

Recommendations for a Global Core Curriculum in Medical Oncology

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1. Introduction

The number of patients with malignancies in the world continues to increase. It is estimated that 10 million new cases are

diagnosed every year and that 2 million people are either receiving treatment or are living with their disease. The last decades have seen a rapid growth in medical technology and in the advances of fundamental knowledge of cancer cell biology with impact on genetics, screening, early diagnosis, staging, and overall treatment of cancer.

These developments have also led to a more coordinated, multidisciplinary approach to the management of the individual malignancy and the need to establish formal training based on a set of guidelines or a curriculum in the various major specialties such as surgery, radiotherapy, and medical oncology.

The foundation for the establishment of medical oncology as a speciality was created in 1965 when the American Society of Clinical Oncology (ASCO) was founded. A uniform system of training in medical oncology in the United States was formulated by the American Board of Internal Medicine in 1989 [1]. In 1997, ASCO published a training resource document for development of a curriculum in medical oncology [2].

The European Society for Medical Oncology (ESMO) started an examination in medical oncology in 1989 for physicians actively working in the field. To guarantee maintenance and update of the knowledge, skills, and attitudes of these physicians, which is essential to the provision of excellent care, the program of continued education of medical oncology, the ESMO-Medical Oncologist's Recertification Approval program, was introduced in 1994 [3].

The main objective of these certification systems is to improve the quality of patient treatment and care, to set standards of clinical competence for the practice of medical oncology, and encourage a continued scholarship for professional excellence over a lifetime of practice.

In 1998, a standard program of certification and training for medical oncology was published in accordance with the requirements imposed by the Union Européenne des Médecins Spécialistes for recognition of medical oncology as an independent discipline. At present, medical oncology is a recognized specialty in 14 countries in Europe.

Also, in other areas of the world, teaching and training programs in medical oncology have been developed.

With the increasing internationalization of health care, exchange of specialists, and rapid flow of information over borders, it is time to develop a set of common guidelines with a global perspective for the clinical training required for physicians to qualify as medical oncologists. Thus, a joint ESMO/ASCO Task Force has proposed this first Global Core Curriculum in Medical Oncology.

2. Standard requirements for training in medical oncology

The standard requirements are a total training period of 6 years, beginning with training in internal medicine for at least 2 years, followed by a training program in medical oncology for 3 to 4 years.

The 3- to 4-year training program in medical oncology must include a minimum of 2 years full-time clinical training in the diagnosis and management of a broad spectrum of neoplastic diseases.

Full-time clinical training means that at least 80% of the trainee's professional time and effort during a standard working week is dedicated to clinical activities (patient care or education). These may include the primary care of cancer patients, supervision of cancer patients on the general medical service or in designated medical oncology in-patient units, oncologic consultations and consultation rounds, oncology ambulatory care, scheduled clinical conferences, performance of procedures on patients, review of imaging, pathology, and other diagnostic materials, other direct patient care, attending national and international scientific meetings, and reading relevant literature.

Clinical activities may also include research involving patient contact, care, and treatment. Research experience for 1 or more years, including international training, is strongly recommended, especially for the oncologists who want an academic career.

3. Special requirements

3.1 Program leader

The medical oncology program leader must be qualified to supervise and educate trainees in medical oncology. Thus, the leader must either be certified in medical oncology or possess equivalent qualifications. The leader will have a major commitment to the training program and related activities, and must be based at the primary training site of the medical oncology program.

The trainee will maintain a record of training. The program leader will countersign it, as appropriate, to confirm the satisfactory fulfillment of the required training experience and the acquisition of the competencies that are cumulated in the speciality curriculum. It will remain the property of the trainee and must be signed at the annual assessments. The assessment of the trainee will be based on the standard format of annual reviews.

3.2 Faculty

3.2.1 Faculty members

The medical oncology program faculty must include a minimum of three full-time qualified teaching faculty members, including the program leader.

All the faculty members must be certified in medical oncology or possess equivalent qualifications, and each of them must devote substantial time (at least 10 hours per week) to teaching, research, administration, and/or the critical evaluation of the performance, progress, and competence of the trainees.

3.2.2 Faculty standards

The teaching staff must demonstrate an interest in teaching, and set an example for trainees by documented engagement in

the following pursuits: actively sharing in a medical oncology clinical practice; continuing his/her own medical education; active membership in regional, national and international scientific societies; active participation in research; and presentation and publication of scientific studies.

3.3 Educational program

The educational program in medical oncology must be organized to provide training and experience at a level high enough for the trainee to acquire the competency of a specialist in the field. The program must emphasize scholarship, self-instruction, development of critical analysis of clinical problems, and the ability to make appropriate decisions. Appropriate supervision of the trainees must be provided for the duration of their educational experience.

The following principles require special emphasis.

3.3.1 Educational environment

Medical oncology training programs must provide an intellectual environment for acquisition of the knowledge, skills, clinical judgement, and attitudes essential to the practice of medical oncology. This objective can only be achieved when appropriate resources and facilities are available. Service commitments must not compromise the achievement of educational goals and objectives.

3.3.2 Professionalism—ethics

Professionalism must be fostered during medical oncology training. In addition to mastering the comprehensive clinical and technical skills of the consultant medical oncologist, trainees are expected to maintain the values of professionalism. These values include placing the needs of one's patient ahead of one's self-interest, being responsive to the needs of society, and maintaining a commitment to scholarship and high standards of related research. Trainees, therefore, should be encouraged to participate in professional organizations, community programs, and institutional committees.

3.3.3 Responsibility

Lines of responsibility must be clearly delineated for the trainees in medical oncology.

3.3.4 Institutional requirements

3.3.4.1 Clinical setting

The clinical setting must include opportunities to observe and manage patients with a wide variety of neoplastic diseases on an in-patient and out-patient basis. The trainee must be given the opportunity to assume the continuing responsibility for both acute and chronically ill patients in order to learn the natural history of cancer, the extent of the effectiveness of the various therapeutic programs, and how to impart information to the patient, including bad news.

3.3.4.2 Hospital facilities

Modern in-patient, ambulatory care, and laboratory facilities necessary for the overall educational program must be

available and functioning. Specifically, at the primary site, there must be adequate pathology services, modern diagnostic radiology services, resources for nuclear medicine imaging, blood banking and blood therapy facilities, and facilities for clinical pharmacology and tumor immunology. A general surgical service and its support must be available, in addition to access to radiation therapy. The program must also include attendance at a multidisciplinary tumor conference, and clinical cancer protocol studies applied according to the guidelines for good clinical practice.

3.3.5 Update of skills and knowledge

Having obtained certification in medical oncology, the specialist is expected to update the acquired skills and knowledge by participating in Continuing Medical Education programs such as courses, symposia or self-learning processes on a regular basis.

3.3.6 Perception of other specialties

It is also essential to have the support of oncology nursing, pharmacy, rehabilitation medicine, palliative care medicine, and dietetic and psychosocial services so that the trainee can perceive the role of other specialties in the total care of the cancer patient.

3.3.7 Facilities

It is the responsibility of the teaching institute to oversee that these facilities are available before a graduate medical education program is initiated.

4. Competency comprising curriculum

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

4.1 Basic scientific principles

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

4.1.1 Cancer biology

Trainees should know the biology of normal cells and the basic processes of carcinogenesis. They should have an in-depth understanding of gene structure, organization, expression, and regulation. A fundamental understanding of the cell cycle, its control by oncogenesis, and its interaction with therapy is important. They should understand tumor cell kinetics, proliferation, and programmed cell death, and the balance between cell death and cell proliferation. Trainees should be familiar with molecular techniques, such as polymerase chain reaction, chromosomal analyses, and other techniques of molecular and tumor cell biology.

4.1.2 Tumor immunology

The trainee 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 inter-relationship between tumor and host immune systems, including tumor antigenicity, immune-mediated antitumor cytotoxicity, and the direct effect of cytokines on tumors.

4.1.3 Etiology, epidemiology, screening, and prevention

Trainees should have an understanding of the etiology of genetic and environmental factors in oncogenesis. They should have a basic knowledge in epidemiologic factors and descriptors of disease. 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 and the situations in which the role of screening is unclear or not defined. They should be aware of the principles and indications for genetic screening and counselling. They should know the value of prevention in cancer development and what primary, secondary, and tertiary preventive measures may be taken to prevent cancer development.

4.1.4 Clinical research including statistics

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 international cooperative groups or in-house protocols. That instruction should include the following: clinical trial design, phase I–II–III trials; review of the ethical, regulatory, and legal issues involved in study design; criteria for defining response to therapy; tools used to assess quality of life; basics of statistics, including statistical methods, requirements for patient numbers in designing studies, and proper interpretation of data; toxicity assessment and grading; role and functioning of the institutional review board and ethical committees; experience obtaining informed consent from patients; government regulatory mechanisms of surveillance; instruction in grant writing and information about mechanisms of support for clinical research; cost of therapy and the cost-effectiveness of therapy; instruction in preparing abstracts, oral and visual presentations, and writing articles; and they should be able to critically evaluate the scientific value of published articles and their influence on daily clinical practice.

4.2 Basic principles in the management and treatment of malignant diseases

The management of malignant diseases requires the expertise of many different medical subspecialties, and the majority of patients with malignant diseases are best managed in a multidisciplinary approach with integration of the various subspecialties because of increasing complexity of modern treatment.

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 trainees should interact with each of these disciplines in order to gain an appreciation of the benefits and limitations of each modality. Participation of the trainees in interdisciplinary meetings is encouraged. The 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 and be aware of the special conditions that influence the treatment of the growing population of elderly patients with malignant disorders.

4.2.1 Pathology/laboratory medicine/molecular biology

The trainee should know that the definite diagnosis of cancer is based on a cytology or biopsy. The trainees 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 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 markers (serum tumor markers, cell membrane markers, DNA markers) and recognize their limitations.

4.2.2 Staging procedures

Trainees should know the tumor–node–metastasis staging system and how to stage a cancer patient. They should know the indications for clinical, 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.

4.2.3 Therapy

4.2.3.1 Surgery

By interacting with surgeons, the trainee should develop an understanding of the indications and contraindications of 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 of 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 radiotherapy and/or anticancer agents. In addition, the trainees should be aware of postoperative complications.

4.2.3.2 Radiation oncology

The trainee should be familiar with the principles of radiation biology and the indications of 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 anticancer agents. They should recognize both the acute and late effects of radiation therapy.

4.2.3.3 Anticancer agents

Trainees should be familiar with the indications and goals of useful treatment with anticancer agents in primary and recurrent malignant disorders. They should know the usefulness of these agents in the neo-adjuvant, concomitant, and adjuvant setting. They should know the indications of anticancer agents as a radiation sensitizer. They should know the importance of dosing and treatment delay of specific anticancer agents. They should be able to assess a patient's comorbid medical conditions in order to determine the risk/benefit ratio of treatment with anticancer agents for that individual patient. Knowledge of the pharmacokinetics, pharmacogenomics, and pharmacology of the various agents should be obtained. Trainees should know the toxicity profile of each anticancer agent, including long-term hazards, how to adapt the dose and treatment schedule according to the individual patient in case of organ dysfunction, and how to handle these complications.

4.2.3.4 Biologic therapy

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

4.2.3.5 Supportive and palliative measurements

Trainees should know what supportive therapy during anticancer therapy is, and should be able to use supportive therapy. They should know the indications of the different supportive treatments and their limitations and side-effects. Trainees should know what palliative therapy is and should be able to determine when palliative care is indicated. They should know what palliative care and end-of-life care is and how to implement this in their clinical practice. They should know that palliative care is an integrated part of medical oncology, and that it has a multidisciplinary dimension.

4.2.3.5.1 Supportive measures:

4.2.3.5.1.1 Nausea and vomiting. The trainee should know the various etiologies of nausea and vomiting in patients with malignancies, and recognize the mechanism of action and pharmacology of anti-emetic agents and how to use them in daily clinical practice

4.2.3.5.1.2 Infections and neutropenia. The trainee should know the principles of diagnosis and management of infections and neutropenic fever in all types of cancer patients. They should know how to treat and prevent infections. They should know the indications of the use of hematologic growth factors.

4.2.3.5.1.3 Anemia. The trainee should know the indications and complications of red blood cell transfusions. They should be aware of the options regarding preparation and administration of these products. They should know the appropriate use of erythropoietin.

4.2.3.5.1.4 Thrombocytopenia. The trainee should know the indications and complications of platelet transfusions. They should be aware of the options regarding preparation and administration of these products.

4.2.3.5.1.5 Marrow and peripheral-blood progenitor cells. Trainees should be familiar with the methods for marrow and peripheral-blood progenitor cells procurement and cryopreservation.

4.2.3.5.1.6 Organ protection. The trainee should be familiar with the use of organ-protective measurements and treatments. They should know the indications and side-effects of different organ-protective agents. They should know the techniques of gonad preservation to ensure the fertility of the patient (cryopreservation techniques).

4.2.3.5.1.7 Mucositis. The trainee should be able to distinguish mucositis, which is infectious, from that caused by anticancer agents. They should be aware of the need for pain medication and topical anesthetics as palliation.

4.2.3.5.1.8 Malignant effusions. The trainee should know the signs, symptoms, and treatments and their indication of ascites and pleural and pericardial effusions. They should be able to treat effusions by paracentesis

4.2.3.5.1.9 Extravasation. Trainees should know that prevention is the most important factor in extravasation. They should be able to diagnose and treat extravasation.

4.2.3.5.1.10 Oncologic emergencies. Trainees should recognize the clinical presentations that require immediate intervention (e.g., spinal cord compression, pericardial tamponade). 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.

4.2.3.5.1.11 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.

4.2.3.5.1.12 Nutritional support. Trainees should know the indications for and complications of enteral and parenteral support.

4.2.3.5.2 Palliative care and end-of-life care:

4.2.3.5.2.1 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 pain ladder

and an understanding of the pharmacology and toxicity of the opiate narcotics and other analgesics. They should be able to manage cancer pain with the available modalities and recognize when referral for an invasive palliative intervention is indicated.

4.2.3.5.2.2 Other symptoms. Trainees should be able to palliate other symptoms (respiratory tract, gastrointestinal tract, neurologic symptoms, cutaneous and mucosal symptoms, anorexia and cachexia, dehydration). They should know how to handle end of life symptoms.

4.2.3.5.2.3 Communication. The trainees should be able to communicate with the patient and his family. They should be able to break bad news and act adequately in difficult situations. The trainees should learn to communicate and work together with other professional health care professionals in a team (e.g., nurses, social workers, psychologists).

4.2.3.6 Rehabilitation

The trainee should recognize the role of physical therapy, particularly in the postoperative setting. Trainees should recognize the role of occupational therapy, speech therapy, and swallowing therapy.

4.3 Management and treatment of individual cancers

Having understood the general principles of treatment, the trainee should be instructed in the care of individual cancer types and the unique considerations for each malignant disease. For each specific disease, the trainee should know the epidemiology, pathophysiology, genetics, signs and symptoms, diagnostic work-up, treatment, and follow-up. The trainee should be able to communicate and discuss these topics with the patients. For each tumor, specific items may be more important. They are stated below.

4.3.1 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 for staging. Trainees should recognize that staging is the basis for selecting surgery and/or radiation therapy as definitive treatment. They should be aware of the role of chemotherapy 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.

4.3.2 Lung cancer and mesothelioma

The trainees should be aware of the risk factors for developing lung cancer or mesothelioma.

4.3.2.1 Small-cell lung cancer

Trainees should be familiar with the multimodality approach to limited-stage disease and the role of chemotherapy in

patients with advanced disease. They should know the indications for central nervous system treatment.

4.3.2.2 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 value of surgery, chemotherapy, and radiation therapy in localized disease, often given as combined modality treatment, and the role of chemotherapy and/or radiation therapy in the palliation of advanced disease.

4.3.2.3 Mesothelioma

Trainees should be familiar with the risk factors for mesothelioma, criteria for operability, and the value of chemotherapy.

4.3.3 Gastrointestinal cancers

4.3.3.1 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.

4.3.3.2 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, as well as the role of palliative chemotherapy and other supportive measures.

4.3.3.3 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.

4.3.3.4 Anal cancer

Trainees should recognize the association of human papilloma virus and anal cancer. They should appreciate the role of combined modality therapy in organ preservation.

4.3.3.5 Hepatobiliary cancers

Trainees should understand the epidemiology and risk factors for hepatobiliary cancers. They should learn the importance of alpha-fetoprotein in diagnosis, response assessment, and screening. They should know the indications for the curative role of surgery in localized disease and the role of systemic and intra-arterial chemotherapy.

4.3.3.6 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. Also they should recognize the palliative role of chemotherapy in advanced disease.

4.3.4 Genitourinary cancers

4.3.4.1 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.

4.3.4.2 Urothelial cancers

Trainees should know the risk factors of 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 localized and urothelial disease and the management of metastatic transitional-cell carcinoma.

4.3.4.3 Penile cancer

Trainees should appreciate the role of human papilloma virus in the etiology of penile cancers. They should know the potentially curative role of combined modality treatment.

4.3.4.4 Prostate cancer

Trainees should understand the epidemiology and screening of prostate cancer, including the indications for prostate-specific antigen in screening and follow-up of patients with prostate cancer. They should appreciate the importance of histologic grading. They should recognize the role of observation, surgery, or radiation therapy in the management of early stage disease, and the application of hormone therapy and chemotherapy in advanced disease.

4.3.4.5 Germ cell tumors

The trainees should be able to classify patients according to the International Germ Cell Collaborative Group classification. Trainees should know the utility of tumor markers in the diagnosis, prognosis, and follow-up of patients. They should know the roles of surgery, radiotherapy, and chemotherapy. They should know that combination chemotherapy is curative in advanced disease.

4.3.5 Gynecologic malignancies

4.3.5.1 Ovarian cancer

Trainees should recognize that a predisposition of 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.

4.3.5.2 Uterine cancer

Trainees should recognize the role 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 also recognize the role of chemotherapy and hormone therapy in the management of both local and metastatic disease.

4.3.5.3 Cervical cancer

Trainees should recognize unique risk factors for cervical cancer. They should recognize that staging is the basis for selecting surgery and/or radiation therapy as curative surgery. They should appreciate the role of chemotherapy in the management of both local disease combined with radiotherapy and in the treatment of advanced disease.

4.3.5.4 Vulvar and vaginal cancers

Trainees should know about the induction of clear-cell carcinoma of the vagina in women whose mothers received diethylstilbestrol during pregnancy. 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.

4.3.6 Breast cancer

Trainees should have a working knowledge in the interpretation of a mammogram, ultrasound, and magnetic resonance imaging scan of the breast. They should recognize the pathologic and prognostic features that assist in determining the indications for therapy, including how to manage pre-neoplastic lesions. They should understand the issues that affect the choice of primary treatments, including the value of determination of receptors. They should appreciate the benefits of hormone therapy and/or chemotherapy in advanced disease and know the indications for adjuvant therapy. The role of elective chemotherapy regimens should be reviewed and understood. They should recognize the importance of family history and the role for genetic testing and counselling.

4.3.7 Sarcomas

4.3.7.1 Bone sarcomas

The trainee should recognize the predisposing situation and condition in 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.

4.3.7.2 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, including the specific medical treatment available for gastrointestinal tumors.

4.3.8 Skin cancers

4.3.8.1 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 counselling of patients at high risk for developing melanoma.

4.3.8.2 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.

4.3.9 Endocrine cancers

Trainees should know the specific diagnostic work-up and treatment of endocrine cancers. They should know that endocrine cancer may be part of a cancer syndrome due to specific genetic defects. They should know the role of anticancer drugs in the different endocrine cancers.

4.3.10 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 central nervous system.

4.3.11 Carcinoma of unknown primary site

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 in which treatment may affect survival, and when it is palliative.

4.3.12 Hematologic malignancies

4.3.12.1 Leukemia

The trainee should be familiar with all the pathologic and molecular biologic techniques (cytogenetics, immuno-

phenotyping, polymerase chain reaction) used in the diagnosis of leukemia. They should be familiar with the current treatment recommendations and their applications for acute lymphoblastic and myeloid leukemia in both the standard adult population and the elderly.

4.3.12.1.1 Acute leukemias and myelodysplasia:

Trainees should be familiar with the risk factors for developing leukemia: They should know the French-American-British 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.

4.3.12.1.2 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 treatment. They should be aware of the indications for marrow transplantation.

4.3.12.2 Lymphomas

Trainees should be familiar with the Ann Arbor Staging and World Health Organization classification as well as its strengths, limitations, and current initiatives to improve upon the staging classification.

4.3.12.2.1 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.

4.3.12.2.2 Non-Hodgkin's lymphoma:

Trainees should be aware of the association of lymphomas with HIV and immunosuppression. They should be familiar with the Revised European-American Lymphoma 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, including monoclonal antibodies 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.

4.3.12.2.3 Cutaneous T-cell lymphoma:

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 psoralen and ultraviolet A, 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.

4.3.12.3 Plasma cell dyscrasias

Trainees should know how to distinguish the plasma cell dyscrasias: monoclonal gammopathy of unknown significance, Waldenstroms, macroglobulinemia, plasmacytoma, multiple myeloma, POEMS (polyneuropathy, organomegaly, endocrinopathy, monoclonal protein, skin changes), and plasma cell leukemia. They should know the indications for treatment in each instance.

4.3.13 AIDS-associated malignancies

The trainee should be familiar with association of central nervous system tumors 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 of increased toxicities attributable to concurrent medical problems. Trainees should know the appropriate prophylaxis and treatment for common opportunistic infections.

5. Psychosocial aspects of cancer

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

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

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

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

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

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

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

Trainees should be familiar with the indication and uses of psychotropic drugs.

Trainees should have knowledge of the bereavement process.

The trainee should have an appreciation of the physicians' personal coping.

Trainees also should know how to integrate family members, pastoral care, nursing support, hospice, and cancer support groups in the multidisciplinary treatment of patients.

Trainees should be able to communicate with patients and their family. They should be able to break bad news and act

adequately in difficult situations. Trainees should learn to communicate and work together with other professional health care takers in a team.

6. Patient education

6.1 Genetic counselling

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 counselling.

6.2 Health maintenance

The trainee should be capable of counselling the patients and their family about known risk factors for subsequent malignancy: diet, smoking, alcohol, and sun exposure.

6.3 Long-term complications

Trainees should recognize long-term complications of each treatment modality employed including the following.

6.3.1 Risk of treatment-induced cancers. Acute myeloid leukemia after chemotherapy, and radiation induced sarcomas

6.3.2 Endocrine dysfunctions Hypothyroidism after neck radiation, sterility with chemotherapy

6.4 Chemoprevention measures/clinical trials

6.5 Testing and intervals for follow-up

7. Bioethics, legal, and economic issues

7.1 Informed consent

The trainee should know the requirements for obtaining informed consent.

7.2 Ethics

The trainee should understand the ethics involved in the conduct of medical research.

7.3 Legal issues

They should know the legal issues related to anticancer treatment, institution of life support, and withdrawal of life support systems.

7.4 Cost efficiency

Trainees should appreciate the cost effectiveness of medical intervention in the management of cancer.

7.5 Conflict of interest

The trainee should be aware of guidelines to define conflict of interest within professional activities.

7.6 Professional attitude

Trainees must demonstrate professionalism and humanism in their care of patients and their families.

8. Skills

8.1 Anticancer agent administration

The trainees should have knowledge of how to prescribe and safely administer anticancer agents. They should be able to care and access indwelling venous catheters. They should have knowledge about the handling and disposal of chemotherapeutic and biologic agents.

8.2 Bone marrow aspiration, biopsy, and interpretation

Trainees should be able to perform a marrow aspiration and biopsy. They should have an experience in the interpretation of marrow aspirations and biopsies. Trainees should have a fundamental knowledge about marrow interpretation.

8.3 Ommaya reservoir and lumbar puncture

Training must demonstrate an ability to perform a lumbar puncture and to administer chemotherapy by that route.

The trainee should be able to use a subcutaneous device to administer medication. He should be able to recognize and solve complications of such device. Trainees must be capable of administering chemotherapy through an Ommaya reservoir.

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References

1. American Board of Internal Medicine. Requirements for dual certification in hematology and medical oncology, 1989.
2. Training resource document for curriculum development in medical oncology. Adopted on February 20, 1997 by the American Society of Clinical Oncology. J Clin Oncol 1998; 16: 372–379.
3. Wagener DJ, Vermorken JB, Hansen HH et al. The ESMO-programme of certification and training for medical oncology. Ann Oncol 1998; 9: 585–587.