ASCO SPECIAL ARTICLE

Training Resource Document for Curriculum Development in Medical Oncology

Adopted on February 20, 1997 by the American Society of Clinical Oncology*

Purpose: **Medical oncology is a rapidly growing profession, not only in its membership, but in its knowledge-base as well. In order to keep pace with the changing profile of health care delivery and still ensure uniform quality subspecialty training, a template for education is needed.**

Design and Results: **An Ad Hoc Committee was created from the American Society of Clinical Oncology (ASCO) membership. Goals of training were discussed and curriculum guidelines were created. To gain special expertise in medical oncology, the curriculum emphasizes formal instruction in the following: (1) the treatment of individual malignancies, with an emphasis on a coordinated multidisciplinary approach; (2) a clinical experience that emphasizes patient management in both the inpatient and outpatient settings; (3) the ability to perform specified procedures; and (4) the key tools in basic science that apply to patient management. This document should be considered the educational frame work around which a curriculum is developed.**

J Clin Oncol 16:372-379.

THE AMERICAN Society of Clinical Oncology (ASCO) was founded in 1965 and by 1979, the membership had risen to 2,950. Today, more than 10,000 physicians are members of ASCO. Since the first subspecialty examination in medical oncology was offered in 1973, the number of certified medical oncologists has grown to 5,953. Medical oncology is not only one of the youngest subspecialties in internal medicine, but also one of the fastest growing.

The recent years have witnessed an explosion in medical technology. Two entirely new classes of drugs, biologic response modifiers and growth factors, have been developed. The pharmacopoeia of chemotherapeutic agents has grown from the three available agents in 1950 to over 40 antineoplastic agents. Molecular diagnostic testing is commonplace, and more widespread use of genetic screening is on the horizon. Moreover, an entirely new area of clinical research trials have been initiated in pharmacologic cancer prevention.

Meanwhile, health care has become an ''industry'' that has forced us to shift patient care to outpatient treatment and focus on cost-containment. It is a challenge to develop a curriculum for training physicians in so dynamic an environment. While the American Board of Internal Medicine (ABIM) and Accreditation Council on Graduate Medical Examiners (ACGME) create a basic structure for subspecialty training, the specific items that are to be included in the training curriculum are not within their purview. The President of the Board of ASCO has identified the need to create a framework for subspecialty training. That curriculum emphasizes formal instruction in the following: (1) the treatment of individual malignancies, with an emphasis on a coordinated multidisciplinary approach; (2) a clinical experience that emphasizes patient management in both the inpatient and outpatient settings; (3) the ability to perform procedures; and (4) the key tools in basic science that apply to patient management. The following recommendations have been developed by the Ad Hoc Committee on Curriculum Guidelines.

COMPETENCY COMPRISING CURRICULUM

The following curriculum should be considered as the educational framework for the training of physicians in medical oncology.

I. Basic Scientific Principles

As foundations for treating malignant disease, the trainee should understand the biology of cancer, principles of therapy, and proper conduct and interpretation of clinical research.

A. *Cancer Biology:*

Trainees should know the biology of normal cells and the basic processes of carcinogenesis. They should have an understanding of gene structure, organization, expression, and regulation. A fundamental understanding of the cell cycle, its control by oncogenes, and its interaction with chemotherapy is important. They should understand tumor cell kinetics, proliferation and programmed cell death and the balance between cell death and cell proliferation.

From the American Society of Clinical Oncology.

Submitted February 20, 1997; accepted November 10, 1997.

**ASCO sincerely appreciates the contributions of the Ad Hoc Committee on Fellowship Curriculum Guidelines, which devoted much time and effort to this project. Chair: Joanne E. Mortimer; Members: Dean Bajorin, Jan Buckner, Cynthia Gail Leichman, Robert Mayer, and Oliver W. Press.*

Address reprint requests to Michele Dinkel, American Society of Clinical Oncology, 225 Reinekers Ln, Suite 650, Alexandria, VA 22314.

0732-183X/98/1601-0064$3.00/0

Trainees should be familiar with molecular techniques, such as polymerase chain reaction (PCR), chromosomal analyses, and other techniques of molecular and tumor cell biology.

B. *Radiation Therapy:*
Because radiation therapy is an important tool in the treatment of malignant diseases, trainees should be familiar with principles of radiation biology, mechanisms of cell death and normal tissue tolerance and toxicity, and interactions with chemotherapy.

C. *Pharmacology and Pharmacokinetics:*
Trainees should know the mechanisms of action, metabolism, and degradation of the antineoplastic and biologic agents. They should be familiar with basic principles of pharmacology and be able to interpret basic pharmacokinetic information. They should know the appropriate dosages, routes of administration, and drug interactions. They should be familiar with the mechanism of new drug development and how these agents are tested clinically.

D. *Epidemiology:*
Trainees should have an understanding of the etiologies and epidemiology of each malignancy.

E. *Tumor Immunology:*
The trainee should understand how the body identifies substances as ''self'' and responds to cells that are seen as ''non-self.'' They should have basic knowledge of the cellular and humoral components of the immune system and the regulatory action of cytokines on the immune system. They should understand the interrelationship between tumor and host immune systems, including tumor antigenicity, immune-mediated antitumor cytotoxicity, and the direct effect of cytokines on tumors.

F. *Clinical Research:*
Trainees must be provided an education in the design and conduct of clinical trials. They must have an exposure to the development and conduct of these trials through national cooperative groups or in-house protocols. That instruction should include the following:

1. Clinical trial design.
2. Review of the ethical, regulatory, and legal issues involved in study design.
3. Criteria for defining response to therapy.
4. Tools used to assess quality of life.
5. Basics of statistics.
   a. Statistical methods.
   b. Requirement for patient numbers in designing studies.
   c. Proper interpretation of data.
6. Toxicity assessment and grading.
7. Role and functioning of the Institutional Review Board.
8. Experience obtaining informed consent from patients.
9. Government regulatory mechanisms of surveillance and monitoring of government-sponsored studies.
10. Instruction in grant writing and information about mechanisms of support for clinical research.
11. Cost of therapy and the cost effectiveness of therapy.
12. Appreciation for the altered natural history, toxicity, and disease impact in the elderly.

II. Basic Principles in the Management and Treatment of Malignant Diseases

The management of malignant diseases requires the expertise of many different medical subspecialties. The trainee should recognize the contributions of each of these subspecialties in making the diagnosis, assessing disease stage, and treating the underlying disease and its complications. The trainee should interact with each of these disciplines in order to gain an appreciation for the benefits and limitations of each modality. Trainees should be capable of assessing the patient's comorbid medical conditions that may affect the toxicity and efficacy of treatment in order to formulate a treatment plan. The trainee should have an extensive knowledge of cancer staging with emphasis on the T, N, M staging classification for most cancers.

A. *Pathology/Laboratory Medicine:*
The trainee should have the opportunity to review biopsy material and surgical specimens with a pathologist. They should appreciate the role of the pathologist in confirming the diagnosis of cancer and in determining the severity and extent of disease. Trainees should be familiar with newer pathologic techniques (eg, immunostaining, cytology, fine needle aspiration) and the contribution of these techniques to the staging and management of patients with cancer. Trainees should know what laboratory testing is appropriate in the staging and follow-up of patients. They should appreciate the

utility of serum tumor markers and recognize their limitations.

B. *Radiology:*
Trainees should know the indications for radiographic and nuclear medicine imaging procedures in the diagnosis, staging, and follow-up of patients with malignant diseases. They should learn to assess response to treatment using these tests.

C. *Surgery:*
By interacting with surgeons, the trainee should develop an understanding of the indications and contraindications for surgery. They should become knowledgeable about the role of surgery in the staging, cure, and palliation of patients with malignant diseases. The trainee should become familiar with the indications for organ preservation and the sequencing of surgery with other treatment modalities. They should recognize the risks and benefits of surgery as a definitive treatment and as an adjunct to radiation therapy and/or chemotherapy.

D. *Radiation Oncology:*
The trainee should be familiar with the indications for radiation therapy as a curative and palliative modality. They should be familiar with the principles of treatment planning and dosimetry. The trainee should appreciate when radiation therapy should be sequenced with surgery and/or chemotherapy. They should recognize both the acute and the late effects of radiation therapy.

E. *Chemotherapy:*
Trainees should be familiar with the indications and goals of chemotherapy in primary and recurrent cancer, in both the adjuvant setting and as neoadjuvant therapy. They should know the indications for chemotherapy as a radiation sensitizer. They should be able to assess a patient's comorbid medical conditions in order to determine the risk/benefit ratio of chemotherapy for that individual.

F. *Biologic Therapy:*
Trainees should be familiar with the activities and indications for cytokines and hematopoietic growth factors. Knowledge should include the spectrum of specific side effects and their management and therapeutic combinations with chemotherapy. The trainee also should be familiar with basic concepts of targeted molecular therapies, such as monoclonal antibodies, tumor vaccines, cellular therapy, and gene-directed therapy.

G. *Rehabilitation:*
The trainee should recognize the role of physical therapy, particularly in the postoperative setting (eg, axillary dissection, amputation). Trainees should recognize the role of occupational therapy, speech therapy, and swallowing therapy.

III. Management and Treatment of Individual Cancers
Having understood the general principles of treatment, the trainee should be instructed in the care of individual cancers and unique considerations for each malignant disease.

A. *Breast Cancer:*
Trainees should have a working knowledge in the interpretation of a mammogram and ultrasound. They should recognize the pathologic and prognostic features that assist in determining the indications for therapy. They should understand the issues that affect the choice of primary treatments. They should appreciate the benefits of hormone therapy and/or chemotherapy in advanced disease and know the indications for adjuvant therapy. The role for elective chemotherapy regimens should be reviewed and understood. They should recognize the importance of family history and the role for genetic testing.

B. *Carcinoma of Unknown Primary Sites:*
The trainee should learn the importance of the tumor histopathology, pathologic analysis, and tumor markers in directing the work-up. In particular, they should recognize the settings on which treatment may affect survival and when it is palliative.

C. *Central Nervous System Malignancies:*
The trainee should be aware of the roles for surgery, radiation therapy, and chemotherapy in primary and metastatic disease involving the CNS.

D. *Gastrointestinal Cancers:*
1. *Esophageal Cancer:* Trainees should appreciate the risk factors for esophageal cancer. They should know the indications for endoscopy in the diagnosis and staging of the disease. Trainees should learn the indications for nutritional support. They should recognize the importance of combined modality therapy, as well as the role of palliative chemotherapy and other supportive care measures.

2. *Gastric Cancer:* Trainees should recognize unique risk factors for gastric cancer. They should understand major surgical approaches to the disease and recognize the potentially curative role of surgery and the relative roles of combined modality therapy.
3. *Colon Cancer:* Trainees should appreciate the importance of surgical staging and recognize the indications for adjuvant therapies in colon and rectal cancers and the role of chemotherapy in advanced metastatic disease. They should recognize heritable types of colon cancer and the differences in their patterns of spread and their management. They should understand risk factors and rationale for screening for colorectal cancer, as well as its chemoprevention, and should appreciate the role of genetic testing.
4. *Anal Cancer:* Trainees should recognize the association of papilloma virus and anal cancer. They should appreciate the role of combined modality therapy in organ preservation.
5. *Hepatobiliary Cancers:* Trainees should understand the epidemiology and risk factors for hepatobiliary cancers. They should learn the roles of alpha-fetoprotein (AFP) in diagnosis, response assessment, and screening. They should know the indications for the curative role of surgery in localized disease and the role of chemotherapy as palliation.
6. *Pancreatic Cancer:* Trainees should appreciate the risk factors for the development of pancreatic cancer. They should know the unique genetic aspects of pancreatic cancer and be familiar with the roles of endoscopy and molecular diagnosis in pancreatic cancer. They should know that surgery has a curative role in rare patients and may provide palliation in others. Combined modality treatment may provide palliation in locally advanced disease.

E. Genitourinary Cancers:
1. *Renal Cell Cancer:* Trainees should understand the diagnostic aspects of renal cell cancer and be familiar with paraneoplastic aspects of the disease. They should appreciate the curative role of surgery in localized disease and the value of biologic therapies in the palliation of advanced disease. They should also understand the familial and genetic aspects of renal cell cancer.
2. *Urothelial cancers:* Trainees should know the risk factors for urothelial cancers, the differences between localized and invasive disease, and the propensity for transitional-cell carcinoma to recur. They should recognize the role of urine cytology and cystoscopy in the staging and follow-up of patients. They should know the role of intravesical therapy in the management of superficial bladder cancer as well as the role of surgery in early-stage invasive cancers. They should appreciate the value of combined modality therapy in locally advanced disease and the management of metastatic transitional-cell carcinoma.
3. *Penile Cancer:* Trainees should appreciate the role of human papilloma virus (HPV) in the etiology of penile cancers. They should know the potentially curative role of surgery.
4. *Prostate Cancer:* Trainees should understand the epidemiology and screening of prostate cancer. They should know the indications for prostate-specific antigen (PSA) in screening and follow-up of patients with prostate cancer. They should appreciate the importance of histologic grading. They should recognize the roles for surgery, radiation therapy, or observation in the management of early-stage disease, and the application of hormone therapy in advanced disease.
5. *Germ Cell Tumors:* Trainees should know the utility of tumor markers in the diagnosis, prognosis, and follow-up of patients. They should know the roles of surgery, diagnosis, staging, and treatment after chemotherapy. They should know that chemotherapy is curative in advanced disease. They should understand the roles of radiation therapy and chemotherapy in the treatment of seminoma.

F. *Gynecologic Malignancies:*
1. *Ovarian Cancer:* Trainees should recognize that a predisposition for ovarian cancer is heritable. They should understand the role of appropriate surgical procedures in the initial staging and initial treatment of patients and subsequent systemic treatment. They should appreciate the indications for chemotherapy in localized and advanced disease. Trainees also should be familiar with the current status of screening for ovarian cancer and which populations are most likely to benefit from this approach.

2. *Uterine Cancer:* Trainees should recognize the roles of hormones and hormonal therapies in the etiology of endometrial cancers. They should know the curative role of surgery in early-stage disease and the value of radiation therapy in the multidisciplinary approach of more advanced disease. They should recognize the role of chemotherapy and hormone therapy in the palliative management of metastatic disease.
3. *Cervical Cancer:* Trainees should have an appreciation of the role of HPV in the development of cancers of the uterine cervix. They should recognize the role of screening in the identification of localized disease and that surgery and radiation therapy play key roles in treatment. Moreover, they should understand the treatment of patients with advanced disease.
4. *Vulvar and Vaginal Cancers:* Trainees should know about the induction of clear-cell carcinoma of the vagina in women where the mother received diethylstilbestrol (DES) during surgery. They should understand proper surveillance and management of these individuals. Trainees should recognize the curative role of surgery in early-stage disease and the need for combination therapy in advanced disease.

G. *Head and Neck Cancers:*
Trainees should know how a proper head and neck examination is performed. They should know the risk factors for head and neck cancers and natural histories of the individual primary tumor sites. Staging of head and neck cancers should be emphasized as the proper evaluation for therapeutic recommendations. Panendoscopy is needed in staging patients. Trainees should recognize that staging is the basis for selecting surgery and/or radiation therapy as definitive treatment. They should be aware of the roles of chemotherapy, as neoadjuvant therapy, and palliation of advanced disease. They should recognize when organ preservation may be an option. They should be aware of the long-term management of these patients and of risks of second malignancies.

H. *Leukemia:*
The trainee should be familiar with all the pathologic and molecular biologic techniques (eg, cytogenetics, immunophenotyping, PCR) used in the diagnosis of leukemia. They should be familiar with the current treatment recommendations and their applications for ALL/AML in both the ''standard adult population'' as well as in the elderly.

1. *Acute Leukemias and Myelodysplasia:* Trainees should be familiar with the risk factors for developing leukemia. They should know the French-American-British (FAB) classification and its implications for treatment and prognosis. They should appreciate the potential use of marrow transplantation in patients with leukemia and the value of differentiation therapy.
2. *Chronic Leukemias:* Trainees should be able to distinguish the chronic leukemias on peripheral-blood smear. Trainees should understand the current therapeutic approaches in the treatment of the chronic leukemias in addition to understanding the expectations of chemotherapy. They should be aware of the indications for marrow transplantation.

I. *Lung Cancer:*
1. *Small-cell lung cancer:* Trainees should be familiar with the multimodality approach to limited-stage disease and the role of chemotherapy in prolonging the survival of patients with advanced disease. They should know the indications for CNS treatment.
2. *Non–Small-Cell Lung Cancer:* Trainees should be familiar with criteria of inoperability and the surgical and nonsurgical staging of patients with localized disease. They should be familiar with the use of chemotherapy and radiation therapy in locally advanced disease, and the role of chemotherapy and/or radiation therapy in the palliation of advanced disease.

J. *Lymphomas:*
Trainees should be familiar with the Ann Arbor Staging Classification as well as its strengths and limitations and current initiatives to improve upon the staging classification.
1. *Hodgkin's Disease:* Trainees should be experienced with the staging of Hodgkin's disease and the indications for surgical staging. They should be familiar with the curative role of radiation therapy in early-stage disease. They should know the indications for chemotherapy in stages II, III, and IV. Trainees should be aware of the long-term complications of treatment and know what is entailed in the follow-up of patients. They should appreciate

the indications for marrow transplantation in patients with relapsed or refractory disease.

2. *Non-Hodgkin's Lymphoma:* Trainees should be aware of the association of lymphomas with human immunodeficiency virus (HIV) and immunosuppression. They should be familiar with the REAL Classification and the International Prognostic Factors. They should recognize the curative role of chemotherapy and the value of marrow transplantation in relapsed or refractory disease. They should understand different types of low-grade lymphomas and appreciate when treatment is indicated and when observation is appropriate. They should appreciate the roles of radiation therapy, surgery, and chemotherapy in staging and treatment of intermediate-grade non-Hodgkin's lymphomas. They should know the challenge and unique clinical properties of high-grade lymphomas and the role for intensive treatment of this subgroup.

K. *Plasma Cell Dyscrasias:*
Trainees should know how to distinguish the plasma cell dyscrasias: MGUS, Waldenstrom's Macroglobulinemia, plasmacytoma, myeloma, POEMS, and plasma cell leukemia. They should know the indications for treatment in each instance.

L. *Sarcomas:*
1. *Bone Sarcomas:* The trainee should recognize the predisposing situation and condition for the development of primary bone sarcomas. They should appreciate the pathologic spectrum of these lesions and know indications and considerations for limb preservation and adjuvant chemotherapy and the role of combined modality therapy for specific tumors.
2. *Soft Tissue Sarcomas:* The trainees should know the appropriate surgery for initial diagnosis and the indications for limb preservation. They should recognize the roles of chemotherapy, surgery, and radiation therapy.

M. *Skin Cancers:*
1. *Melanoma:* Trainees should have an appreciation for the risk factors and varied clinical appearance of primary melanomas and its precursor lesions (such as dysplastic nevus). They should be able to recognize skin lesions that are benign from those that are potentially malignant. They should know the value of tumor depth and other prognostic factors in assessing prognosis. They should know what surgical procedure is required in making the diagnosis and curative resection. They should be aware of the indications for biologic therapies in the adjuvant setting and the potential risks and benefits of chemotherapy and in advanced disease. Trainees should have a working knowledge in the primary prevention of melanoma as well as the recognition and counseling of patients at high risk for developing melanoma.
2. *Basal Cell and Squamous Cell Cancers:* Trainees should recognize the clinical appearance of these lesions and appreciate that their occurrence is associated with sun exposure and may be a long-term complication of cancer therapy.
3. *Cutaneous T-Cell Lymphoma (CTCL):* Trainees should recognize the clinical appearance of patients at different stages of the disease. They should be aware of the value of immunophenotyping in the diagnosis. They should appreciate the roles of PUVA, radiation therapy, and topical chemotherapy in the initial management of patients. They should be aware of the palliative roles of chemotherapy, biologic agents, and radiation therapy in advanced or refractory disease.

N. *AIDS-Associated Malignancies:*
The trainee should be familiar with association of CNS tumor with immunosuppression and AIDS. The trainee should recognize the increased incidence of malignancy in the HIV-positive population. They should know the indications for treatment of those cancers and be aware of the potential for increased toxicities, attributable to concurrent medical problems. Trainees should know the appropriate prophylaxis and treatment for common opportunistic infections.

O. *Oncologic Emergencies:*
Trainees should recognize the clinical presentations that require immediate intervention. For patients in whom a diagnosis of cancer is suspected, the trainee should know the proper approach for obtaining a tissue diagnosis. They should know what therapy is required in the acute and chronic setting.

P. *Paraneoplastic Syndromes:*
Trainees should recognize the ''remote effects'' of malignancy, potentially manifested in every

organ system. They should recognize which malignancies are most commonly associated with the individual syndromes. Trainees should know the appropriate management of each syndrome.

IV. Marrow Transplantation

The trainees should understand the evolving use and indications for bone marrow transplantation (BMT) in various diseases (leukemia, lymphoma), both autologous and allogeneic. They should be familiar with the multiple complications of BMT, including veno-occlusive disease (VOD), graft-versus-host disease (GVHD), and infectious complications.

V. Supportive Care

A. *Growth Factors:*
The trainee should know the indications, proper use, and development of cytokines (see ASCO Guidelines JCO 12:2471-2508, 1994) and the use of other cytokines, such as erythropoietin.

B. *Infections and Neutropenia:*
The trainee should know the principles of diagnosis and management seen in all types of patients with cancer.

C. *Mucositis:*
The trainee should be able to distinguish mucositis, which is infectious, from that caused by chemotherapy. They should be aware of the need for pain medications and topical anesthetics as palliation.

D. *Transfusion:*
The trainee should know the indications for and complications of red-cell and platelet transfusions. They should be aware of the options regarding preparation and administration of those products.

E. *Marrow and Peripheral-Blood Progenitor Cells (PBPC):*
Trainees should be familiar with the methods for marrow and PBPC procurement and cryopreservation.

VI. Palliative Therapy

A. *Pain:*
Trainees should be adept in their ability to assess location and severity of pain. They should have a working knowledge of the World Health Organization (WHO) pain ladder and an understanding of the pharmacology and toxicity of the opioid narcotics. They should be able to manage cancer pain with the available modalities and recognize when referral for a surgical palliative intervention is indicated (see ASCO Cancer Pain Assessment and Treatment Curriculum Guidelines JCO 10:1976-1982, 1992).

B. *Antiemetics:*
Trainees should recognize the mechanism of action and pharmacology of current antiemetic agents in addition to knowing which ones are appropriate.

C. *Malignant Effusions:*
The trainee should have a working knowledge of the indications for pleurodesis or therapeutic paracentesis.

D. *Nutritional Support:*
Trainees should know the indications for and complications of enteral and parenteral support.

VII. Chemoprevention

Trainees should know the scientific basis for using naturally occurring or synthetic agents that reverse, suppress, or prevent development of an invasive cancer. They should be familiar with the clinical trials testing prevention hypotheses.

VIII. Screening

Trainees should understand the basic principles of screening and risk assessment. They should know the sensitivity and specificity of the test employed and the cost-benefit ratio. They should know the situations in which screening has a well-defined role (eg, PAP smear) and the many situations in which the role of screening is unclear or not defined (eg, PSA). They should be aware of the principles and indications for genetic screening and counseling.

IX. Psychosocial Aspects of Cancer

A. Trainees should know the psychosocial stages of cancer. They should be aware of available resources and recognize when intervention is indicated at all stages of disease.

B. The trainee should know the cultural issues that impact on the management of disease.

C. They should appreciate the spiritual conflicts associated with the diagnosis and treatment of cancer.

D. Trainees should learn to recognize adaptive and maladaptive behavior in coping with disease.

E. They should recognize acceptable coping mechanisms for patients and families within the context of the cancer diagnosis.

F. Trainees should have an awareness of the issues involved in end-of-life care.

G. The trainee should recognize that cancer impacts sexuality and may result in dysfunction as a result of the disease process, the treatment, or because of psychological effects.

H. Trainees should be familiar with the indication and uses of psychotropic drugs.
I. Trainees should have a knowledge of the bereavement process.
J. The trainee should have an appreciation of the physicians' personal coping.
K. Trainees also should know how to integrate family members, pastoral care, nursing support, hospice, and cancer support groups in the multidisciplinary treatment of patients.

X. Patient Education
A. *Genetics Counseling:*
The trainee should be capable of assessing the increased risk of cancer in the patient and the patient's family. They should be aware of the principles for genetic screening and counseling.
B. *Health Maintenance:*
The trainee should be capable of counseling the patient and their family about recognized risk factors for subsequent malignancy.
1. Diet
2. Smoking cessation
3. Alcohol
4. Sun exposure
C. Trainees should recognize long-term complications of each treatment modality employed including the following:
1. Risk of treatment-induced cancers (eg, AML after chemotherapy for Hodgkin's disease, radiation-induced sarcomas).
2. Endocrine dysfunction (eg, hypothyroidism after neck radiation, sterility with chemotherapy).
D. Awareness of chemoprevention measures/clinical trials.
E. Trainees should be aware of the appropriate testing and intervals for follow-up.

XI . Bioethics, Legal, and Economic Issues
A. The trainee should know the requirements for obtaining informed consent.
B. They should understand the ethics involved in the conduct of medical research.
C. They should know the legal issues related to institution of life support and withdrawal of life support systems.
D. Trainees should appreciate the cost effectiveness of medical intervention in the management of cancer.
E. Guidelines to define conflict of interest within professional activities.
F. Trainees must demonstrate professionalism and humanism in their care of patients and their families.

XII . Procedures
A. *Chemotherapy Administration:*
1. The trainee should have knowledge about the care and accessing of indwelling venous catheters.
2. Knowledge about acute toxicities of chemotherapy related to administration of drugs.
3. Administration of chemotherapy and biologics by all therapeutic routes.
4. Knowledge about the handling and disposal of chemotherapeutic and biologic agents.
B. *Bone Marrow Aspiration, Biopsy, and Interpretation:*
1. Trainees must demonstrate an ability to perform a marrow aspiration and biopsy. They should have an experience in the interpretation of marrow aspirations and biopsies.
2. Trainees should have a fundamental knowledge about marrow interpretation.
C. *Ommaya Reservoir and Lumbar Puncture:* Trainees must demonstrate an ability to perform a lumbar puncture and to administer chemotherapy by that route. Trainees must be capable of accessing and administering chemotherapy through an Ommaya reservoir.

XIII. Clinical Experience
A. *Inpatient Experience:*
1. Trainees should gain experience managing the complications of therapy requiring inpatient hospitalization.
2. Trainees should have practical experience managing neutropenic complications.
3. Trainees should have practical experience in the management of patients receiving high-dose chemotherapy.
B. *Outpatient Experience:*
1. Trainees should be exposed to patients with a full range of cancer diagnoses.
2. Trainees must manage patients in a longitudinal fashion.
3. Trainees should have experience providing patient care through home health agencies and also have the experience of introducing the concept of hospice to patients and their families.
4. Trainees must participate in multidisciplinary ambulatory cancer care.