece. • Maintains hygiene and grooming. • Interacts and socializes with others. • States that hair loss and necessity of wig are temporary.
2. Explore potential impact of hair loss on self-image, interpersonal relationships, and sexuality.	2. Facilitates coping.	
3. Prevent or minimize hair loss through the following: a. Use scalp hypothermia and scalp tourniquets, if appropriate.	3. Retains hair as long as possible. a. Decreases hair follicle uptake of chemotherapy (not used for patients with leukemia or lymphoma because tumor cells may be present in blood vessels or scalp tissue).	
b. Cut long hair before treatment. c. Use mild shampoo and conditioner, gently pat dry, and avoid excessive shampooing. d. Avoid electric curlers, curling irons, dryers, clips, barrettes, hair sprays, hair dyes, and permanent waves. e. Avoid excessive combing or brushing; use wide-toothed comb.	b–e. Minimizes hair loss due to the weight and manipulation of hair.	
4. Prevent trauma to scalp. a. Lubricate scalp with vitamin A&D ointment to decrease itching. b. Have patient use sunscreen or wear hat when in the sun.	4. Preserves tissue integrity. a. Assists in maintaining skin integrity. b. Prevents ultraviolet light exposure.	
5. Suggest ways to assist in coping with hair loss: a. Purchase wig or hairpiece before hair loss.	5. Minimizes change in appearance. a. Wig that closely resembles hair color and style is more easily selected if hair loss has not begun.	
b. If hair loss has occurred, take photograph to wig shop to assist in selection. c. Begin to wear wig before hair loss. d. Contact the American Cancer Society for donated wigs, or a store that specializes in this product. e. Wear hat, scarf, or turban.	b. Facilitates adjustment. e. Conceals loss.	
6. Encourage patient to wear own clothes and retain social contacts.	6. Assists in maintaining personal identity.	
7. Explain that hair growth usually begins again once therapy is completed.	7. Reassures patient that hair loss is usually temporary.	
Nursing Diagnosis: Imbalanced nutrition, less than body requirements, related to nausea and vomiting **Goal:** Fewer episodes of nausea and vomiting before, during, and after chemotherapy		
1. Assess the patient's previous experiences and expectations of nausea and vomiting, including causes and interventions used.	1. Identifies patient concerns, misinformation, potential strategies for intervention. Also gives patient sense of empowerment and control.	• Identifies previous triggers of nausea and vomiting. • Exhibits decreased apprehension and anxiety. • Identifies previously used successful interventions for nausea and vomiting. • Reports decrease in nausea.
2. Adjust diet before and after drug administration according to patient preference and tolerance.	2. Each patient responds differently to food after chemotherapy. A diet containing foods that relieve the patient's nausea or vomiting is most helpful.	

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
3. Prevent unpleasant sights, odors, and sounds in the environment.	3. Unpleasant sensations can stimulate the nausea and vomiting center.	• Reports decrease in incidence of vomiting. • Consumes adequate fluid and food when nausea subsides. • Demonstrates use of distraction, relaxation, and imagery when indicated. • Exhibits normal skin turgor and moist mucous membranes. • Reports no additional weight loss.
4. Use distraction, music therapy, biofeedback, self-hypnosis, relaxation techniques, and guided imagery before, during, and after chemotherapy.	4. Decreases anxiety, which can contribute to nausea and vomiting. Psychological conditioning may also be decreased.	
5. Administer prescribed antiemetics, sedatives, and corticosteroids before chemotherapy and afterward as needed.	5. Administration of antiemetic regimen before onset of nausea and vomiting limits the adverse experience and facilitates control. Combination drug therapy reduces nausea and vomiting through various triggering mechanisms.	
6. Ensure adequate fluid hydration before, during, and after drug administration; assess intake and output.	6. Adequate fluid volume dilutes drug levels, decreasing stimulation of vomiting receptors.	
7. Encourage frequent oral hygiene.	7. Reduces unpleasant taste sensations.	
8. Provide pain relief measures, if necessary.	8. Increased comfort increases physical tolerance of symptoms.	
9. Assess other causes of nausea and vomiting, such as constipation, gastrointestinal irritation, electrolyte imbalance, radiation therapy, medications, and central nervous system metastasis.	9. Multiple factors may cause nausea and vomiting.	

Nursing Diagnosis: Imbalanced nutrition: less than body requirements, related to anorexia, cachexia, or malabsorption

Goal: Maintenance of nutritional status and of weight within 10% of pretreatment weight

1. Teach patient to avoid unpleasant sights, odors, sounds in the environment during mealtime.	1. Anorexia can be stimulated or increased with noxious stimuli.	• Exhibits weight loss no greater than 10% of pretreatment weight. • Reports decreasing anorexia and increased interest in eating. • Demonstrates normal skin turgor. • Identifies rationale for dietary modifications. • Participates in calorie counts and diet histories. • Uses appropriate relaxation and imagery before meals. • Exhibits laboratory and clinical findings indicative of adequate nutritional intake: normal serum protein and transferrin levels; normal serum iron levels; normal hemoglobin, hematocrit, and lymphocyte levels; normal urinary creatinine levels. • Consumes diet high in required nutrients. • Carries out oral hygiene before meals. • Reports that pain does not interfere with meals. • Reports decreasing episodes of nausea and vomiting. • Participates in increasing levels of activity. • States rationale for use of tube feedings or hyperalimentation. • Participates in management of tube feedings or parenteral nutrition, if prescribed.
2. Suggest foods that are preferred and well tolerated by the patient, preferably high-calorie and high-protein foods. Respect ethnic and cultural food preferences.	2. Foods preferred, well tolerated, and high in calories and protein maintain nutritional status during periods of increased metabolic demand.	
3. Encourage adequate fluid intake, but limit fluids at mealtime.	3. Fluids are necessary to eliminate wastes and prevent dehydration. Increased fluids with meals can lead to early satiety.	
4. Suggest smaller, more frequent meals.	4. Smaller, more frequent meals are better tolerated because early satiety does not occur.	
5. Promote relaxed, quiet environment during mealtime with increased social interaction as desired.	5. A quiet environment promotes relaxation. Social interaction at mealtime increases appetite.	
6. If possible, serve wine at mealtime with foods.	6. Wine often stimulates appetite and adds calories.	
7. Consider cold foods, if desired.	7. Cold, high-protein foods are often more tolerable and less odorous than hot foods.	
8. Advocate nutritional supplements and high-protein foods between meals.	8. Supplements and snacks add protein and calories to meet nutritional requirements.	
9. Encourage frequent oral hygiene.	9. Oral hygiene stimulates appetite and increases saliva production.	
10. Provide pain relief measures.	10. Pain impairs appetite.	
11. Provide control of nausea and vomiting.	11. Nausea and vomiting increase anorexia.	
12. Increase activity level as tolerated.	12. Increased activity promotes appetite.	

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
13. Decrease anxiety by encouraging verbalization of fears, concerns; use of relaxation techniques; imagery at mealtime.	13. Relief of anxiety may increase appetite.	
14. Position patient properly at mealtime.	14. Proper body position and alignment are necessary to aid chewing and swallowing.	
15. For collaborative management, provide enteral tube feedings of commercial liquid diets, elemental diets, or blenderized foods as prescribed.	15. Tube feedings may be necessary in the severely debilitated patient who has a functioning gastrointestinal system.	
16. Provide parenteral nutrition with lipid supplements as prescribed.	16. Parenteral nutrition with supplemental fats supplies needed calories and proteins to meet nutritional demands, especially in the nonfunctional gastrointestinal system.	
17. Administer appetite stimulants as prescribed by physician.	17. Although the mechanism is unclear, medications such as megestrol acetate (Megace) have been noted to improve appetite in patients with cancer and HIV infection.	

Nursing Diagnosis: Fatigue
Goal: Increased activity tolerance and decreased fatigue level

1. Encourage several rest periods during the day, especially before and after physical exertion.	1. During rest, energy is conserved and levels are replenished. Several shorter rest periods may be more beneficial than one longer rest period.	• Reports decreasing levels of fatigue. • Increases participation in activities gradually.
2. Increase total hours of nighttime sleep.	2. Sleep helps to restore energy levels.	• Rests when fatigued. • Reports restful sleep.
3. Rearrange daily schedule and organize activities to conserve energy expenditure.	3. Reorganization of activities can reduce energy losses and stressors.	• Requests assistance with activities appropriately.
4. Encourage patient to ask for others' assistance with necessary chores, such as housework, child care, shopping, cooking.	4. Conserves energy.	• Reports adequate energy to participate in activities important to him or her (eg, visiting with family, hobbies).
5. Encourage reduced job workload, if possible, by reducing number of hours worked per week.	5. Reducing workload decreases physical and psychological stress and increases periods of rest and relaxation.	• Consumes diet with recommended protein and caloric intake.
6. Encourage adequate protein and calorie intake.	6. Protein and calorie depletion decreases activity tolerance.	• Uses relaxation exercises and imagery to decrease anxiety and promote rest.
7. Encourage use of relaxation techniques, mental imagery.	7. Promotion of relaxation and psychological rest decreases physical fatigue.	• Participates in planned exercise program gradually.
8. Encourage participation in planned exercise programs.	8. Proper exercise programs increase endurance and stamina.	• Reports no breathlessness during activities.
9. For collaborative management, administer blood products as prescribed.	9. Lowered hemoglobin and hematocrit predispose patient to fatigue due to decreased oxygen availability.	• Exhibits acceptable hemoglobin and hematocrit levels. • Exhibits normal fluid and electrolyte balance.
10. Assess for fluid and electrolyte disturbances.	10. May contribute to altered nerve transmission and muscle function.	• Reports decreased discomfort.
11. Assess for sources of discomfort.	11. Coping with discomfort requires energy expenditure.	• Exhibits improved mobility.
12. Provide strategies to facilitate mobility.	12. Impaired mobility requires increased energy expenditure.	

Nursing Diagnosis: Chronic Pain
Goal: Relief of pain and discomfort

1. Use pain scale to assess pain and discomfort characteristics: location, quality, frequency, duration, etc.	1. Provides baseline for assessing changes in pain level and evaluation of interventions.	• Reports decreased level of pain and discomfort on pain scale.

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Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
2. Assure patient that you know that pain is real and will assist him or her in reducing it.	2. Fear that pain will not be considered real increases anxiety and reduces pain tolerance.	• Reports less disruption from pain and discomfort. • Explains how fatigue, fear, anger, etc., contribute to severity of pain and discomfort. • Accepts pain medication as prescribed. • Exhibits decreased physical and behavioral signs of pain and discomfort in acute pain (no grimacing, crying, moaning; displays interest in surroundings and activities around him). • Takes an active role in administration of analgesia. • Identifies additional effective pain relief strategies. • Uses alternative pain relief strategies appropriately. • Reports effective use of new pain relief strategies and decrease in pain intensity. • Reports that decreased level of pain permits participation in other activities and events.
3. Assess other factors contributing to patient's pain: fear, fatigue, anger, etc.	3. Provides data about factors that decrease patient's ability to tolerate pain and increase pain level.	
4. Administer analgesics to promote optimum pain relief within limits of physician's prescription.	4. Analgesics tend to be more effective when administered early in pain cycle.	
5. Assess patient's behavioral responses to pain and pain experience.	5. Provides additional information about patient's pain.	
6. Collaborate with patient, physician, and other health care team members when changes in pain management are necessary.	6. New methods of administering analgesia must be acceptable to patient, physician, and health care team to be effective; patient's participation decreases the sense of powerlessness.	
7. Encourage strategies of pain relief that patient has used successfully in previous pain experience.	7. Encourages success of pain relief strategies accepted by patient and family.	
8. Teach patient new strategies to relieve pain and discomfort: distraction, imagery, relaxation, cutaneous stimulation, etc.	8. Increases number of options and strategies available to patient.	
Nursing Diagnosis: Anticipatory grieving related to loss; altered role functioning **Goal:** Appropriate progression through grieving process		
1. Encourage verbalization of fears, concerns, and questions regarding disease, treatment, and future implications.	1. An increased and accurate knowledge base decreases anxiety and dispels misconceptions.	• The patient and family progress through the phases of grief as evidenced by increased verbalization and expression of grief. • The patient and family identify resources available to aid coping strategies during grieving. • The patient and family use resources and supports appropriately. • The patient and family discuss the future openly with each other. • The patient and family discuss concerns and feelings openly with each other. • The patient and family use nonverbal expressions of concern for each other.
2. Encourage active participation of patient or family in care and treatment decisions.	2. Active participation maintains patient independence and control.	
3. Visit family frequently to establish and maintain relationships and physical closeness.	3. Frequent contacts promote trust and security and reduce feelings of fear and isolation.	
4. Encourage ventilation of negative feelings, including projected anger and hostility, within acceptable limits.	4. This allows for emotional expression without loss of self-esteem.	
5. Allow for periods of crying and expression of sadness.	5. These feelings are necessary for separation and detachment to occur.	
6. Involve clergy as desired by the patient and family.	6. This facilitates the grief process and spiritual care.	
7. Advise professional counseling as indicated for patient or family to alleviate pathologic grieving.	7. This facilitates the grief process.	
8. Allow for progression through the grieving process at the individual pace of the patient and family.	8. Grief work is variable. Not every person uses every phase of the grief process, and the time spent in dealing with each phase varies with every person. To complete grief work, this variability must be allowed.	
Nursing Diagnosis: Disturbed body image and situational low self-esteem related to changes in appearance, function, and roles **Goal:** Improved body image and self-esteem		
1. Assess patient's feelings about body image and level of self-esteem.	1. Provides baseline assessment for evaluating changes and assessing effectiveness of interventions.	• Identifies concerns of importance. • Takes active role in activities. • Maintains previous role in decision making.

(continued)

Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
2. Identify potential threats to patient's self-esteem (eg, altered appearance, decreased sexual function, hair loss, decreased energy, role changes). Validate concerns with patient.	2. Anticipates changes and permits patient to identify importance of these areas to him or her.	• Verbalizes feelings and reactions to losses or threatened losses. • Participates in self-care activities. • Permits others to assist in care when he or she is unable to be independent. • Exhibits interest in appearance and uses aids (cosmetics, scarves, etc.) appropriately. • Participates with others in conversations and social events and activities. • Verbalizes concern about sexual partner and/or significant others. • Explores alternative ways of expressing concern and affection.
3. Encourage continued participation in activities and decision making.	3. Encourages and permits continued control of events and self.	
4. Encourage patient to verbalize concerns.	4. Identifying concerns is an important step in coping with them.	
5. Individualize care for the patient.	5. Prevents or reduces depersonalization and emphasizes patient's self-worth.	
6. Assist patient in self-care when fatigue, lethargy, nausea, vomiting, and other symptoms prevent independence.	6. Physical well-being improves self-esteem.	
7. Assist patient in selecting and using cosmetics, scarves, hair pieces, and clothing that increase his or her sense of attractiveness.	7. Promotes positive body image.	
8. Encourage patient and partner to share concerns about altered sexuality and sexual function and to explore alternatives to their usual sexual expression.	8. Provides opportunity for expressing concern, affection, and acceptance.	

Collaborative Problem: Potential complication: risk for bleeding problems
Goal: Prevention of bleeding

1. Assess for potential for bleeding: monitor platelet count.	1. Mild risk: 50,000–100,000/mm^3 ($0.05–0.1 \times 10^{12}$/L) Moderate risk: 20,000–50,000/mm^3 ($0.02–0.05 \times 10^{12}$/L) Severe risk: less than 20,000/mm^3 (0.02×10^{12}/L)	• Signs and symptoms of bleeding are identified. • Exhibits no blood in feces, urine, or emesis. • Exhibits no bleeding of gums or of injection or venipuncture sites. • Exhibits no ecchymosis (bruising). • Patient and family identify ways to prevent bleeding. • Uses recommended measures to reduce risk of bleeding (uses soft toothbrush, shaves with electric razor only). • Exhibits normal vital signs. • Reports that environmental hazards have been reduced or removed. • Consumes adequate fluid. • Reports absence of constipation. • Avoids substances interfering with clotting. • Absence of tissue destruction. • Exhibits normal mental status and absence of signs of intracranial bleeding. • Avoids medications that interfere with clotting (eg, aspirin). • Absence of epistaxis and cerebral bleeding.
2. Assess for bleeding:	2. Early detection promotes early intervention.	
a. Petechiae or ecchymosis	a. Indicates injury to microcirculation and larger vessels.	
b. Decrease in hemoglobin or hematocrit c. Prolonged bleeding from invasive procedures, venipunctures, minor cuts or scratches d. Frank or occult blood in any body excretion, emesis, sputum e. Bleeding from any body orifice	b. Indicates blood loss.	
f. Altered mental status	f. Indicates neurologic involvement.	
3. Instruct patient and family about ways to minimize bleeding:	3. Patient can participate in self-protection.	
a. Use soft toothbrush or toothette for mouth care.	a. Prevents trauma to oral tissues.	
b. Avoid commercial mouthwashes.	b. Contain high alcohol content that will dry oral tissues.	
c. Use electric razor for shaving.	c. Prevents trauma to skin.	
d. Use emery board for nail care.	d. Reduces risk of trauma to nailbeds.	
e. Avoid foods that are difficult to chew.	e. Prevents oral tissue trauma.	
4. Initiate measures to minimize bleeding.	4. Preserves circulating blood volume.	
a. Draw all blood for lab work with one daily venipuncture.	a. Minimizes trauma and blood loss.	
b. Avoid taking temperature rectally or administering suppositories and enemas.	b. Prevents trauma to rectal mucosa.	

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Plan of Nursing Care
The Patient With Cancer *(Continued)*

Nursing Interventions	Rationale	Expected Outcomes
c. Avoid intramuscular injections; use smallest needle possible.	c. Prevents intramuscular bleeding.	
d. Apply direct pressure to injection and venipuncture sites for at least 5 min.	d. Minimizes blood loss.	
e. Lubricate lips with petrolatum.	e. Prevents skin from drying.	
f. Avoid bladder catheterizations; use smallest catheter if catheterization is necessary.	f. Prevents trauma to urethra.	
g. Maintain fluid intake of at least 3 L/24 h unless contraindicated.	g. Hydration helps to prevent skin drying.	
h. Use stool softeners or increase bulk in diet.	h. Prevents constipation and straining that may injure rectal tissue.	
i. Avoid medications that will interfere with clotting (eg, aspirin).	i. Minimizes risk of bleeding.	
j. Recommend use of water-based lubricant before sexual intercourse.	j. Prevents friction and tissue trauma.	
5. When platelet count is less than 20,000/mm^3, institute the following:	5. Platelet count of less than 20,000/mm^3 (0.02×10^{12}/L) is associated with increased risk of spontaneous bleeding.	
a. Bed rest with padded side rails	a. Reduces risk of injury	
b. Avoidance of strenuous activity	b. Increases intracranial pressure and risk of cerebral hemorrhage.	
c. Platelet transfusions as prescribed; administer prescribed diphenhydramine hydrochloride (Benadryl) or hydrocortisone sodium succinate (Solu-Cortef) to prevent reaction to platelet transfusion.	c. Allergic reactions to blood products are associated with antigen–antibody reaction that causes platelet destruction.	
d. Supervise activity when out of bed.		
e. Caution against forceful nose blowing.	e. Prevents trauma to nasal mucosa and increased intracranial pressure.	

ADMINISTERING CHEMOTHERAPY

The local effects of the chemotherapeutic agent are also of concern. The patient is observed closely during its administration because of the risk and consequences of extravasation (particularly of vesicant agents, which may produce necrosis if deposited in the subcutaneous tissues). Local difficulties or problems with administration of chemotherapeutic agents are brought to the attention of the physician promptly so that corrective measures can be taken immediately to minimize local tissue damage.

IMPLEMENTING SAFEGUARDS

Nurses involved in handling chemotherapeutic agents may be exposed to low doses of the drugs by direct contact, inhalation, and ingestion. Urinalyses of personnel repeatedly exposed to cytotoxic agents demonstrate mutagenic activity. Although not all mutagens are carcinogenic, they can produce permanent inheritable changes in the genetic material of cells.

Although long-term studies of nurses handling chemotherapeutic agents have not been conducted, it is known that chemotherapeutic agents are associated with secondary formation of cancers and chromosome abnormalities. Additionally, nausea, vomiting, dizziness, alopecia, and nasal mucosal ulcerations have been reported in health care personnel who have handled chemotherapeutic agents.

Because of known and potential hazards associated with handling chemotherapeutic agents, the Occupational Safety and Health Administration, Oncology Nursing Society, hospitals, and other health care agencies have developed specific precautions for those involved in the preparation and administration of chemotherapy (Chart 16-6).

BONE MARROW TRANSPLANTATION

Although surgery, radiation therapy, and chemotherapy have resulted in improved survival rates for cancer patients, many cancers that initially respond to therapy recur. This is true of hematologic cancers that affect the bone marrow and solid tumor cancers treated with lower doses of antineoplastics to spare the bone marrow from larger, ablative doses of chemotherapy or radiation therapy.

The role of bone marrow transplantation (BMT) for malignant as well as some nonmalignant diseases continues to grow. Types of BMT based on the source of donor cells include:

1. Allogeneic (from a donor other than the patient): either a related donor (ie, family member) or a matched unrelated donor (national bone marrow registry, cord blood registry)

Chart 16-6 Safety in Administering Chemotherapy

Safety recommendations from the Occupational Safety and Health Administration (OSHA), Oncology Nursing Society (ONS), hospitals, and other health care agencies for the preparation and handling of antineoplastic agents follow:

- Use a biologic safety cabinet for the preparation of all chemotherapy agents.
- Wear surgical gloves when handling antineoplastic agents and the excretions of patients who received chemotherapy.
- Wear disposable, long-sleeved gowns when preparing and administering chemotherapy agents.
- Use Luer-Lok fittings on all intravenous tubing used to deliver chemotherapy.
- Dispose of all equipment used in chemotherapy preparation and administration in appropriate, leak-proof, puncture-proof containers.
- Dispose of all chemotherapy wastes as hazardous materials.

When followed, these precautions greatly minimize the risk of exposure to chemotherapy agents.

2. Autologous (from patient)
3. Syngeneic (from an identical twin)

The process of obtaining donor cells has evolved over the years. Donor cells can be obtained by the traditional harvesting of large amounts of bone marrow tissue under general anesthesia in the operating room. A newer method, referred to as peripheral blood stem cell transplant (PBSCT), is gaining widespread use. This method of collection uses apheresis of the donor to collect stem cells for reinfusion. It is considered to be a safer and more cost-effective means of collection than the traditional harvesting of marrow.

Allogeneic BMT, used primarily for disease of the bone marrow, depends on the availability of a human leukocyte antigen–matched donor. This greatly limits the number of transplants possible. An advantage to allogeneic BMT is that the transplanted cells should not be immunologically tolerant of the patient's malignancy and should cause a lethal graft-versus-disease effect to the malignant cells. The recipient must undergo ablative doses of chemotherapy and possibly total body irradiation to destroy all existing bone marrow and malignant disease. The harvested donor marrow is infused intravenously into the recipient and travels to sites in the body where it produces bone marrow and establishes itself. This establishment of the new bone marrow is known as engraftment. Once engraftment is complete (2 to 4 weeks, sometimes longer), the new bone marrow becomes functional and begins producing red blood cells, WBCs, and platelets.

Before engraftment, patients are at a high risk for infection, sepsis, and bleeding. Side effects of the high-dose chemotherapy and total body irradiation can be acute and chronic. Acute side effects include alopecia, hemorrhagic cystitis, nausea, vomiting, diarrhea, and severe stomatitis. Chronic side effects include sterility, pulmonary dysfunction, cardiac dysfunction, and liver disease. Patients receive immunosuppressant drugs, such as cyclosporine, tacrolimus (FK 506), or azathioprine (Imuran), to prevent graft-versus-host disease (GVHD). In allogeneic transplant recipients, GVHD occurs when the T lymphocytes from the transplanted donor marrow become activated and mount an immune response against the recipient's tissues (skin, gastrointestinal tract, liver). T lymphocytes respond in this manner because they view the recipient's tissue as "foreign," immunologically differing from what they recognize as "self" in the donor. GVHD may occur acutely or chronically. The first 100 days or so after allogeneic transplantation are crucial for BMT patients until the immune system and blood-making capacity (hematopoiesis) have recovered sufficiently to prevent infection and hemorrhage. Most acute side effects, such as nausea, vomiting, and mucositis, also resolve in the initial 100 days after transplantation. Patients are also at risk for development of venous occlusive disease (VOD), a vascular injury to the liver from the high-dose chemotherapy occurring in the first 100 days or so after BMT. VOD can lead to acute liver failure and death.

Autologous BMT is considered for patients with disease of the bone marrow who do not have a suitable donor for allogeneic BMT and for patients who have healthy bone marrow but require bone marrow–ablative doses of chemotherapy to cure an aggressive malignancy. Stem cells are collected from the patient and preserved for reinfusion and, if necessary, treated to kill any malignant cells within the marrow. The patient is treated with ablative chemotherapy and, possibly, total body irradiation to eradicate any remaining tumor. The stem cells are then reinfused and engraft. Until engraftment occurs in the bone marrow sites of the body, the patient is at high risk for infection, sepsis, and bleeding. Acute and chronic toxicities from chemotherapy and radiation therapy may be severe. The risk of VOD is also present after an autologous transplant. No immunosuppressant medications are necessary after autologous BMT because the patient did not receive foreign tissue. A disadvantage of autologous transplantation is the risk that viable tumor cells may remain in the bone marrow despite conditioning regimens (high-dose chemotherapy).

Syngeneic BMT is the least common type of transplantation because it requires an identical sibling for harvest. Syngeneic transplantations result in fewer complications and no marrow rejection because the donor is an identical tissue match to the recipient. The transplantation and collection processes are the same with syngeneic BMT as with allogeneic BMT.

Nursing Management in Bone Marrow Transplantation

Nursing care of patients undergoing BMT is complex and demands a high level of skill. Transplantation nursing can be extremely rewarding yet extremely stressful. The success of BMT is greatly influenced by nursing care throughout the transplantation process.

IMPLEMENTING PRETRANSPLANTATION CARE

All patients must undergo extensive pretransplantation evaluations to assess the current clinical status of the disease. Nutritional assessments, extensive physical examinations and organ function tests, and psychological evaluations are conducted. Blood work includes assessing past antigen exposure (for example, to hepatitis virus, cytomegalovirus, herpes simplex virus, HIV, and syphilis). The patient's social support systems and financial and insurance resources are also evaluated. Informed consent and patient teaching about the procedure and pretransplantation and posttransplantation care are vital.

PROVIDING CARE DURING TREATMENT

Skilled nursing care is required during the treatment phase of BMT when high-dose chemotherapy (conditioning regimen) and total body irradiation are administered. The acute toxicities of nausea, diarrhea, mucositis, and hemorrhagic cystitis require close monitoring and constant attention by the nurse.

Nursing management during the bone marrow or stem cell infusions consists of monitoring the patient's vital signs and blood

oxygen saturation; assessing for adverse effects, such as fever, chills, shortness of breath, chest pain, cutaneous reactions, nausea, vomiting, hypotension or hypertension, tachycardia, anxiety, and taste changes; and providing ongoing support and patient teaching.

Throughout the period of bone marrow aplasia until engraftment of the new marrow occurs, patients are at high risk for dying of sepsis and bleeding. Patients require support with blood products and hemopoietic growth factors. Potential infection may be bacterial, viral, fungal, or protozoan in origin. Renal complications arise from the nephrotoxic chemotherapy agents used in the conditioning regimen or those used to treat infection (amphotericin B, aminoglycosides). Tumor lysis syndrome and acute tubular necrosis are also risks after BMT.

GVHD requires skillful nursing assessment to detect early effects on the skin, liver, and gastrointestinal tract. VOD resulting from the conditioning regimens used in BMT can result in fluid retention, jaundice, abdominal pain, ascites, tender and enlarged liver, and encephalopathy. Pulmonary complications, such as pulmonary edema, interstitial pneumonia, and other pneumonias, often complicate the recovery after BMT.

Providing Posttransplantation Care

Ongoing nursing assessment in follow-up visits is essential to detect late effects of therapy in BMT patients. Late complications are those that occur 100 days or more after BMT. Late effects include infections, such as varicella zoster infection, restrictive pulmonary abnormalities, and recurrent pneumonias. Sterility often results. Chronic GVHD involves the skin, liver, intestine, esophagus, eye, lungs, joints, and vaginal mucosa. Cataracts may also develop after total body irradiation.

Psychosocial assessments by nursing staff must be ongoing. In addition to the stressors affecting patients at each phase of the transplantation experience, marrow donors and family members also have psychosocial needs that must be addressed.

CARING FOR THE DONORS

Donors commonly experience mood alterations, decreased self-esteem, and guilt from feelings of failure if the transplantation fails. Family members must be educated and supported to reduce anxiety and promote coping during this difficult time. Family members must also be assisted to maintain realistic expectations of themselves as well as of the patient.

As BMT becomes more prevalent, many moral and ethical issues become apparent, including those related to informed consent, allocation of resources, and quality of life.

HYPERTHERMIA

Hyperthermia (thermal therapy), the generation of temperatures greater than physiologic fever range (above 41.5°C [106.7°F]), has been used for many years to destroy tumors in human cancers. Malignant cells may be more sensitive than normal cells to the harmful effects of high temperatures for several reasons. Malignant cells lack the repair mechanisms necessary to repair cell damage by elevated temperatures. Most tumor cells lack an adequate blood supply to provide needed oxygen during periods of increased cellular demand, such as during hyperthermia. Cancerous tumors lack blood vessels of adequate size for dissipation of heat. In addition, the body's immune system may be indirectly stimulated when hyperthermia is used.

Hyperthermia is most effective when combined with radiation therapy, chemotherapy, or biologic therapy. Hyperthermia and radiation therapy are thought to work well together because hypoxic tumor cells and cells in the S phase of the cell cycle are more sensitive to heat than radiation; the addition of heat damages tumor cells so that they cannot repair themselves after radiation therapy. Hyperthermia is thought to alter cellular membrane permeability when used with chemotherapy, allowing for an increased uptake of the chemotherapeutic agent. Hyperthermia may enhance function of immune system cells, such as macrophages and T cells, which are stimulated by many biologic agents.

Heat can be produced by using radiowaves, ultrasound, microwaves, magnetic waves, hot-water baths, or even hot-wax immersions. Hyperthermia may be local or regional, or it may include the whole body. Local or regional hyperthermia may be delivered to a cancerous extremity (for malignant melanoma) by regional perfusion, in which the affected extremity is isolated by a tourniquet and an extracorporeal circulator heats the blood flowing through the affected part. Hyperthermia probes may also be inserted around a tumor in a local area and attached to a heat source during treatment. Chemotherapeutic agents, such as melphalan (Alkeran), may also be heated and instilled into the region's circulating blood. Local or regional hyperthermia may also include infusion of heated solutions into cancerous body organs. Whole-body hyperthermia to treat disseminated disease may be achieved by extracorporeal circulation, immersion of patients in heated water or paraffin, or enclosure in heated suits.

Side effects of hyperthermic treatments include skin burns and tissue damage, fatigue, hypotension, peripheral neuropathies, thrombophlebitis, nausea, vomiting, diarrhea, and electrolyte imbalances. Resistance to hyperthermia may develop during the treatment because cells adapt to repeated thermal insult. Research into the effectiveness of hyperthermia, methods of delivery, and side effects is ongoing.

Nursing Management in Hyperthermia

Although hyperthermia has been used for many years, many patients and their families are unfamiliar with this cancer treatment. Consequently, they need explanations about the procedure, its goals, and its effects. The patient is assessed for adverse effects, and efforts are made to reduce their occurrence and severity. Local skin care at the site of the implanted hyperthermic probes is also required.

BIOLOGIC RESPONSE MODIFIERS

Biologic response modifier (BRM) therapy involves the use of naturally occurring or recombinant (reproduced through genetic engineering) agents or treatment methods that can alter the immunologic relationship between the tumor and the cancer patient (host) to provide a therapeutic benefit. Although the mechanisms of action vary with each type of BRM, the goal is to destroy or stop the malignant growth. The basis of BRM treatment lies in the restoration, modification, stimulation, or augmentation of the body's natural immune defenses against cancer.

Nonspecific Biologic Response Modifiers

Some of the early investigations of the stimulation of the immune system involved nonspecific agents such as Bacille Calmette-Guérin (BCG) and *Corynebacterium parvum.* When injected into the patient, these agents serve as antigens that stimulate an immune response. The hope is that the stimulated immune system will then eradicate malignant cells. Extensive animal and human investigations with BCG have shown promising results, especially in treating localized malignant melanoma. Additionally, BCG is considered to be a standard form of treatment for localized bladder cancer. Use of nonspecific agents in advanced cancer remains

limited, however, and research is continuing in an effort to identify other uses and other agents.

Monoclonal Antibodies

Monoclonal antibodies (MoAbs), another type of BRM, became available through technological advances, enabling investigators to grow and produce specific antibodies for specific malignant cells. Theoretically, this type of specificity allows the MoAb to destroy the cancer cells and spare normal cells. The production of MoAbs involves injecting tumor cells that act as antigens into mice. Antibodies made in response to injected antigens can be found in the spleen of the mouse. Antibody-producing spleen cells are combined with a cancer cell that has the ability to grow indefinitely in culture medium and continue producing more antibodies. The combination of spleen cells and the cancer cells is referred to as a hybridoma. From hybridomas that continue to grow in the culture medium, the desired antibodies are harvested, purified, and prepared for diagnostic or therapeutic use (Fig. 16-5). Alternative methods of producing MoAbs using human or genetically engineered sources are under investigation.

MoAbs are being used as aids in diagnostic evaluation. By attaching a radioactive substance to the MoAb, physicians can detect both primary and metastatic tumors through radiologic techniques. This process is referred to as radioimmunodetection. OncoScint (Cytogen Corp., Princeton, NJ) is a U.S. Food and Drug Administration (FDA)-approved MoAb that is used to assist in diagnosing ovarian and colorectal cancers. The use of MoAbs in detecting breast, gastric, and prostate cancers and lymphoma is under investigation. MoAbs are also used in purging residual tumor cells from the bone marrow or peripheral blood of patients who are undergoing BMT for peripheral stem cell rescue after high-dose cytotoxic therapy.

Several MoAbs have been approved for treatment in cancer. Rituximab (Rituxan) is used for the treatment of relapsed or refractory non-Hodgkin's lymphoma (Kosits & Callaghan, 2000). Trastuzumab (Herceptin) is approved as a single agent or given in addition to chemotherapy for the treatment of some types of metastatic breast cancer (Yarbro, 2000). Alemtuzumab (Campath) is used in the treatment of some forms of leukemia (Seeley & DeMeyer, 2002). Gemtuzumab ozogomicin (Mylotarg) is a combination of a MoAb and the antitumor antibiotic calicheamicin, which is used for the treatment of a specific type of acute myeloid leukemia (Sorokin, 2000). Gemtuzumab ozogomicin is an example of immunoconjugate therapy or a "magic bullet" that transports cancer-killing substances to the cancer cells. Ibritumomab-tiuxetan (Zevalin) is another form of immunoconjugate therapy that combines a monoclonal antibody and a radioactive source for the treatment of specific types of non-Hodgkin's lymphoma. The monoclonal antibody delivers the radioactive source to the malignant cells, causing the cells to be destroyed by both radioactivity and normal immune responses (Estes, 2002). Researchers are continuing to explore the development and use of other MoAbs either alone or in combination with other substances such as radioactive materials, chemotherapeutic agents, toxins, hormones, or other BRMs.

Cytokines

Cytokines, substances produced by cells of the immune system to enhance the production and functioning of components of the immune system, are also the focus of cancer treatment research. Cytokines are grouped into families, such as interferons, interleukins, colony-stimulating factors, and tumor necrosis factors (TNFs).

INTERFERON

Interferons (IFNs) are examples of cytokines with both antiviral and antitumor properties. When stimulated, all nucleated cells are capable of producing these glycoproteins, which are classified according to their biologic and chemical properties: IFN-α is produced by leukocytes, IFN-β is produced by fibroblasts, and IFN-γ is produced by lymphocytes.

Although the exact antitumor effects of IFNs have not been thoroughly established, it is thought that they either stimulate the immune system or assist in preventing tumor growth. The antitumor effects are dependent on the type of IFN and the disease for which IFN is being used. IFNs enhance both lymphocyte and antibody production. They also facilitate the cytolytic or cell destruction role of macrophages and natural killer cells. Additionally, IFNs can inhibit cell multiplication by increasing the duration of various phases of the cell cycle.

The effects of IFN have been demonstrated in a variety of malignancies. IFN-α has been approved by the FDA for treating hairy-cell leukemia, Kaposi's sarcoma, chronic myelogenous leukemia, high-grade non-Hodgkin's lymphoma, and melanoma. Other positive responses have been seen in hematologic malignancies and renal carcinomas. IFN-α, IFN-β, and IFN-γ have been approved by the FDA for the treatment of several nonmalignant diseases. IFN is administered through subcutaneous, intramuscular, intravenous, and intracavitary routes. Efforts are underway to establish the effectiveness of IFN for various malignancies in combination with other treatment regimens.

INTERLEUKINS

Interleukins are a subgroup of cytokines known as lymphokines and monokines because they are primarily produced by lymphocytes and monocytes. About 15 different interleukins have been identified. They act by signaling and coordinating other cells of the immune system. The FDA has approved interleukin-2 (IL-2) as a treatment option for renal cell cancer and metastatic melanoma in adults. Originally referred to as T-cell growth factor, IL-2 is known to stimulate the production and activation of several different types of lymphocytes. In addition, IL-2 enhances the production of other types of cytokines and plays a role in influencing both humoral and cell-mediated immunity.

Clinical trials are beng conducted on IL-2 as well as other interleukins, such as IL-1, IL-4, and IL-6, for their roles in treating other cancers. Some early-stage clinical trials are assessing the effects of interleukins in combination with chemotherapy. In addition, interleukins are being investigated for their role as growth factors for treating myelosuppression after the use of some forms of chemotherapy.

HEMATOPOIETIC GROWTH FACTORS (COLONY-STIMULATING FACTORS)

Hematopoietic growth factors, also known as colony-stimulating factors, are hormone-like substances naturally produced by cells within the immune system. Hematopoietic growth factors of different types regulate the production of all cells in the blood, including neutrophils, macrophages, monocytes, red blood cells, and platelets. FDA approval of GM-CSF, G-CSF, IL-11, and EPO (Epogen) has contributed significantly to the supportive care of patients with cancer.

Although these agents do not treat the underlying malignancy, they do target the effects of myelotoxic cancer therapies

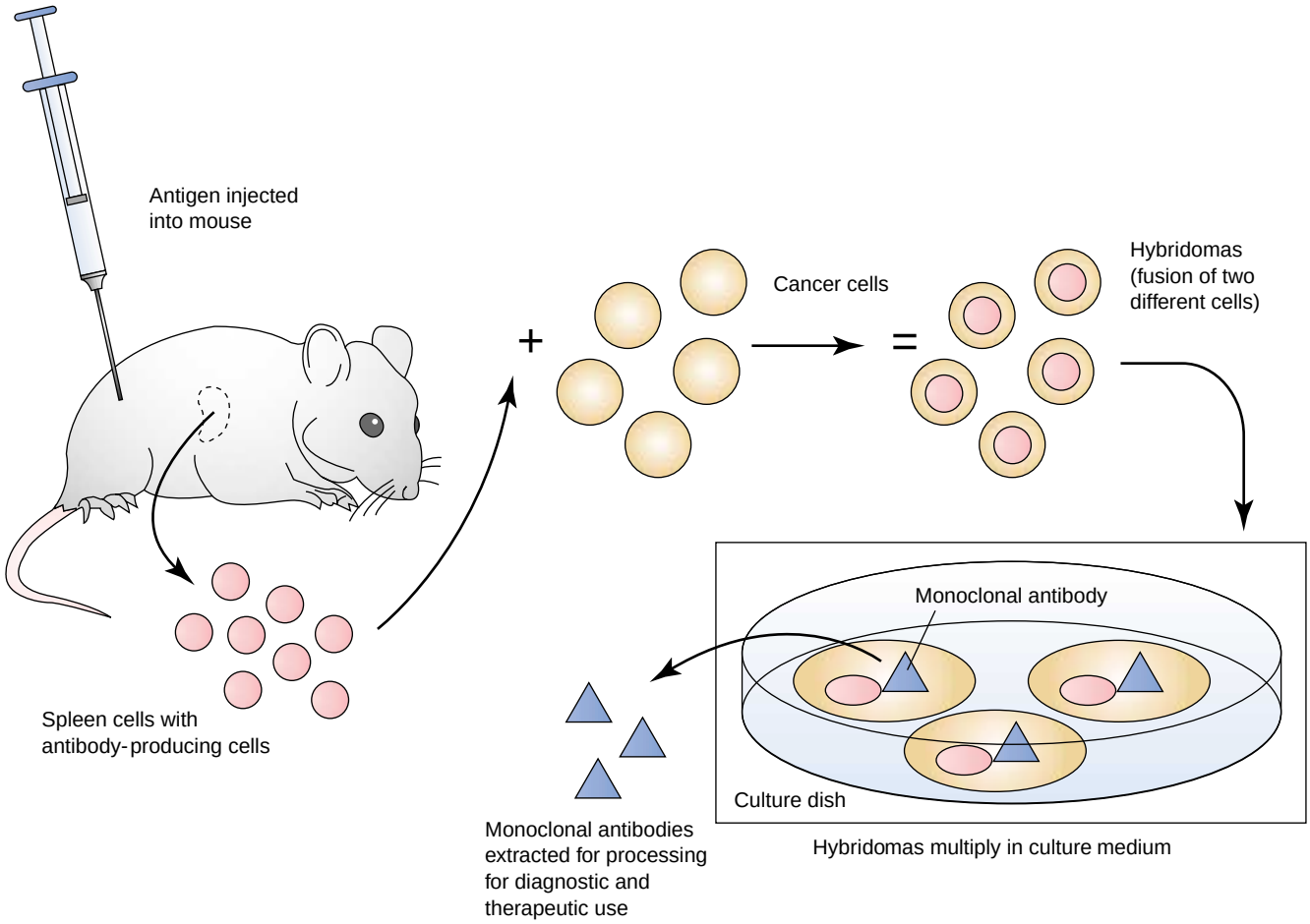

FIGURE 16-5 Antibody-producing spleen cells are fused with cancer cells. This process produces cells called hybridomas. These cells, which can grow indefinitely in a culture medium, produce antibodies that are harvested, purified, and prepared for diagnostic or treatment purposes.

(adversely affecting the bone marrow), such as radiation and chemotherapy. Previously, the myelotoxic or bone marrow suppressive effects of chemotherapy had imposed limits on some chemotherapy agents and contributed to the development of life-threatening infections.

GM-CSF is used to treat the **neutropenia** (decreased numbers of neutrophils in the blood) associated with BMT. G-CSF is used to treat neutropenia associated with chemotherapy for solid tumor malignancies. IL-11 is used to prevent severe thrombocytopenia and reduce the need for platelet transfusions in patients following myelosuppressive therapy for nonmyeloid cancers. EPO is used to treat anemia in cancer patients as well as in patients with chronic renal disease and in patients with HIV infection with zidovudine-induced anemia. Other growth factors, such as macrophage colony-stimulating factor and IL-3, are being investigated.

TUMOR NECROSIS FACTOR

TNF is a cytokine naturally produced by macrophages, lymphocytes, astrocytes, and microglial cells of the brain. The exact role of TNF is still under investigation. In vitro studies have shown TNF to stimulate other cells of the immune response; in animal studies it has been shown to have direct tumor-killing activity. Clinical trials using systemic TNF have been halted because of severe toxicities (Pazadur, Coia, Hoskins & Wagman, 2001). Current clinical trials are examining local administration of TNF for patients with sarcomas and melanomas of the extremities.

Retinoids

Retinoids are vitamin A derivatives (retinol, all-*trans*-retinoic acid, and 13-*cis*-retinoic acid) that play a role in growth, reproduction, epithelial cell differentiation, and immune function. All-*trans*-retinoic acid (tretinoin) has been granted FDA approval for treating acute promyelocytic leukemia, a rare form of leukemia. Retinoids are being tested for treating both hematologic cancers and solid tumors and for preventing a variety of cancers (Evans & Kaye, 1999; Kelloff, 2000; Kurie, 1999).

Nursing Management in Biologic Response Modifier Therapy

Patients receiving BRM therapy have many of the same needs as cancer patients undergoing other treatment approaches. However, some BRM therapies are still investigational and considered a last-chance effort by many patients who have not responded to standard treatments. Consequently, it is essential that the nurse assess the need for education, support, and guidance for both

the patient and family and assist in planning and evaluating patient care.

MONITORING THERAPEUTIC AND ADVERSE EFFECTS

Nurses need to be familiar with each agent given and the potential effects (Table 16-7). Adverse effects, such as fever, myalgia, nausea, and vomiting, as seen with IFN therapy, may not be life-threatening. However, nurses must be aware of the impact of these side effects on the patient's quality of life. Other life-threatening adverse effects (eg, capillary leak syndrome, pulmonary edema, and hypotension) may occur with IL-2 therapy. Nurses must work closely with physicians to assess and manage potential toxicities of BRM therapy. Because of the investigational nature of many of these agents, the nurse will be administering them in a research setting. Accurate observations and careful documentation are essential components of patient assessment and data collection.

PROMOTING HOME AND COMMUNITY-BASED CARE

Teaching Patients Self-Care. Some BRMs, such as IFN, EPO, and G-CSF, can be administered by the patient or family in the home. Nurses teach patients and families, as needed, how to administer these agents through subcutaneous injections. Further, they provide instructions about side effects and assist patients and families to identify strategies to manage many of the common side effects of BRM therapy, such as fatigue, anorexia, and flu-like symptoms.

Continuing Care. Referral for home care is usually indicated to monitor the patient's responses to treatment and continue and reinforce teaching. During home visits, the nurse assesses the patient's and family's technique in administering medications. The nurse collaborates with physicians, third-party payors, and pharmaceutical companies to help patients obtain reimbursement for home administration of BRM therapies. The nurse also reminds

Table 16-7 • Side Effects of FDA-Approved Biologic Response Modifiers

AGENT	SELECTED SIDE EFFECTS
Monoclonal Antibodies	
Rituximab	Allergic/anaphylactic reactions; fever; chills; nausea; headache; abdominal pain; decreased lymphocyte, white blood cell, platelet, and red blood cell counts; back pain; night sweats; itching; cough; infection
Trastuzumab	Allergic/anaphylactic reactions, hypotension, fever, chills, heart failure, stroke, diarrhea, infection, rash, nausea, vomiting, anorexia, insomnia, dizziness, headache, chills, back pain, weakness, rhinitis, pharyngitis, cough
Gemtuzumab	Allergic/anaphylactic reactions; fever; chills; weakness; abdominal pain; headache; dyspnea; epistaxis; cough; tachycardia; hemorrhage; local skin reaction; rash; petechiae; peripheral edema; nausea; vomiting; diarrhea; anorexia; stomatitis; constipation; indigestion; dizziness; decreased platelet, white and red blood cell counts; increased bilirubin, potassium, and LDH values
Alemtuzumab	Allergic/anaphylactic reactions, fever, chills, rash, hives, itching, sweating, nausea, vomiting, diarrhea, stomatitis, abdominal pain, indigestion, infection, headache, dizziness, muscle pain, insomnia, dyspnea, cough, bronchitis/pneumonitis, pharyngitis, fatigue, skeletal pain, anorexia, weakness, peripheral edema, decreased white, platelet, and red blood cell counts
Ibritumomab	Decreased platelets, white blood cell and red blood cell counts, weakness, chills, abdominal pain, fever, difficulty breathing, nausea and vomiting
Cytokines	
Interferon alfa	Flu-like symptoms (fever, chills, weakness, muscle and joint pain, headaches); fatigue; anorexia; mental status changes; rash; pruritus; hair loss; abdominal pain; nausea; constipation; diarrhea; irritation at the injection site; depression; irritability; insomnia; cough; decreased white blood cell, red blood cell, and platelet counts; abnormal liver function values
Interleukin-2	Flu-like symptoms (fever, chills, weakness, muscle and joint pain, headaches); fatigue; anorexia; nausea; vomiting; diarrhea; capillary leak syndrome; edema and fluid retention; hypotension; tachycardia; skin rash; erythema; desquamation; irritation at the injection site; weight gain during therapy due to fluid retention; weight loss after therapy related to anorexia with long-term therapy; decreased white blood cell, red blood cell, and platelet counts; abnormal liver function values
Filgrastim (granulocyte growth factor)	Bone pain, malaise, fever, fatigue, headache, skin rash, weakness
Sargranstim (granulocyte-macrophage growth factor)	Allergic/anaphylactic reaction with first dose, bone pain, fever, fatigue, headache, weakness, chills, skin rash, infection
Epoetin alfa (erythrocyte growth factor)	Fever, fatigue, weakness, bone pain, diarrhea, dizziness, nausea, edema, shortness of breath
Oprelvekin (platelet growth factor)	Edema, fever, headache, rash, chills, bone pain, fatigue, nausea, vomiting, abdominal pain, constipation, rhinitis, cough, arrhythmia, skin discoloration, bleeding, dehydration, amblyopia, dermatitis
Retinoids	
Retinoic acid	Headache, fever, skin and mucous membrane dryness, bone pain, nausea and vomiting, dyspnea, pleural and pericardial effusions, malaise, chills, bleeding, heart failure, mental status changes, depression, abnormal liver function tests

patients about the importance of keeping follow-up appointments with the physician and assesses the patient's need for changes in care.

PHOTODYNAMIC THERAPY

Photodynamic therapy, or phototherapy, is an investigational cancer treatment that uses photosensitizing agents, such as porfimer (Photofrin). When administered intravenously, these agents are retained in higher concentrations in malignant tissue than in normal tissue. They are then activated by a light source, usually laser light, which penetrates body tissue. The light-activated agent then creates activated singlet oxygen molecules that are cytotoxic or harmful to body tissue cells. Because most of the photosensitizing agent has been retained in malignant tissue, a selective cytotoxicity can be achieved with minimal destruction to normal tissues.

Cancers treated with phototherapy include esophageal cancers, endobronchial tumors, skin cancers, breast cancers, intraperitoneal tumors, and malignant central nervous system disease. The major side effect of therapy is photosensitivity for 4 to 6 weeks after treatment. Patients must protect themselves from direct and indirect sunlight to prevent skin burns. In addition, local reactions are observed in the area treated. Liver and renal function should also be monitored for transient abnormalities. As with any investigational treatment, emotional support and education are vital to assist the patient and family.

GENE THERAPY

As early as 1914, the somatic mutation theory of cancer suggested that cancer develops as a result of inherited or acquired genetic mutations that lead to a disturbance in the normal chromosomal balance regulating cell growth and reproduction. Technological advances and information gained through intense study of genetics have assisted researchers and clinicians in predicting, diagnosing, and treating cancer. Gene therapy includes approaches that correct genetic defects or manipulate genes to induce tumor cell destruction in the hope of preventing or combating disease. Somatic cell (any cell not contained in an embryo or destined to become an egg or sperm) gene therapy is the only publicly funded form of gene therapy in the United States. This type of therapy involves the insertion of a desired gene into the targeted cells. Human germ cell manipulation is considered by many to be controversial and a potential source of bioethical concerns (Frankel & Chapman, 2000).

Although gene therapy is currently investigational, researchers predict it will have a profound impact on medical and health care in the 21st century. More than 100 clinical trials for gene therapy in treating cancer have been initiated. An example of one such trial involves inserting the p53 tumor suppressor gene into cancer cells. Normally this gene is responsible for repairing damaged cells or causing cell death when the cell cannot be repaired. Many types of cancer cells have mutated p53 genes that then lead to uncontrolled cell growth. Insertion of normal p53 genes can lead to either cancer cell death or slowing of tumor growth. This approach has been tested in lung, head and neck, and colon cancers (Wasil & Buchbinder, 2000). In another clinical trial, a "suicide gene" is inserted into tumor cells to facilitate cell death. When the gene for herpes simplex virus thymidine kinase is inserted into malignant cells, those cells become infected with the virus and susceptible to destruction by antiviral drugs, such as ganciclovir. This approach has been tried in treating brain, ovarian, and breast cancers (Fibison, 2000). For more information about investigational therapies, see Chart 16-4.

UNPROVEN AND UNCONVENTIONAL THERAPIES

A diagnosis of cancer evokes many emotions in patients and families, including feelings of fear, frustration, and loss of control. Despite increasing 5-year survival rates with the use of traditional methods of treatment, a significant number of patients use or seriously consider using some form of unconventional treatment. Hopelessness, desperation, unmet needs, lack of factual information, and family or social pressures are major factors that motivate patients to seek unconventional methods of treatment and allow them to fall prey to deceptive practices and quackery. Although research is scant and accuracy of reporting may be questionable, it is estimated that 30% to 50% of patients with cancer may be using a complementary or alternative method of treatment.

Caring for patients who choose unconventional methods may place members of the health care team in difficult situations professionally, legally, and ethically. Nurses must keep in mind those ethical principles that help guide professional practice, such as autonomy, beneficence, nonmaleficence, and justice.

Unconventional treatments have not demonstrated scientifically, in an objective, reproducible method, the ability to cure or control cancer. In addition to being ineffective, some unconventional treatments may also be harmful to patients and may cost thousands of dollars. Most unproven cancer treatments can be categorized as machines and devices, drugs and biologicals, metabolic and dietary regimens, or mystical and spiritual approaches.

Machines and Devices

Electrical gadgets and devices are commonly reputed to cure cancers. Most are operated by people with questionable training who report unrealistic and unlikely success stories. Such machines are often decorated with elaborate lights and dials and produce vibrations or other sensations.

Drugs and Biologicals

Medicinal agents, herbs, proteins (such as shark cartilage), megavitamins (including vitamin C therapy), immune therapy, vaccines, enzymes, hydrogen peroxide, and sera have been frequent components of fraudulent cancer therapy. These agents have included oral, intravenous, and external medications derived from weeds, flowers, and herbs and the blood and urine of patients and animals. Many of these agents, especially in megadoses, can be toxic and can have untoward interactions with concomitant medications. Herbs commonly used by individuals with cancer include echinacea, essiac, ginseng, green tea, pau d'arco, and hoxsey (Montbriand, 1999). Many of these treatments are costly.

Metabolic and Dietary Regimens

Metabolic and dietary regimens emphasize the ingestion of only natural substances to purify the body and retard cancerous growth. These regimens include the grape diet, the carrot juice diet, garlic, onions, various teas, coffee enemas, and raw liver intake. Laetrile (vitamin B, amygdalin), one of the best-known forms of cancer quackery, was advocated as an agent to kill

tumor cells by releasing cyanide, which is especially toxic to malignant cells. The National Cancer Institute, in response to public demand, investigated the effects of laetrile and reported no therapeutic benefits with its use; indeed, many toxic effects (cyanide poisoning, fever, rash, headache, vomiting, diarrhea, and hypotension) were reported. Macrobiotic diets have also been advocated as a cancer treatment to reestablish balance between the major forces in the universe, yin and yang. People who adhere to macrobiotic diets tend to develop vitamin, mineral, and protein deficiencies; experience additional weight loss due to decreased calorie intake; and receive no therapeutic benefits from the diet.

Mystical and Spiritual Approaches

Traditional Chinese medicine attempts to balance chi forces in order to heal the body. Mystical or spiritual approaches to cancer therapy include such techniques as psychic surgery, faith healing, "laying on of hands," prayer groups, and invocation of mystical universal powers to kill cancerous growths. These techniques are difficult to disclaim because they are based on faith.

Nursing Management in Unconventional Therapies

A trusting relationship, supportive care, and promotion of hope in the patient and family are the most effective means of protecting them from fraudulent therapy and questionable cancer cures. Truthful responses given in a nonjudgmental manner to questions and inquiries about unproven methods of cancer treatments may alleviate the fear and guilt on the part of the patient and family that they are not "doing everything we can" to obtain a cure. The nurse may inform the patient and family of the characteristics common to fraudulent therapy so that they will be informed and cautious when evaluating other forms of "therapy." The nurse should encourage any patient who uses unconventional therapies to inform the physician about such use. Knowing this information can help prevent interactions with medications and other therapies that may be prescribed and avoid attributing the side effects of unconventional therapies to prescribed medications.

NURSING PROCESS: THE PATIENT WITH CANCER

The outlook for patients with cancer has greatly improved because of scientific and technological advances. As a result of the underlying disease or various treatment modalities, however, the patient with cancer may experience a variety of secondary problems, such as infection, reduced WBC counts, bleeding, skin problems, nutritional problems, pain, fatigue, and psychological stress.

Assessment

Regardless of the type of cancer treatment or prognosis, many patients with cancer are susceptible to the following problems and complications. An important role of the nurse on the oncology team is to assess the patient for these problems and complications.

INFECTION

In all stages of cancer, the nurse assesses factors that can promote infection. Infection is the leading cause of death in cancer patients. Factors predisposing patients to infection are summarized in Table 16-8. The nurse monitors laboratory studies to detect early changes in WBC counts. Common sites of infection, such as the pharynx, skin, perianal area, urinary tract, and respiratory tract, are assessed frequently. The typical signs of infection (swelling, redness, drainage, and pain), however, may not occur in the immunosuppressed patient due to a diminished local inflammatory response. Fever may be the only sign of infection that the patient exhibits. The nurse also monitors the patient for sepsis, particularly if invasive catheters or infusion lines are in place.

WBC function is often impaired in cancer patients. A decrease in circulating WBCs is referred to as leukopenia or granulocytopenia. There are three types of WBCs: neutrophils, basophils, and eosinophils. The neutrophils, totaling 60% to 70% of all the body's WBCs, play a major role in combating infection by engulfing and destroying infective agents in a process called phagocytosis. Both the total WBC count and the concentration of neutrophils are important in determining the patient's ability to fight infection.

A differential WBC count identifies the relative numbers of WBCs and permits tabulation of polymorphonuclear neutrophils (mature neutrophils, reported as "polys," PMNs, or "segs") and immature forms of neutrophils (reported as bands, metamyelocytes, and "stabs"). These numbers are compiled and reported as the absolute neutrophil count (ANC). The ANC is calculated by the following formula:

$$\text{ANC} = \frac{(\text{Total WBC count} \times [\%\ \text{segmented neutrophils} + \%\ \text{bands}])}{100}$$

For example, if the patient's total WBC count is 6,000, with segmented neutrophils 25% and bands 25%, the ANC would be 3,000.

Neutropenia, an abnormally low ANC, is associated with an increased risk for infection. The risk for infection rises as the ANC decreases and persists. An ANC of less than 1,000 cells/mm^3 reflects a severe risk for infection. **Nadir** is the lowest ANC after myelosuppressive chemotherapy or radiation therapy. Therapies that suppress bone marrow function are called myelosuppressive. Febrile patients who are neutropenic are assessed for infection through cultures of blood, sputum, urine, stool, catheter, or wounds, if appropriate. In addition, a chest x-ray is often included to assess for pulmonary infections.

BLEEDING

The nurse assesses cancer patients for factors that may contribute to bleeding. These include bone marrow suppression from radiation, chemotherapy, and other medications that interfere with coagulation and platelet functioning, such as aspirin, dipyridamole (Persantine), heparin, or warfarin (Coumadin). Common bleeding sites include skin and mucous membranes; the intestinal, urinary, and respiratory tracts; and the brain. Gross hemorrhage, as well as blood in the stools, urine, sputum, or vomitus (melena, hematuria, hemoptysis, hematemesis), oozing at injection sites, bruising (ecchymosis), petechiae, and changes in mental status, are monitored and reported.

SKIN PROBLEMS

The integrity of skin and tissue is at risk in cancer patients because of the effects of chemotherapy, radiation therapy, surgery, and invasive procedures carried out for diagnosis and therapy. As part of the assessment, the nurse identifies which of these predisposing factors are present and assesses the patient for other risk factors, including nutritional deficits, bowel and bladder incontinence, immobility, immunosuppression, multiple skin folds,

Table 16-8 • Factors Predisposing Cancer Patients to Infection

FACTORS	UNDERLYING MECHANISMS
1. Impaired skin and mucous membrane integrity	• Loss of body's first line of defense against invading organisms.
2. Chemotherapy	• Many agents cause suppression of bone marrow, resulting in decreased production and function of white blood cells. Chemotherapy agents that cause mucositis impair skin and mucous membrane integrity. Organ damage associated with certain agents may also predispose patients to infection. Organ damage such as pulmonary fibrosis or cardiomyopathy that is associated with certain agents may also predispose patients to infection.
3. Radiation therapy	• Radiation involving sites of bone marrow production may result in bone marrow suppression. May also lead to impaired tissue integrity.
4. Biologic response modifiers	• Some biologic response modifiers may cause bone marrow suppression and organ dysfunction.
5. Malignancy	• Malignant cells may infiltrate the bone marrow and interfere with production of white blood cells and lymphocytes. Hematologic malignancies (leukemias and lymphomas) are associated with impaired function and production of blood cells.
6. Malnutrition	• Results in impaired function and production of cells of the immune response. May contribute to impaired skin integrity.
7. Medications	• Antibiotics disturb the balance of normal flora, allowing them to become pathogenic. This process occurs most commonly in the gastrointestinal tract. Corticosteroids and nonsteroidal anti-inflammatory drugs mask inflammatory responses.
8. Urinary catheter	• Creates port and mechanism of entry for organisms.
9. Intravenous catheter	• Results in impaired skin integrity and site of entry for organisms.
10. Other invasive procedures (surgery, paracentesis, thoracentesis, drainage tubes, endoscopies, mechanical ventilation)	• Creates port of entry and possible introduction of exogenous organisms into the system.
11. Contaminated equipment	• Environmental objects such as stagnant water in oxygen equipment are associated with growth of microorganisms.
12. Age	• Increasing age associated with declining organ function. Also associated with decreased production and functioning of the cells of the immune system.
13. Chronic illness	• Associated with impaired organ function and altered immune responses.
14. Prolonged hospitalization	• Allows increased exposure to nosocomial infection and colonization of new organisms.

and changes related to aging. Skin lesions or ulcerations secondary to the tumor are noted. Alterations in tissue integrity throughout the gastrointestinal tract are particularly bothersome to the patient. Any lesions of the oral mucous membranes are noted, as are their effects on the patient's nutritional status and comfort level.

HAIR LOSS

Alopecia (hair loss) is another form of tissue disruption common to cancer patients who receive radiation therapy or chemotherapy. In addition to noting hair loss, the nurse also assesses the psychological impact of this side effect on the patient and the family.

NUTRITIONAL CONCERNS

Assessing the patient's nutritional status is an important nursing role. Impaired nutritional status may contribute to disease progression, immune incompetence, increased incidence of infection, delayed tissue repair, diminished functional ability, and decreased capacity to continue antineoplastic therapy. Altered nutritional status, weight loss, and cachexia (muscle wasting, emaciation) may be secondary to decreased protein and caloric intake, metabolic or mechanical effects of the cancer, systemic disease, side effects of the treatment, or the emotional status of the patient.

The patient's weight and caloric intake are monitored on a consistent basis. Other information obtained through assessment includes diet history, any episodes of anorexia, changes in appetite, situations and foods that aggravate or relieve anorexia, and medication history. Difficulty in chewing or swallowing is determined and the occurrence of nausea, vomiting, or diarrhea is noted.

Clinical and laboratory data useful in assessing the patient's nutritional status include anthropometric measurements (triceps skin fold and middle-upper arm circumference), serum protein levels (albumin and transferrin), serum electrolytes, lymphocyte count, skin response to intradermal injection of antigens, hemoglobin levels, hematocrit, urinary creatinine levels, and serum iron levels.

PAIN

Pain and discomfort in cancer may be related to the underlying disease, pressure exerted by the tumor, diagnostic procedures, or the cancer treatment itself. As in any other situation involving pain, cancer pain is affected by both physical and psychosocial influences.

In addition to assessing the source and site of pain, the nurse also assesses those factors that increase the patient's perception of pain, such as fear and apprehension, fatigue, anger, and social isolation. Pain assessment scales (see Chap. 13) are useful in assess-

ing the patient's pain level before pain-relieving interventions are instituted and in evaluating their effectiveness.

FATIGUE

Acute fatigue, which occurs after an energy-demanding experience, serves a protective function; chronic fatigue, however, does not. It is often overwhelming, excessive, and not responsive to rest, and it seriously affects quality of life. Fatigue is the most commonly reported side effect in patients who receive chemotherapy and radiation therapy. The nurse assesses for feelings of weariness, weakness, lack of energy, inability to carry out necessary and valued daily functions, lack of motivation, and inability to concentrate. Patients may become less verbal and appear pallid, with relaxed facial musculature. The nurse assesses physiologic and psychological stressors that can contribute to fatigue, including pain, nausea, dyspnea, constipation, fear, and anxiety. (See Nursing Research Profile 16-2.)

PSYCHOSOCIAL STATUS

Nursing assessment also focuses on the patient's psychological and mental status as the patient and the family face this life-threatening experience, unpleasant diagnostic tests and treatment modalities, and progression of disease. The patient's mood and emotional reaction to the results of diagnostic testing and prognosis are assessed, along with evidence that the patient is progressing through the stages of grief and can talk about the diagnosis and prognosis with the family.

BODY IMAGE

Cancer patients are forced to cope with many assaults to body image throughout the course of disease and treatment. Entry into the health care system is often accompanied by depersonalization. Threats to self-concept are enormous as patients face the realization of illness, possible disability, and death. To accommodate treatments or because of the disease, many cancer patients are forced to alter their lifestyles. Priorities and values change when body image is threatened. Disfiguring surgery, hair loss, cachexia, skin changes, altered communication patterns, and sexual dysfunction are some of the devastating results of cancer and its treatment that threaten the patient's self-esteem and body image. The nurse identifies these potential threats and assesses the patient's ability to cope with these changes.

Diagnosis

NURSING DIAGNOSES

Based on the assessment data, nursing diagnoses of the patient with cancer may include the following:

- Impaired oral mucous membrane
- Impaired tissue integrity
- Impaired tissue integrity: alopecia
- Impaired tissue integrity: malignant skin lesions
- Imbalanced nutrition, less than body requirements
- Anorexia
- Malabsorption
- Cachexia
- Chronic pain
- Fatigue
- Disturbed body image
- Anticipatory grieving

NURSING RESEARCH PROFILE 16-2
Cancer-Related Fatigue

Berger, A. M., & Farr, L. (1999). The influence of daytime inactivity and nighttime restlessness on cancer-related fatigue. *Oncology Nursing Forum, 26*(10), 1663–1671.

Purpose

Negative, long-term consequences of chemotherapy, including fatigue, have been reported. Many women report fatigue during and following breast cancer treatment; however, perceptions of fatigue have not been objectively quantified. The purpose of this study was to identify relationships between circadian activity/rest indicators and fatigue experienced by women during the first three chemotherapy cycles for stage I/II breast cancer.

Study Sample and Design

A prospective, descriptive, repeated-measures study was conducted over a 12-month period. Seventy-two participants were recruited for the study; 12 withdrew, leaving a sample of 60 women. To be eligible for the study, women had to be 33 to 69 years of age, diagnosed for the first time with stage I/II breast cancer, scheduled to begin one of three intravenous chemotherapy regimens following recent modified radical mastectomy or breast-conservation surgery, English-speaking, and able to complete the research instruments.

A wrist actigraph was used for continuous monitoring of body movement over time, providing data for analysis of circadian activity/rest cycles; relative activity within days and across days; and the timing, duration, and disruption of sleep. Data were collected for 96 hours at the start of each treatment and for 72 hours at the midpoint of each chemotherapy cycle. Data from the actigraph were downloaded to a software program. The Piper Fatigue scale was used to measure participants' subjective perception of fatigue shortly after each chemotherapy treatment and on the midpoint days of each cycle coinciding with the actigraph measurements.

Findings

Analysis of data revealed that participants who were less active during the day and had more nighttime awakenings consistently reported higher levels of cancer-related fatigue (CRF) at the midpoint of each chemotherapy cycle. The number of night awakenings had the strongest association with CRF. Decreased daytime activity and nighttime restlessness were associated with higher CRF. Participants who were more active maintained more distinctive circadian activity/rest rhythms.

Nursing Implications

The findings of this study demonstrate that women whose sleep is disrupted at midpoints of chemotherapy cycles are at risk for CRF. Higher CRF levels are associated with the cumulative effects of less daytime activity, more daytime sleep, and night awakenings. Sedentary lifestyles in response to fatigue result, in turn, in increased fatigue. These findings suggest the need to assist women with developing a balance of activity and rest; advising women to "take it easy" during chemotherapy may result in decreased activity and increased fatigue.

COLLABORATIVE PROBLEMS/ POTENTIAL COMPLICATIONS

Based on the assessment data, potential complications that may develop include the following:

- Infection and sepsis
- Hemorrhage
- Superior vena cava syndrome
- Spinal cord compression
- Hypercalcemia
- Pericardial effusion

- Disseminated intravascular coagulation
- Syndrome of inappropriate secretion of antidiuretic hormone
- Tumor lysis syndrome

See the later section, Oncologic Emergencies, for more information.

Planning and Goals

The major goals for the patient may include management of stomatitis, maintenance of tissue integrity, maintenance of nutrition, relief of pain, relief of fatigue, improved body image, effective progression through the grieving process, and absence of complications.

Nursing Interventions

The patient with cancer is at risk for various adverse effects of therapy and complications. The nurse in all health care settings, including the home, assists the patient and family in managing these problems.

MANAGING STOMATITIS

Stomatitis, an inflammatory response of the oral tissues, commonly develops within 5 to 14 days after the patient receives certain chemotherapeutic agents, such as doxorubicin and 5-fluorouracil, and BRMs, such as IL-2 and IFN. As many as 40% of patients receiving chemotherapy experience some degree of stomatitis during treatment. Patients receiving dose-intensive chemotherapy (considerably higher doses than conventional dosing), such as those undergoing BMT, are at increased risk for stomatitis. Stomatitis may also occur with radiation to the head and neck. Stomatitis is characterized by mild redness (erythema) and edema or, if severe, by painful ulcerations, bleeding, and secondary infection. In severe cases of stomatitis, cancer therapy may be temporarily halted until the inflammation decreases.

As a result of normal everyday wear and tear, the epithelial cells that line the oral cavity undergo rapid turnover and slough off routinely. Chemotherapy and radiation interfere with the body's ability to replace those cells. An inflammatory response develops as denuded areas appear in the oral cavity. Poor oral hygiene, existing dental disease, use of other medications that dry mucous membranes, and impaired nutritional status contribute to morbidity associated with stomatitis. Radiation-induced xerostomia (dry mouth) associated with decreased function of the salivary glands may contribute to stomatitis in patients who have received radiation to the head and neck.

Myelosuppression (bone marrow depression) resulting from underlying disease or its treatment predisposes the patient to oral bleeding and infection. Pain associated with ulcerated oral tissues can significantly interfere with nutritional intake, speech, and a willingness to maintain oral hygiene.

Although multiple studies on stomatitis have been published, the optimal prevention and treatment approaches have not been identified. However, most clinicians agree that good oral hygiene that includes brushing, flossing, and rinsing is necessary to minimize the risk for oral complications associated with cancer therapies. Soft-bristled toothbrushes and nonabrasive toothpaste prevent or reduce trauma to the oral mucosa. Oral swabs with spongelike applicators may be used in place of a toothbrush for painful oral tissues. Flossing may be performed unless it causes pain or unless platelet levels are below 40,000/mm^3 (0.04×10^{12}/L). Oral rinses with saline solution or tap water may be necessary for patients who cannot tolerate a toothbrush. Products that irritate oral tissues or impair healing, such as alcohol-based mouth rinses, are avoided. Foods that are difficult to chew or are hot or spicy are avoided to minimize further trauma. The patient's lips are lubricated to keep them from becoming dry and cracked. Topical anti-inflammatory and anesthetic agents may be prescribed to promote healing and minimize discomfort. Products that coat or protect oral mucosa are used to promote comfort and prevent further trauma. The patient who experiences severe pain and discomfort with stomatitis requires systemic analgesics.

Adequate fluid and food intake is encouraged. In some instances, parenteral hydration and nutrition are needed. Topical or systemic antifungal and antibiotic medications are prescribed to treat local or systemic infections.

MAINTAINING TISSUE INTEGRITY

Some of the most frequently encountered disturbances of tissue integrity, in addition to stomatitis, include skin and tissue reactions to radiation therapy, alopecia, and metastatic skin lesions.

The patient who is experiencing skin and tissue reactions to radiation therapy requires careful skin care to prevent further skin irritation, drying, and damage. The skin over the affected area is handled gently; rubbing and use of hot or cold water, soaps, powders, lotions, and cosmetics are avoided. The patient may avoid tissue injury by wearing loose-fitting clothes and avoiding clothes that constrict, irritate, or rub the affected area. If blistering occurs, care is taken not to disrupt the blisters, thus reducing the risk of introducing bacteria. Moisture- and vapor-permeable dressings, such as hydrocolloids and hydrogels, are helpful in promoting healing and reducing pain. Aseptic wound care is indicated to minimize the risk for infection and sepsis. Topical antibiotics, such as 1% silver sulfadiazine cream (Silvadene), may be prescribed for use on areas of moist desquamation (painful, red, moist skin).

ASSISTING PATIENTS TO COPE WITH ALOPECIA

The temporary or permanent thinning or complete loss of hair is a potential adverse effect of various radiation therapies and chemotherapeutic agents. The extent of alopecia depends on the dose and duration of therapy. These treatments cause alopecia by damaging stem cells and hair follicles. As a result, the hair is brittle and may fall out or break off at the surface of the scalp. Loss of other body hair is less frequent. Hair loss usually begins within 2 to 3 weeks after the initiation of treatment; regrowth begins within 8 weeks after the last treatment. Some patients who undergo radiation to the head may sustain permanent hair loss. Many health care providers view hair loss as a minor problem when compared with the potentially life-threatening consequences of cancer. For many patients, however, hair loss is a major assault on body image, resulting in depression, anxiety, anger, rejection, and isolation. To patients and families, hair loss can serve as a constant reminder of the challenges cancer places on their coping abilities, interpersonal relationships, and sexuality.

The nurse's role is to provide information about alopecia and to support the patient and family in coping with disturbing effects of therapy, such as hair loss and changes in body image. Patients are encouraged to acquire a wig or hairpiece before hair loss occurs so that the replacement matches their own hair. Use of attractive scarves and hats may make the patient feel less conspicuous. Nurses can refer patients to supportive programs, such as "Look Good, Feel Better," offered by the American Cancer Soci-

ety. Knowledge that hair usually begins to regrow after completing therapy may comfort some patients, although the color and texture of the new hair may be different.

MANAGING MALIGNANT SKIN LESIONS

Skin lesions may occur with local extension of the tumor or embolization of the tumor into the epithelium and its surrounding lymph and blood vessels. Secondary growth of cancer cells into the skin may result in redness (erythematous areas) or can progress to wounds involving tissue necrosis and infection. The most extensive lesions tend to disintegrate and are purulent and malodorous. In addition, these lesions are a source of considerable pain and discomfort. Although this type of lesion is most often associated with breast cancer and head and neck cancers, it can also occur with lymphoma, leukemia, melanoma, and cancers of the lung, uterus, kidney, colon, and bladder. The development of severe skin lesions is usually associated with a poor prognosis for extended survival.

Ulcerating skin lesions usually indicate widely disseminated disease unlikely to be eradicated. Managing these lesions becomes a nursing priority. Nursing care includes carefully assessing and cleansing the skin, reducing superficial bacteria, controlling bleeding, reducing odor, and protecting the skin from pain and further trauma. The patient and family require assistance and guidance to care for these skin lesions at home. Referral for home care is indicated.

PROMOTING NUTRITION

Most cancer patients experience some weight loss during their illness. Anorexia, malabsorption, and cachexia are examples of nutritional problems that commonly occur in cancer patients; special attention is needed to prevent weight loss and promote nutrition.

Anorexia

Among the many causes of anorexia in the cancer patient are alterations in taste, manifested by increased salty, sour, and metallic taste sensations, and altered responses to sweet and bitter flavors, leading to decreased appetite, decreased nutritional intake, and protein-calorie malnutrition. Taste alterations may result from mineral (eg, zinc) deficiencies, increases in circulating amino acids and cellular metabolites, or the administration of chemotherapeutic agents. Patients undergoing radiation therapy to the head and neck may experience "mouth blindness," which is a severe impairment of taste.

Alterations in the sense of smell also alter taste; this is a common experience of patients with head and neck cancers. Anorexia may occur because the person feels full after eating only a small amount of food. This sense of fullness occurs secondary to a decrease in digestive enzymes, abnormalities in the metabolism of glucose and triglycerides, and prolonged stimulation of gastric volume receptors, which convey the feeling of being full. Psychological distress, such as fear, pain, depression, and isolation, throughout illness may also have a negative impact on appetite. The person may develop an aversion to food because of nausea and vomiting after treatment.

Malabsorption

Many cancer patients are unable to absorb nutrients from the gastrointestinal system as a result of tumor activity and cancer treatment. Tumors can affect the gastrointestinal activity in several ways. They may impair enzyme production or produce fistulas. They secrete hormones and enzymes, such as gastrin; this leads to increased gastrointestinal irritation, peptic ulcer disease, and decreased fat digestion. They also interfere with protein digestion.

Chemotherapy and radiation can irritate and damage mucosal cells of the bowel, inhibiting absorption. Radiation therapy can cause sclerosis of the blood vessels in the bowel and fibrotic changes in the gastrointestinal tissue. Surgical intervention may change peristaltic patterns, alter gastrointestinal secretions, and reduce the absorptive surfaces of the gastrointestinal mucosa, all leading to malabsorption.

Cachexia

Cachexia is common in patients with cancer, especially in advanced disease. Cancer cachexia is related to inadequate nutritional intake along with increasing metabolic demand, increased energy expenditure due to anaerobic metabolism of the tumor, impaired glucose metabolism, competition of the tumor cells for nutrients, altered lipid metabolism, and a suppressed appetite. It is characterized by loss of body weight, adipose tissue, visceral protein, and skeletal muscle. Patients who are cachectic complain of loss of appetite, early satiety, and fatigue. As a result of protein losses they are often anemic and have peripheral edema.

General Nutritional Considerations

Whenever possible, every effort is used to maintain adequate nutrition through the oral route. Food should be prepared in ways that make it appealing. Unpleasant smells and unappetizing-looking foods are avoided. Family members are included in the plan of care to encourage adequate food intake. The patient's preferences, as well as physiologic and metabolic requirements, are considered when selecting foods. Small, frequent meals are provided, with supplements between meals. Patients often tolerate larger amounts of food earlier in the day rather than later, so meals can be planned accordingly. Patients should avoid drinking fluids while eating, to avoid early satiety. Oral hygiene before mealtime often makes meals more pleasant. Pain, nausea, and other symptoms that may interfere with nutrition are assessed and managed. Medications such as corticosteroids or progestational agents such as megestrol acetate have been used successfully as appetite stimulants.

If adequate nutrition cannot be maintained by oral intake, nutritional support via the enteral route may be necessary. Short-term nutritional supplementation may be provided through a nasogastric tube. However, if nutritional support is needed beyond several weeks, a gastrostomy or jejunostomy tube may be inserted. Patients and families are taught to administer enteral nutrition in the home setting.

If malabsorption is a problem, enzyme and vitamin replacement may be instituted. Additional strategies include changing the feeding schedule, using simple diets, and relieving diarrhea. If malabsorption is severe, parenteral nutrition (PN) may be necessary. PN can be administered in several ways: by a long-term venous access device, such as a right atrial catheter, an implanted venous port, or a peripherally inserted central catheter (Fig. 16-6). The nurse teaches the patient and family to care for venous access devices and to administer PN. Home care nurses may assist with or supervise PN in the home.

Interventions to reduce cachexia usually do not prolong survival but may improve the patient's quality of life. Before invasive nutritional strategies are instituted, the nurse should assess the patient carefully and discuss the options with the patient and family. Creative dietary therapies, enteral (tube) feedings, or PN may be necessary to ensure adequate nutrition. Nursing care is

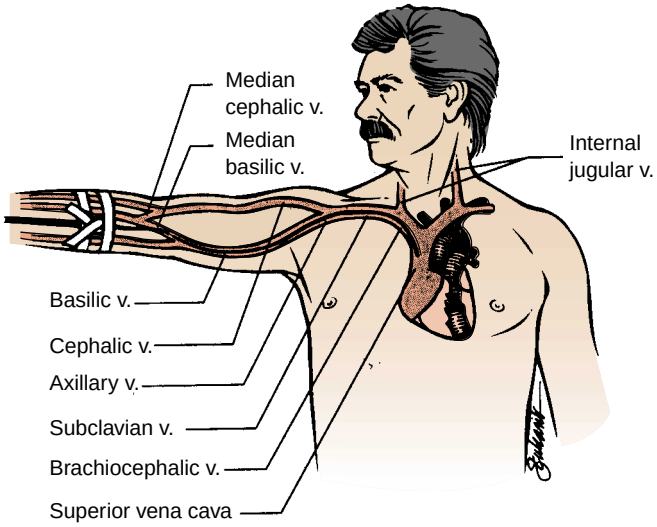

FIGURE 16-6 A peripherally inserted central catheter (PICC) is advanced through the cephalic or basilic vein to the axillary, subclavian, or brachiocephalic vein or the superior vena cava.

also directed toward preventing trauma, infection, and other complications that increase metabolic demands.

RELIEVING PAIN

Of all patients with progressive cancer, more than 75% experience pain (Yarbro, Hansen-Frogge & Goodman, 1999). Although patients with cancer may have acute pain, their pain is more frequently characterized as chronic. (For more information on cancer-related pain, see Chap. 13.) As in other situations involving pain, the experience of cancer pain is influenced by both physical and psychosocial factors.

Cancer can cause pain in various ways (Table 16-9). Pain is also associated with various cancer treatments. Acute pain is linked with trauma from surgery. Occasionally, chronic pain syndromes, such as postsurgical neuropathies (pain related to nerve tissue injury), occur. Some chemotherapeutic agents cause tissue necrosis, peripheral neuropathies, and stomatitis—all potential sources of pain—whereas radiation therapy can cause pain secondary to skin or organ inflammation. Cancer patients may have other sources of pain, such as arthritis or migraine headaches, that are unrelated to the underlying cancer or its treatment.

In today's society, most people expect pain to disappear or resolve quickly, and in fact it usually does. Although controllable, cancer pain is commonly irreversible and not quickly resolved. For many patients, pain is a signal that the tumor is growing and that death is approaching. As the patient anticipates the pain and anxiety increases, pain perception heightens, producing fear and further pain. Chronic cancer pain, then, can be best described as a cycle progressing from pain to anxiety to fear and back to pain again.

Pain tolerance, the point past which pain can no longer be tolerated, varies among people. Pain tolerance is decreased by fatigue, anxiety, fear of death, anger, powerlessness, social isolation, changes in role identity, loss of independence, and past experiences. Adequate rest and sleep, diversion, mood elevation, empathy, and medications such as antidepressants, antianxiety agents, and analgesics enhance tolerance to pain.

Inadequate pain management is most often the result of misconceptions and insufficient knowledge about pain assessment and pharmacologic interventions on the part of patients, families, and health care providers. Successful management of cancer pain is based on thorough and objective pain assessment that examines physical, psychosocial, environmental, and spiritual factors. A multidisciplinary team approach is essential to determine optimal management of the patient's pain. Unlike instances of chronic nonmalignant pain, systemic analgesics play a central role in managing cancer pain.

The World Health Organization (Dalton & Youngblood, 2000) advocates a three-step approach to treating cancer pain (see Chap. 13). Analgesics are administered based on the patient's level of pain. Nonopioid analgesics (eg, acetaminophen) are used for mild pain; weak opioid analgesics (eg, codeine) are used for moderate pain; and strong opioid analgesics (eg, morphine) are used for severe pain. If the patient's pain escalates, the strength of the analgesic medication is increased until the pain is controlled. Adjuvant medications are also administered to enhance the effectiveness of analgesics and to manage other symptoms that may contribute to the pain experience. Examples of adjuvant medications include antiemetics, antidepressants, anxiolytics, antiseizure agents, stimulants, local anesthetics, radiopharmaceuticals (radioactive agents that may be used to treat painful bone tumors), and corticosteroids.

Preventing and reducing pain help to decrease anxiety and break the pain cycle. This can be accomplished best by administering analgesics on a regularly scheduled basis as prescribed (the preventive approach to pain management), with additional analgesics administered for breakthrough pain as needed and as prescribed.

Various pharmacologic and nonpharmacologic approaches offer the best methods of managing cancer pain. No reasonable approaches, even those that may be invasive, should be over-

Table 16-9 • Sources of Cancer Pain

SOURCE	DESCRIPTIONS	UNDERLYING CANCER
Bone metastasis	Throbbing, aching	Breast, prostate, myeloma
Nerve compression, infiltration	Burning, sharp, tingling	Breast, prostate, lymphoma
Lymphatic or venous obstruction	Dull, aching, tightness	Lymphoma, breast, Kaposi's sarcoma
Ischemia	Sharp, throbbing	Kaposi's sarcoma
Organ obstruction	Dull, crampy, gnawing	Colon, gastric
Organ infiltration	Distention, crampy	Liver, pancreatic
Skin inflammation, ulceration, infection, necrosis	Burning, sharp	Breast, head and neck, Kaposi's sarcoma

looked because of a poor or terminal prognosis. Nurses help patients and families to take an active role in managing pain. Nurses provide education and support to correct fears and misconceptions about opioid use. Inadequate pain control leads to suffering, anxiety, fear, immobility, isolation, and depression. Improving a patient's quality of life is as important as preventing a painful death.

DECREASING FATIGUE

In recent years, fatigue has been recognized as one of the most significant and frequent symptoms experienced by patients receiving cancer therapy. Nurses help the patient and family to understand that fatigue is usually an expected and temporary side effect of the cancer process and of many treatments used. Fatigue also stems from the stress of coping with cancer. It does not always signify that the cancer is advancing or that the treatment is failing. Potential sources of fatigue are summarized in Chart 16-7.

Nursing strategies are implemented to minimize fatigue or assist the patient to cope with existing fatigue. Helping the patient to identify sources of fatigue aids in selecting appropriate and individualized interventions. Ways to conserve energy are developed to help the patient plan daily activities. Alternating periods of rest and activity are beneficial. Regular, light exercise may decrease fatigue and facilitate coping, whereas lack of physical activity and "too much rest" can actually contribute to deconditioning and associated fatigue.

Patients are encouraged to maintain as normal a lifestyle as possible by continuing with those activities they value and enjoy. Prioritizing necessary and valued activities can assist patients in planning for each day. Both patients and families are encouraged to plan to reallocate responsibilities, such as attending to child care, cleaning, and preparing meals. Patients who are employed full-time may need to reduce the number of hours worked each week. The nurse assists the patient and family in coping with these changing roles and responsibilities.

Nurses also address factors that contribute to fatigue and implement pharmacologic and nonpharmacologic strategies to manage pain. Nutrition counseling is provided to patients who are not eating enough calories or protein. Small, frequent meals require less energy for digestion. Serum hemoglobin and hematocrit levels are monitored for deficiencies, and blood products or EPO are administered as prescribed. Patients are monitored for alterations in oxygenation and electrolyte balances. Physical therapy and assistive devices are beneficial for patients with impaired mobility.

Chart 16-7 Sources of Fatigue in Cancer Patients

- Pain, pruritus
- Imbalanced nutrition related to anorexia, nausea, vomiting, cachexia
- Electrolyte imbalance related to vomiting, diarrhea
- Ineffective protection related to neutropenia, thrombocytopenia, anemia
- Impaired tissue integrity related to stomatitis, mucositis
- Impaired physical mobility related to neurologic impairments, surgery, bone metastasis, pain, and analgesic use
- Deficient knowledge related to disease process, treatment
- Anxiety related to fear, diagnosis, role changes, uncertainty of future
- Ineffective breathing patterns related to cough, shortness of breath, and dyspnea
- Disturbed sleep pattern related to cancer therapies, anxiety, and pain

IMPROVING BODY IMAGE AND SELF-ESTEEM

A positive approach is essential when caring for the patient with an altered body image. To help the patient retain control and positive self-esteem, it is important to encourage independence and continued participation in self-care and decision making. The patient should be assisted to assume those tasks and participate in those activities that are personally of most value. Any negative feelings that the patient has or threats to body image should be identified and discussed. The nurse serves as a listener and counselor to both the patient and the family. Referral to a support group can provide the patient with additional assistance in coping with the changes resulting from cancer or its treatment. In many cases, a cosmetologist can provide ideas about hair or wig styling, make-up, and the use of scarves and turbans to help with body image concerns.

Patients who experience alterations in sexuality and sexual function are encouraged to discuss concerns openly with their partner. Alternative forms of sexual expression are explored with the patient and partner to promote positive self-worth and acceptance. The nurse who identifies serious physiologic, psychological, or communication difficulties related to sexuality or sexual function is in a key position to assist the patient and partner to seek further counseling if necessary.

ASSISTING IN THE GRIEVING PROCESS

A cancer diagnosis need not indicate a fatal outcome. Many forms of cancer are curable; others may be cured if treated early. Despite these facts, many patients and their families view cancer as a fatal disease that is inevitably accompanied by pain, suffering, debility, and emaciation. Grieving is a normal response to these fears and to the losses anticipated or experienced by the patient with cancer. These may include loss of health, normal sensations, body image, social interaction, sexuality, and intimacy. The patient, family, and friends may grieve for the loss of quality time to spend with others, the loss of future and unfulfilled plans, and the loss of control over one's own body and emotional reactions.

The patient and family just informed of the cancer diagnosis frequently respond with shock, numbness, and disbelief. It is often during this stage that the patient and family are called on to make important initial decisions about treatment. They require the support of the physician, nurse, and other health care team members to make these decisions. An important role of the nurse is to answer any questions the patient and family have and clarify information provided by the physician.

In addition to assessing the response of the patient and family to the diagnosis and planned treatment, the nurse assists them in framing their questions and concerns, identifying resources and support people (eg, spiritual advisor, counselor), and communicating their concerns with each other. Support groups for patients and families are available through hospitals and various community organizations. These groups provide direct assistance, advice, and emotional support.

As the patient and family progress through the grieving process, they may express anger, frustration, and depression. During this time, the nurse encourages the patient and family to verbalize their feelings in an atmosphere of trust and support. The nurse continues to assess their reactions and provides assistance and support as they confront and learn to deal with new problems.

If the patient enters the terminal phase of disease, the nurse may realize that the patient and family members are at different stages of grief. In such cases, the nurse assists the patient and family to ac-

knowledge and cope with their reactions and feelings. Nurses also assist patients and families to explore preferences for issues related to end-of-life care such as withdrawal of active disease treatment, desire for the use of life support measures, and symptom management. Support, which can be as simple as holding the patient's hand or just being with the patient at home or at the bedside, often contributes to peace of mind. Maintaining contact with the surviving family members after the death of the cancer patient may help them to work through their feelings of loss and grief. See Chapter 17 for further discussion of end-of-life issues.

MONITORING AND MANAGING POTENTIAL COMPLICATIONS

Despite advances in cancer care, infection remains the leading cause of death. In the cancer patient, defense against infection is compromised in many different ways. The integrity of the skin and mucous membrane, the body's first line of defense, is challenged by multiple invasive diagnostic and therapeutic procedures, by adverse effects of radiation and chemotherapy, and by the detrimental effects of immobility.

Impaired nutrition resulting from anorexia, nausea, vomiting, diarrhea, and the underlying disease alters the body's ability to combat invading organisms. Medications such as antibiotics disturb the balance of normal flora, allowing the overgrowth of pathogenic organisms. Other medications can also alter the immune response (see Chap. 50). Cancer itself may be immunosuppressive. Cancers such as leukemia and lymphoma are often associated with defects in cellular and humoral immunity. Advanced cancer can lead to obstruction by the tumor of the hollow viscera (such as the intestines), blood vessels, and lymphatic vessels, creating a favorable environment for proliferation of pathogenic organisms. In some patients, tumor cells infiltrate bone marrow and prevent normal production of WBCs. Most often, however, a decrease in WBCs is a result of bone marrow suppression after chemotherapy or radiation therapy.

The use of the hematopoietic growth factors, also called colony-stimulating factors (see the previous discussion of BRM therapy), has reduced the severity and duration of neutropenia associated with myelosuppressive chemotherapy and radiation therapy. The administration of these factors assists in reducing the risk for infection and, possibly, in maintaining treatment schedules, drug dosages, treatment effectiveness, and the quality of life.

Infection

Gram-positive organisms, such as *Streptococcus* and *Staphylococcus* species, are the most frequently isolated causes of infection. Gram-negative organisms, such as *Escherichia coli* and *Pseudomonas aeruginosa,* and fungal organisms, such as *Candida albicans,* also contribute to the incidence of serious infection.

Fever is probably the most important sign of infection in the immunocompromised patient. Although fever may be related to a variety of noninfectious conditions, including the underlying cancer, any temperature of 38.3°C (101°F) or higher is reported and dealt with promptly.

Antibiotics may be prescribed to treat infections after cultures of wound drainage, exudate, sputum, urine, stool, or blood are obtained. Patients with neutropenia are treated with broad-spectrum antibiotics before the infecting organism is identified because of the high incidence of mortality associated with untreated infection. Broad-spectrum antibiotic coverage or empiric therapy most often includes a combination of medications to defend the body against the major pathogenic organisms. An important component of the nurse's role is to administer these medications promptly according to the prescribed schedule to achieve adequate blood levels of the medications.

Strict asepsis is essential when handling intravenous lines, catheters, and other invasive equipment. Exposure of the patient to others with an active infection and to crowds is avoided. Patients with profound immunosuppression, such as BMT recipients, may need to be placed in a protective environment where the room and its contents are sterilized and the air is filtered. These patients may also receive low-bacteria diets, avoiding fresh fruits and vegetables. Hand hygiene and appropriate general hygiene are necessary to reduce exposure to potentially harmful bacteria and to eliminate environmental contaminants. Invasive procedures, such as injections, vaginal or rectal examinations, rectal temperatures, and surgery, are avoided. The patient is encouraged to cough and perform deep-breathing exercises frequently to prevent atelectasis and other respiratory problems. Prophylactic antimicrobial therapy may be used for patients who are expected to be profoundly immunosuppressed and at risk for certain infections. The nurse teaches the patient and family to recognize signs and symptoms of infection to report, perform effective hand hygiene, use antipyretics, maintain skin integrity, and administer hematopoietic growth factors when indicated.

Septic Shock

The nurse assesses the patient frequently for infection and inflammation throughout the course of the disease. Septicemia and septic shock are life-threatening complications that must be prevented or detected and treated promptly. Patients with signs and symptoms of impending sepsis and septic shock require immediate hospitalization and aggressive treatment.

Signs and symptoms of septic shock (see Chap. 15) include altered mental status, either subnormal or elevated temperature, cool and clammy skin, decreased urine output, hypotension, dysrhythmias, electrolyte imbalances, and abnormal arterial blood gas values. The patient and family members are instructed about signs of septicemia, methods for preventing infection, and actions to take if infection or septicemia occurs.

Septic shock is most often associated with overwhelming gram-negative bacterial infections. The nurse monitors the blood pressure, pulse rate, respirations, and temperature of the patient with shock every 15 to 30 minutes. Neurologic assessments are carried out to detect changes in orientation and responsiveness. Fluid and electrolyte status is monitored by measuring fluid intake and output and serum electrolytes. Arterial blood gas values and pulse oximetry are monitored to determine tissue oxygenation. The nurse administers intravenous fluids, blood products, and vasopressors as prescribed to maintain the patient's blood pressure and tissue perfusion. Supplemental oxygen is often necessary. Broad-spectrum antibiotics are administered as prescribed to combat the underlying infection (see Chap. 15).

Bleeding and Hemorrhage

Thrombocytopenia, a decrease in the circulating platelet count, is the most common cause of bleeding in cancer patients and is usually defined as a count of less than 100,000/mm^3 (0.1×10^{12}/L). When the count falls between 20,000 and 50,000/mm^3 (0.02 to 0.05×10^{12}/L), the risk for bleeding increases. Counts under 20,000/mm^3 (0.02×10^{12}/L) are associated with an increased risk for spontaneous bleeding, for which the patient requires a platelet transfusion. Platelets are essential for normal blood clotting and coagulation (hemostasis).

Thrombocytopenia often results from bone marrow depression after certain types of chemotherapy and radiation therapy. Tumor infiltration of the bone marrow can also impair the normal production of platelets. In some cases, platelet destruction is associated with an enlarged spleen (hypersplenism) and abnormal antibody function that occur with leukemia and lymphoma.

In addition to monitoring laboratory values, the nurse continues to assess the patient for bleeding. The nurse also takes steps to prevent trauma and minimize the risk for bleeding by encouraging the patient to use a soft, not stiff, toothbrush and an electric, not straight-edged, razor. Additionally, the nurse avoids unnecessary invasive procedures (eg, rectal temperatures, intramuscular injections, and catheterization) and assists the patient and family to identify and remove environmental hazards that may lead to falls or other trauma. Soft foods, increased fluid intake, and stool softeners, if prescribed, may be indicated to reduce trauma to the gastrointestinal tract. The joints and extremities are handled and moved gently to minimize the risk for spontaneous bleeding. The nurse may administer IL-11, which has been approved by the FDA (Rust, Wood & Battiato, 1999) to prevent severe thrombocytopenia and to reduce the need for platelet transfusions following myelosuppressive chemotherapy in patients with nonmyeloid malignancies. In some instances, the nurse teaches the patient or family member to administer IL-11 in the home.

Hemorrhage may be related to various underlying abnormalities, such as thrombocytopenia and coagulation disorders. These clinical situations are often associated with the cancer itself or the adverse effects of cancer treatments. Sites of hemorrhage may include the gastrointestinal, respiratory, and genitourinary tracts and the brain. Blood pressure and pulse and respiratory rates are monitored every 15 to 30 minutes when hospitalized patients experience bleeding.

Serum hemoglobin and hematocrit are monitored carefully for changes indicating blood loss. The nurse tests all urine, stool, and emesis for occult blood. Neurologic assessments are performed to detect changes in orientation and behavior. The nurse administers fluids and blood products as prescribed to replace any losses. Vasopressor agents are administered as prescribed to maintain blood pressure and ensure tissue oxygenation. Supplemental oxygen is used as necessary.

PROMOTING HOME AND COMMUNITY-BASED CARE

Teaching Patients Self-Care

Patients with cancer usually return home from acute care facilities or receive treatment in the home or outpatient area rather than acute care facilities. The shift from the acute care setting also shifts the responsibility for care to the patient and family. As a result, families and friends must assume increased involvement in patient care, which requires teaching that enables them to provide care. Teaching initially focuses on providing information needed by the patient and family to address the most immediate care needs likely to be encountered at home.

Side effects of treatments and changes in the patient's status that should be reported are reviewed verbally and reinforced with written information. Strategies to deal with side effects of treatment are discussed with the patient and family. Other learning needs are identified based on the priorities conveyed by the patient and family as well as on the complexity of care provided in the home.

Technological advances allow home administration of chemotherapy, PN, blood products, parenteral antibiotics, and parenteral analgesics; management of symptoms; and care of vascular access devices. Although home care nurses provide care and support for patients receiving this advanced technical care, the patient and family need instruction and ongoing support that allow them to feel comfortable and proficient in managing these treatments at home. Follow-up visits and telephone calls from the nurse are often reassuring to the patient and family and increase their comfort in dealing with complex and new aspects of care. Continued contact facilitates evaluation of the patient's progress and ongoing needs.

Continuing Care

Referral for home care is often indicated for the patient with cancer. The responsibilities of the home care nurse include assessing the home environment, suggesting modifications in the home or in care to assist the patient and family in addressing the patient's physical needs, providing physical care, and assessing the psychological and emotional impact of the illness on the patient and family.

Assessing changes in the patient's physical status and reporting relevant changes to the physician help to ensure that appropriate and timely modifications in therapy are made. The home care nurse also assesses the adequacy of pain management and the effectiveness of other strategies to prevent or manage the side effects of treatment modalities.

The patient's and family's understanding of the treatment plan and management strategies is assessed, and previous teaching is reinforced. The nurse often facilitates the coordination of patient care by maintaining close communication with all health care providers involved in the patient's care. The nurse may make referrals and coordinate available community resources (eg, local office of the American Cancer Society, home aides, church groups, parish nurses, and support groups) to assist patients and caregivers.

Evaluation

EXPECTED PATIENT OUTCOMES

For specific patient outcomes, see the Plan of Nursing Care. Expected patient outcomes may include:

1. Maintains integrity of oral mucous membranes
2. Maintains adequate tissue integrity
3. Maintains adequate nutritional status
4. Achieves relief of pain and discomfort
5. Demonstrates increased activity tolerance and decreased fatigue
6. Exhibits improved body image and self-esteem
7. Progresses through the grieving process
8. Experiences no complications, such as infection, or sepsis, and no episodes of bleeding or hemorrhage

Cancer Rehabilitation

Many cancer patients, including those who receive primary surgical treatment and adjuvant chemotherapy or radiation therapy, return to work and their usual activities of daily living. These patients may encounter a variety of problems, including changes in their functional abilities and in the attitudes of employers, coworkers, and family members who still view cancer as a terminal, debilitating disease. Nurses play an important role in the re-

habilitation of the cancer patient. Both the patient and family are included as part of any rehabilitation effort because cancer affects not only the patient but also the family members. In addition, with the shift away from inpatient care, many families are caring for patients at home. To maximize beneficial outcomes, evaluation of the patient's needs related to cancer rehabilitation begins early in cancer treatment (Table 16-10).

Assessment for body image changes as a result of disfiguring treatments is necessary to facilitate the patient's adjustment to changes in appearance or functional abilities. The nurse can refer the patient and family to a variety of support groups sponsored by the American Cancer Society, such as those for people who have had laryngectomies or mastectomies. Nurses also collaborate with physical, occupational, and enterostomal therapists in improving the patient's abilities in the use of prosthetic and assistive devices, and in altering the home environment as needed.

Patients often experience distress (eg, pain, nausea) related to the underlying cancer or treatments. These symptoms may interfere with work and quality of life. Nurses assess for these problems and assist the patient in identifying strategies for coping with them. For patients with gastrointestinal disturbances after chemotherapy, altering work hours or receiving treatments in the evenings may prove helpful. Collaboration with physicians and pharmacists is helpful in identifying appropriate interventions.

Nurses collaborate with dietitians to help patients plan meals that will be acceptable and meet nutritional requirements. Nurses are also involved in the ongoing assessment of patients to detect any long-term consequences of cancer treatment.

Although the Americans With Disabilities Act of 1990 was intended to protect patients with disabling disorders against discrimination, recovering cancer patients have reported instances of unfair practices and discrimination in the workplace. Some employers do not understand that different kinds of cancers have different prognoses and different effects on functional ability. As a result, employers may hesitate to hire or continue to employ people with cancer, especially if ongoing treatment regimens require adjustments in work schedules. Employers, coworkers, and families may continue to view the person as "sick" despite ongoing recovery or completion of treatment. Attitudes of coworkers can be a problem when the patient has a communication impairment, as may occur in some head and neck cancers. The patient may benefit from vocational rehabilitation services of the American Cancer Society or other agencies.

Nurses can participate in efforts to educate employers and the public in general to ensure that the rights of patients with cancer are maintained. Whenever possible, nurses assist patients and families to resume preexisting roles. Psychologists and clergy or spiritual advisors are consulted to assist with psychosocial and spiritual concerns. Rehabilitation shifts the focus from what has been lost to what can be done with existing strengths and abilities. In that spirit, nurses encourage patients to regain the highest level of function and independence possible.

Table 16-10 • Assessing Patient Needs for Cancer Rehabilitation

AREA OF NEED	FACTORS TO ASSESS
Functional	
Activities of daily living	Mobility
	Cognitive impairment
	Sensory impairments
	Communication barriers
Physiologic	
Nutrition	Need for enteral or parenteral nutrition
Elimination	Alterations in bowel and bladder function
Symptoms related to disease or treatment	Pain
	Nausea, vomiting, diarrhea
	Dyspnea, fatigue
	Skin impairment, alopecia
Psychosocial Resources	
Family	Availability of caregiver, home physical environment
	Availability of private transportation; affordability of transportation
Community	Availability of public transportation; affordability of transportation
	Availability and access to community organizations for assistance and support
Personal	Spiritual concerns
	Family relationships
	Body image
	Coping abilities
	Sexuality
Financial	Job security for patient and family members
	Need for vocational training

Gerontologic Considerations

As a result of an increased life expectancy and an increased risk for cancer with age, nurses are providing cancer-related care for growing numbers of elderly patients. More than 58% of all cancers occur in people older than 65 years of age, and about two thirds of all cancer deaths occur in people 65 years of age and older. Nursing care of this population addresses special needs, including physical, psychosocial, and financial concerns.

Oncology nurses working with the elderly population need to understand the normal physiologic changes that occur with aging. These changes include decreased skin elasticity; decreased skeletal mass, structure, and strength; decreased organ function and structure; impaired immune system mechanisms; alterations in neurologic and sensory functions; and altered drug absorption, distribution, metabolism, and elimination. These changes ultimately influence the elderly patient's ability to tolerate cancer treatment. In addition, many elderly patients have other chronic diseases and associated treatments that may limit tolerance to cancer treatments (Table 16-11).

Potential chemotherapy-related toxicities, such as renal impairment, myelosuppression, fatigue, and cardiomyopathy, may increase as a result of declining organ function and diminished physiologic reserves. The recovery of normal tissues after radiation therapy may be delayed, and the patient may experience more severe adverse effects, such as mucositis, nausea and vomiting, and myelosuppression. Because of decreased tissue healing capacity and declining pulmonary and cardiovascular functioning, the older patient is slower to recover from surgery. Elderly patients are also at increased risk for complications such as atelectasis, pneumonia, and wound infections.

Table 16-11 • Age-Related Changes and Their Effects on Patients with Cancer

AGE-RELATED CHANGES	IMPLICATIONS
Impaired immune system	Use special precautions to avoid infection; monitor for atypical signs and symptoms of infection.
Altered drug absorption, distribution, metabolism, and elimination	Mandates careful calculation of chemotherapy and frequent assessment for drug response and side effects.
Increased prevalence of other chronic diseases	Monitor for effect of cancer or its treatment on patient's other chronic diseases; monitor patient's tolerance for cancer treatment.
Diminished renal, respiratory, and cardiac reserve	Be proactive in prevention of decreased renal function, atelectasis, pneumonia, and cardiovascular compromise.
Decreased skin and tissue integrity; reduction in body mass; delayed healing	Prevent pressure ulcers secondary to immobility. Monitor skin and mucous membranes for changes related to radiation or chemotherapy. Prevent wound infection.
Decreased musculoskeletal strength	Prevent falls; encourage use of hip protectors if indicated.
Decreased neurosensory functioning: loss of vision, hearing, and distal extremity tactile senses	Provide teaching and instructions modified for patient's hearing and vision loss; provide instruction concerning safety and skin care for distal extremities.
Potential changes in cognitive and emotional capacity	Provide teaching and support modified for patient's level of functioning.

Access to cancer care for elderly patients may be limited by discriminatory or fatalistic attitudes of health care providers, caregivers, and patients themselves. Issues such as the gradual loss of supportive resources, declining health or loss of a spouse, and unavailability of relatives or friends may result in limited access to care and unmet needs for assistance with activities of daily living. In addition, the economic impact of health care may be difficult for those living on fixed incomes.

The nurse must be aware of the special needs of the aging population. Cancer prevention, detection, and screening efforts are directed toward the elderly as well as the younger population. Nurses carefully monitor elderly patients receiving cancer treatments for signs and symptoms of adverse effects. In addition, the elderly patient is instructed to report all symptoms to the physician. It is not uncommon for the elderly patient to delay reporting symptoms, attributing them to "old age." Many elderly people do not want to report illness for fear of losing their independence or financial security. Sensory losses (eg, hearing and visual losses) and memory deficits are considered when planning patient education because they may affect the patient's ability to process and retain information. In such cases, the nurse needs to act as a patient advocate, encouraging independence and identifying resources for support when indicated.

Care of the Patient with Advanced Cancer

The patient with advanced cancer is likely to experience many of the problems previously described, but all to a greater degree. Symptoms of gastrointestinal disturbances, nutritional problems, weight loss, and cachexia make the patient more susceptible to skin breakdown, fluid and electrolyte problems, and infection.

Although not all cancer patients experience pain, those who do commonly fear that it will not be adequately treated. Although treatment at this stage of illness is likely to be palliative rather than curative, prevention and appropriate management of problems can improve the quality of the patient's life considerably. For example, use of analgesia at set intervals rather than on an "as needed" basis usually breaks the cycle of tension and anxiety associated with waiting until pain becomes so severe that pain relief is inadequate once the analgesic is given. Working with the patient and family, as well as with other health care providers, on a pain-management program based on the patient's requirements frequently increases the patient's comfort and sense of control. In addition, the dose of opioid analgesic required is often reduced as pain becomes more manageable and other medications (eg, sedatives, tranquilizers, muscle relaxants) are added to assist in relieving pain.

If the patient is a candidate for radiation therapy or surgical intervention to relieve severe pain, the consequences of these procedures (eg, percutaneous nerve block, cordotomy) are explained to the patient and family, and measures are taken to prevent complications resulting from altered sensation, immobility, and changes in bowel and bladder function.

With the appearance of each new symptom, the patient may experience dread and fear that the disease is progressing. However, one cannot assume that all symptoms are related to the cancer. The new symptoms and problems are evaluated and treated aggressively if possible to increase the patient's comfort and improve quality of life.

Weakness, immobility, fatigue, and inactivity typically occur in the advanced stages of cancer as a result of the tumor, treatment, inadequate nutritional intake, or shortness of breath. The nurse works with the patient to set realistic goals and to provide rest balanced with planned activities and exercise. Other measures include assisting the patient in identifying energy-conserving methods for accomplishing tasks and promoting activities that the patient values the most.

Efforts are made throughout the course of the disease to provide the patient with as much control and independence as desired, but with assurance that support and assistance are available when needed. Additionally, the health care team works with the

patient and family to ascertain and comply with the patient's wishes about treatment methods and care as the terminal phase of illness and death approach.

HOSPICE

For many years, society was unable to cope appropriately with patients in the most advanced stages of cancer, and patients died in acute care settings rather than at home or in facilities designed to meet their needs. The needs of patients with terminal illnesses are best met by a comprehensive multidisciplinary program that focuses on quality of life, palliation of symptoms, and provision of psychosocial and spiritual support for the patient and family when cure and control of the disease are no longer possible. The concept of hospice, which originated in Great Britain, best addresses these needs. Most important, the focus of care is on the family, not just the patient. Hospice care can be provided in several settings: freestanding, hospital-based, and community or home-based settings.

Because of the high costs associated with maintaining freestanding hospices, care is often delivered by coordinating services provided by both the hospital and community. Although physicians, social workers, clergy, dietitians, pharmacists, physical therapists, and volunteers are involved in patient care, nurses are most often the coordinators of all hospice activities. It is essential that home care and hospice nurses possess advanced skills in assessing and managing pain, nutrition, dyspnea, bowel dysfunction, and skin impairments.

In addition, hospice programs facilitate clear communication among family members and health care providers. Most patients and families are informed of the prognosis and are encouraged to participate in decisions regarding pursuing or terminating cancer treatment. Through collaboration with other support disciplines, nurses assist patients and families to cope with changes in role identity, family structure, grief, and loss. Hospice nurses are actively involved in bereavement counseling. In many instances, family support for survivors continues for about 1 year. See Chapter 17 for detailed discussion of end-of-life care.

Oncologic Emergencies

For information about these emergencies, see Table 16-12.

Table 16-12 • Oncologic Emergencies: Manifestations and Management

EMERGENCY	CLINICAL MANIFESTATIONS AND DIAGNOSTIC FINDINGS	MANAGEMENT
Superior Vena Cava Syndrome (SVCS) Compression or invasion of the superior vena cava by tumor, enlarged lymph nodes, intraluminal thrombus that obstructs venous circulation, or drainage of the head, neck, arms, and thorax. Typically associated with lung cancer, SVCS can also occur with lymphoma and metastases. If untreated, SVCS may lead to cerebral anoxia (because not enough oxygen reaches the brain), laryngeal edema, bronchial obstruction, and death.	*Clinical* Gradually or suddenly impaired venous drainage giving rise to • Progressive shortness of breath (dyspnea), cough, and facial swelling • Edema of the neck, arms, hands, and thorax and reported sensation of skin tightness and difficulty swallowing • Possibly engorged and distended jugular, temporal, and arm veins • Dilated thoracic vessels causing prominent venous patterns on the chest wall • Increased intracranial pressure, associated visual disturbances, headache, and altered mental status *Diagnostic* Diagnosis is confirmed by • Clinical findings • Chest x-ray • Thoracic CT scan • MRI Intraluminal thrombosis is identified by venogram.	*Medical* • Radiation therapy to shrink tumor size and relieve symptoms • Chemotherapy for radiation-resistant tumor (eg, lymphoma or small cell lung cancer) or when the mediastinum has been irradiated to maximum tolerance • Anticoagulant or thrombolytic therapy for intraluminal thrombosis • Surgery (less common), eg, vena cava bypass graft (synthetic or autologous) to redirect blood flow around the obstruction • Supportive measures such as oxygen therapy, corticosteroids, and diuretics *Nursing* • Identify patients at risk for SVCS. • Monitor and report clinical manifestations of SVCS. • Monitor cardiopulmonary and neurologic status. • Facilitate breathing by positioning the patient properly. This helps to promote comfort and reduce anxiety produced by difficulty breathing resulting from progressive edema. • Promote energy conservation to minimize shortness of breath. • Monitor the patient's fluid volume status and administer fluids cautiously to minimize edema. • Assess for thoracic radiation-related problems such as dysphagia (difficulty swallowing) and esophagitis. • Monitor for chemotherapy-related problems, such as myelosuppression. • Provide postoperative care as appropriate.

(continued)

Table 16-12 • Oncologic Emergencies: Manifestations and Management (Continued)

EMERGENCY	CLINICAL MANIFESTATIONS AND DIAGNOSTIC FINDINGS	MANAGEMENT
Spinal Cord Compression Potentially leading to permanent neurologic impairment and associated morbidity and mortality, compression of the cord and its nerve roots may result from tumor, lymphomas, or intervertebral collapse. The prognosis depends on the severity and rapidity of onset. About 70% of compressions occur at the thoracic level, 20% in the lumbosacral level, and 10% in the cervical region. Metastatic cancers (breast, lung, kidney, prostate, myeloma, lymphoma) and related bone erosion are associated with spinal cord compression.	*Clinical* • Local inflammation, edema, venous stasis, and impaired blood supply to nervous tissues • Local or radicular pain along the dermatomal areas innervated by the affected nerve root (eg, thoracic radicular pain extends in a band around the chest or abdomen) • Pain exacerbated by movement, coughing, sneezing, or the Valsalva maneuver • Neurologic dysfunction, and related motor and sensory deficits (numbness, tingling, feelings of coldness in the affected area, inability to detect vibration, loss of positional sense) • Motor loss ranging from subtle weakness to flaccid paralysis • Bladder and/or bowel dysfunction depending on level of compression (above S2, overflow incontinence; from S3 to S5, flaccid sphincter tone and bowel incontinence) *Diagnostic* • Percussion tenderness at the level of compression • Abnormal reflexes • Sensory and motor abnormalities • MRI, myelogram, spinal cord x-rays, bone scans, and CT scan	*Medical* • Radiation therapy to reduce tumor size to halt progression and corticosteroid therapy to decrease inflammation and swelling at the compression site • Surgery only if symptoms progress despite radiation therapy or if vertebral fracture leads to additional nerve damage • Chemotherapy as adjuvant to radiation therapy for patients with lymphoma or small cell lung cancer • *Note:* Despite treatment, patients with poor neurologic function before treatment are less likely to regain complete motor and sensory function; patients who develop complete paralysis usually do not regain all neurologic function. *Nursing* • Perform ongoing assessment of neurologic function to identify existing and progressing dysfunction. • Control pain with pharmacologic and nonpharmacologic measures. • Prevent complications of immobility resulting from pain and decreased function (eg, skin breakdown, urinary stasis, thrombophlebitis, and decreased clearance of pulmonary secretions). • Maintain muscle tone by assisting with range-of-motion exercises in collaboration with physical and occupational therapists. • Institute intermittent urinary catheterization and bowel training programs for patients with bladder or bowel dysfunction. • Provide encouragement and support to patient and family coping with pain and altered functioning, lifestyle, roles, and independence.
Hypercalcemia In patients with cancer, hypercalcemia is a potentially life-threatening metabolic abnormality resulting when the calcium released from the bones is more than the kidneys can excrete or the bones can reabsorb. It may result from: • Bone destruction by tumor cells and subsequent release of calcium • Production of prostaglandins and osteoclast-activating factor, which stimulate bone breakdown and calcium release • Tumors that produce parathyroid-like substances that promote calcium release • Excessive use of vitamins and minerals and conditions unrelated to cancer, such as dehydration, renal impairment, primary hyperparathyroidism, thyrotoxicosis, thiazide diuretics, and hormone therapy	*Clinical* Fatigue, weakness, confusion, decreased level of responsiveness, hyporeflexia, nausea, vomiting, constipation, polyuria (excessive urination), polydipsia (excessive thirst), dehydration, and dysrhythmias *Diagnostic* Serum calcium level exceeding 11 mg/dL (2.74 mmol/L)	*Medical* See Chapter 14. *Nursing* • Identify patients at risk for hypercalcemia and assess for signs and symptoms of hypercalcemia. • Educate patient and family; prevention and early detection can prevent fatality. • Teach at-risk patients to recognize and report signs and symptoms of hypercalcemia. • Encourage patients to consume 2 to 3 L of fluid daily unless contraindicated by existing renal or cardiac disease. • Explain the use of dietary and pharmacologic interventions such as stool softeners and laxatives for constipation. • Advise patients to maintain nutritional intake without restricting normal calcium intake. • Discuss antiemetic therapy if nausea and vomiting occur. • Promote mobility by emphasizing its importance in preventing demineralization and breakdown of bones.

(continued)

Table 16-12 • Oncologic Emergencies: Manifestations and Management (Continued)

EMERGENCY	CLINICAL MANIFESTATIONS AND DIAGNOSTIC FINDINGS	MANAGEMENT
Pericardial Effusion and Cardiac Tamponade Cardiac tamponade is an accumulation of fluid in the pericardial space. The accumulation compresses the heart and thereby impedes expansion of the ventricles and cardiac filling during diastole. As ventricular volume and cardiac output fall, the heart pump fails, and circulatory collapse develops. With gradual onset, fluid accumulates gradually, and the outer layer of the pericardial space stretches to compensate for rising pressure. Large amounts of fluid accumulate before symptoms of heart failure occur. With rapid onset, pressures rise too quickly for the pericardial space to compensate. Cancerous tumors, particularly from adjacent thoracic tumors (lung, esophagus, breast cancers), and cancer treatment are the most common causes of cardiac tamponade. Radiation therapy of 4,000 cGy or more to the mediastinal area has also been implicated in pericardial fibrosis, pericarditis, and resultant cardiac tamponade. Untreated pericardial effusion and cardiac tamponade lead to circulatory collapse and cardiac arrest.	*Clinical* • Neck vein distention during inspiration (Kussmaul's sign) • Pulsus paradoxus (systolic blood pressure decrease exceeding 10 mm Hg during inspiration; pulse gets stronger on expiration) • Distant heart sounds, rubs and gallops, cardiac dullness • Compensatory tachycardia (heart beats faster to compensate for decreased cardiac output) • Increased venous and vascular pressures *Diagnostic* • ECG helps diagnose pericardial effusion. • In small effusion, chest x-rays show small amounts of fluid in the pericardium; in large effusions, x-ray films disclose "water-bottle" heart (obliteration of vessel contour and cardiac chambers). • ECG and CT scans help diagnose pleural effusions and evaluate effect of treatment. • Narrow pulse pressure • Shortness of breath and tachypnea • Weakness, chest pain, orthopnea, anxiety, diaphoresis, lethargy, and altered consciousness from decreased cerebral perfusion	*Medical* • Pericardiocentesis (the aspiration or withdrawal of the pericardial fluid by a large-bore needle inserted into the pericardial space). In malignant effusions, pericardiocentesis provides only temporary relief; fluid usually reaccumulates. Windows or openings in the pericardium can be created surgically as a palliative measure to drain fluid into the pleural space. Catheters may also be placed in the pericardial space and sclerosing agents (such as tetracycline, talc, bleomycin, 5-fluorouracil, or thiotepa) injected to prevent fluid from reaccumulating. • Radiation therapy or antineoplastic agents, depending on how sensitive the primary tumor is to these treatments. In mild effusions, prednisone and diuretic medications may be prescribed and the patient's status carefully monitored. *Nursing* • Monitor vital signs and oxygen saturation frequently. • Assess for pulsus paradoxus. • Monitor ECG tracings. • Assess heart and lung sounds, neck vein filling, level of consciousness, respiratory status, and skin color and temperature. • Monitor and record intake and output. • Review laboratory findings (eg, arterial blood gas and electrolyte levels). • Elevate the head of the patient's bed to ease breathing. • Minimize patient's physical activity to reduce oxygen requirements; administer supplemental oxygen as prescribed. • Provide frequent oral hygiene. • Reposition and encourage the patient to cough and take deep breaths every 2 hours. • As needed, maintain patent IV access, reorient the patient, and provide supportive measures and appropriate patient instruction.
Disseminated Intravascular Coagulation (DIC, also called consumption coagulopathy) Complex disorder of coagulation or fibrinolysis (destruction of clots), which results in thrombosis or bleeding. DIC is most commonly associated with hematologic cancers (leukemia); cancer of prostate, GI tract, and lungs; chemotherapy (methotrexate, prednisone, L-asparaginase, vincristine, and 6-mercaptopurine), and disease processes, such as sepsis, hepatic failure, and anaphylaxis. Blood clots form when normal coagulation mechanisms are triggered. Once activated, the clotting cascade continues to consume clotting factors and platelets faster than the body can re-	*Clinical* *Chronic DIC:* Few or no observable symptoms or easy bruising, prolonged bleeding from venipuncture and injection sites, bleeding of the gums, and slow GI bleeding *Acute DIC:* life-threatening hemorrhage and infarction; clinical symptoms of this syndrome are varied and depend on the organ system involved in thrombus and infarction or bleeding episodes *Diagnostic* • Prolonged prothrombin time (PT or protime) • Prolonged partial thromboplastin time (PTT) • Prolonged thrombin time (TT) • Decreased fibrinogen level • Decreased platelet level • Decrease in clotting factors	*Medical* • Chemotherapy, biologic response modifier therapy, radiation therapy, or surgery is used to treat the underlying cancer. • Antibiotic therapy is used for sepsis. • Anticoagulants, such as heparin or antithrombin III, decrease the stimulation of the coagulation pathways. • Transfusion of fresh-frozen plasma or cryoprecipitates (which contain clotting factors and fibrinogen), packed red blood cells, and platelets may be used as replacement therapy to prevent or control bleeding. • Although controversial, antifibrinolytic agents such as aminocaproic acid (Amicar), which is associated with increased thrombus formation, may be used.

(continued)

Table 16-12 • Oncologic Emergencies: Manifestations and Management (Continued)

EMERGENCY	CLINICAL MANIFESTATIONS AND DIAGNOSTIC FINDINGS	MANAGEMENT
place them. Clots are deposited in the microvasculature, placing the patient at great risk for impaired circulation, tissue hypoxia, and necrosis. In addition, fibrinolysis occurs, breaking down clots and increasing the circulating levels of anticoagulant substances, thereby placing the patient at risk for hemorrhage.	• Decreased hemoglobin • Decreased hematocrit • Elevated fibrin split products • Positive protamine sulfate precipitation test (thrombin activation test)	*Nursing* • Monitor vital signs. • Measure and document intake and output. • Assess skin color and temperature; lung, heart, and bowel sounds; level of consciousness, headache, visual disturbances, chest pain, decreased urine output, and abdominal tenderness. • Inspect all body orifices, tube insertion sites, incisions, and bodily excretions for bleeding. • Review laboratory test results. • Minimize physical activity to decrease injury risks and oxygen requirements. • Prevent bleeding; apply pressure to all venipuncture sites, and avoid nonessential invasive procedures; provide electric rather than straight-edged razors; avoid tape on the skin and advise gentle but adequate oral hygiene. • Assist the patient to turn, cough, and take deep breaths every 2 hours. • Reorient the patient, if needed; maintain a safe environment; and provide appropriate patient education and supportive measures.
Syndrome of Inappropriate Secretion of Antidiuretic Hormone (SIADH) The continuous, uncontrolled release of antidiuretic hormone (ADH), produced by tumor cells or by the abnormal stimulation of the hypothalmic–pituitary network, leads to increased extracellular fluid volume, water intoxication, hyponatremia, and increased excretion of urinary sodium. As fluid volume increases, stretch receptors in the right atrium respond by releasing a second hormone, atrial naturetic factor (ANF). The release of ANF causes increased renal excretion of sodium, which worsens hyponatremia. The most common cause of SIADH is cancer, especially small cell cancers of the lung. Antineoplastics—vincristine, vinblastine, cisplatin, and cyclophosphamide—and morphine also stimulate ADH secretion, which promotes conservation and reabsorption of water by the kidneys. As more fluid is absorbed, the circulatory volume increases, ANF is released, and sodium is actively excreted by the kidneys in compensation.	*Clinical* *Serum sodium levels below 120 mEq/L* (SI: 120 mmol/L): symptoms of hyponatremia including personality changes, irritability, nausea, anorexia, vomiting, weight gain, fatigue, muscular pain (myalgia), headache, lethargy, and confusion. *Serum sodium levels below 110 mEq/L* (SI: 110 mmol/L): seizure, abnormal reflexes, papilledema, coma, and death. Edema is rare. *Diagnostic* • Decreased serum sodium level • Increased urine osmolality • Increased urinary sodium level • Decreased BUN, creatinine, and serum albumin levels secondary to dilution • Abnormal water load test results	*Medical* Fluid intake range limited to 500 to 1,000 mL/day to increase the serum sodium level and decrease fluid overload. If water restriction alone is not effective in correcting or controlling serum sodium levels, demeclocycline is often prescribed to interfere with the antidiuretic action of ADH and ANF. When neurologic symptoms are severe, parenteral sodium replacement and diuretic therapy are indicated. Electrolyte levels are monitored carefully to detect secondary magnesium, potassium, and calcium imbalances. After the symptoms of SIADH are controlled, the underlying cancer is treated. If water excess continues despite treatment, pharmacologic intervention (urea and furosemide) may be indicated. *Nursing* • Maintain intake and output measurements. • Assess level of consciousness, lung and heart sounds, vital signs, daily weight, and urine specific gravity; also assess for nausea, vomiting, anorexia, edema, fatigue, and lethargy. • Monitor laboratory test results, including serum electrolyte levels, osmolality, and blood urea nitrogen, creatinine, and urinary sodium levels. • Minimize the patient's activity; provide appropriate oral hygiene; maintain environmental safety; and restrict fluid intake if necessary. • Reorient the patient and provide instruction and encouragement as needed.
Tumor Lysis Syndrome Potentially fatal complication associated with radiation- or chemotherapy-induced cell destruction of large or rapidly growing cancers such as leukemia, lymphoma, and small cell lung cancer. The release of intracellular contents from the tumor cells, leads to electrolyte imbalances—hyperkalemia,	*Clinical* Clinical manifestations depend on the extent of metabolic abnormalities. • Neurologic: Fatigue, weakness, memory loss, altered mental status, muscle cramps, tetany, paresthesias (numbness and tingling), seizures • Cardiac: Elevated blood pressure, shortened QT complexes, widened QRS waves, dysrhythmias, cardiac arrest	*Medical* • To prevent renal failure and restore electrolyte balance, aggressive fluid hydration is initiated 48 hours before and after the initiation of cytotoxic therapy to increase urine volume and eliminate uric acid and electrolytes. Urine is alkalinized by adding sodium bicarbonate to IV fluid to maintain a urine pH of 7 or more; this prevents renal failure secondary to uric acid precipitation in the kidneys.

(continued)

Table 16-12 • Oncologic Emergencies: Manifestations and Management (Continued)

EMERGENCY	CLINICAL MANIFESTATIONS AND DIAGNOSTIC FINDINGS	MANAGEMENT
hypocalcemia, hyperphosphatemia, and hyperuricemia—because the kidneys can no longer excrete large volumes of the released intracellular metabolites.	• GI: Anorexia, nausea, vomiting, abdominal cramps, diarrhea • Renal: Flank pain, oliguria, anuria, renal failure, acidic urine pH *Diagnostic* Electrolyte imbalances identified by laboratory test results	• Diuretic therapy, with a carbonic anhydrase inhibitor or acetazolamide, to alkalinize the urine • Allopurinol therapy to inhibit the conversion of nucleic acids to uric acid • Administration of a cation-exchange resin, such as sodium polystyrene sulfonate (Kayexalate) to treat hyperkalemia by binding and eliminating potassium through the bowel • Administration of hypertonic dextrose and regular insulin temporarily shifts potassium into cells and lowers serum potassium levels. • Administration of phosphate-binding gels, such as aluminum hydroxide, to treat hyperphosphatemia by promoting phosphate excretion in the feces. • Hemodialysis when patients are unresponsive to the standard approaches for managing uric acid and electrolyte abnormalities *Nursing* • Identify at-risk patients, including those in whom tumor lysis syndrome may develop up to 1 week after therapy has been completed. • Institute essential preventive measures (eg, fluid hydration and allopurinol). • Assess patient for signs and symptoms of electrolyte imbalances. • Assess urine pH to confirm alkalization. • Monitor serum electrolyte and uric acid levels for evidence of fluid volume overload secondary to aggressive hydration. • Instruct patients to report symptoms indicating electrolyte disturbances.

Critical Thinking Exercises

1. You are seeing a married couple in their 70s in the clinic for blood pressure checks. What questions regarding cancer screening are appropriate for them? How would you respond if your suggestions for cancer screening are met with the answer that they are too old to worry about cancer? What special considerations are there if the woman has a physical disability that requires her to use a wheelchair?

2. A 54-year-old woman with bone metastases secondary to breast cancer has been admitted to the hospital with a diagnosis of hypercalcemia. Describe the underlying cause of hypercalcemia and the medical and nursing management strategies that are anticipated. What patient monitoring would be essential before and after treatment of hypercalcemia?

3. One of your home care patients, a 42-year-old executive of a major corporation, has a nonresectable malignant brain tumor for which she is receiving radiation therapy. She is being discharged from the hospital and will continue therapy as an outpatient. She and her husband are concerned about her future and survival and are also concerned about the impact of the diagnosis on the couple's 10-year-old twins. She is also concerned about her ability to carry out her executive responsibilities. What assessment by the nurse is indicated at this point, and what actions would be warranted by the nurse to help the patient and her husband deal with their concerns?

4. A 70-year-old man with advanced cancer living at home with his wife has been experiencing increasingly severe pain for which an oral opioid analgesic has recently been prescribed. What nursing assessments are essential for the home care nurse? What teaching will be indicated for the patient and family? How would you modify your teaching if the patient and his wife understand little English?

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RESOURCES AND WEBSITES

Professional Organizations

American Society of Clinical Oncology (ASCO), 1900 Duke Street, Suite 200, Alexandria, VA 22314; (703) 299-0150, Fax: (703) 299-1044; http://www.asco@asco.org.
National Comprehensive Cancer Network, 50 Huntingdon Pike, Suite 200, Rockledge, PA 19046; (215) 728-4788, Fax: (215) 728-3877, (888) 909-NCCN, (888) 909-6226; http://www.nccn.org.
Oncology Nursing Society (ONS), 510 Holiday Drive, Pittsburgh, PA 15220-2749; (412) 921-7373; http://www.ons.org.

Patient/Family Support and Education

American Brain Tumor Association, 2720 River Road, Des Plaines, IL 60018; (847) 827-9910, Fax: (847) 827-9918, Patient Line: (800) 886-2282; http://www.abta.org.
American Cancer Society (ACS), 1599 Clifton Road NE, Atlanta, GA 30329; (800)-ACS-2345 (check your local directory for the unit of division nearest you); http://www.cancer.org.
Cancer Care, Inc., National Office, 275 7th Ave., New York, NY 10001; Services: (212) 302-2400, (800)-813-HOPE (4673); http://www.info@cancercare.org.
Cancer Information Network: http://www.cancernetwork.com.
CancerNet (a service of the National Cancer Institute): cancernet-staff@mail.nih.gov;http://cancernet.nci.nih.gov/index.html.
CancerSource World Headquarters, 40 Tall Pine Drive, Sudbury, MA 01776; http://www.cancersource.com.
Make Today Count, 1235 East Cherokee Street, Springfield, MO 85804; (407) 885-3324 or (800) 432-2273.
National Alliance of Breast Cancer Organizations (NABCO), 9 East 37th Street, 10th Floor, New York, NY 10016; (888) 806-2226; http://www.nabo.org:80/index.html.
The National Cancer Institute Public Inquiries Office, Building, 31, Room 10A31, 31 Center Drive, MSC 2580, Bethesda, MD 20892-2580; (800)-4-CANCER; http://rex.nci.nih.gov.
National Coalition for Cancer Survivorship, 1010 Wayne Avenue, Suite 770, Silver Spring, MD 20910-5600; (301) 650-9127 or (877) NCCS-YES (877-622-7937); Fax: (301) 565-9670; http://www.cansearch.org.
The National Hospice and Palliative Care Organization, 1700 Diagonal Road, Suite 300, Alexandria, VA 22314; (703) 837-1500; http://info@nhpco.org.
Oncolink; the University of Pennsylvania Cancer Center, 3400 Spruce St., Philadelphia, PA 19104; http://www.oncolink.upenn.edu.
The Wellness Community, 35 E. Seventh St., Suite 412, Cincinnati, OH 45202; (513) 421-7111, Fax (513) 421-7119, (888)-793-WELL; http://www.wellness-community.org.