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Recommendations for a Global Curriculum in Medical Oncology

- 2010 Update -

ESMO/ASCO Recommendations for a Global Curriculum in Medical Oncology: 2010 Update

Members of the ESMO/ASCO Task Force for Global Curriculum in Medical Oncology

Hansen H Heine, Chair; The Finsen Center, University Hospital, Copenhagen Denmark

Bajorin Dean, Memorial Sloan-Kettering Cancer Center, New York, USA

Muss Hyman, University of North Carolina, Geriatric Oncology, Lineberger Comprehensive Cancer Center, Chapel Hill, USA,

Lopez Ivan Roberto, Centro Oncologico Punta Pacifica, Panama City, Panama

Purkalne Gunta, Stradins University Hospital, Riga, Latvia

Schrijvers Dirk, AZ Middelheim, Antwerpen, Belgium

Stahel Rolf, University Hospital, Laboratory for Molecular Oncology, Zurich, Switzerland

Authors of the ESMO/ASCO Global Curriculum in Medical Oncology 2010 updates:

Andre Fabrice, Institut Gustave Roussy, France

Berry Scott, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Canada

Bonvalot Sylvie, Department of surgery, Institut Gustave Roussy, Villejuif, France

Casali Paolo, Department of Cancer Medicine, Istituto Nazionale dei Tumori, Milan, Italy

Cherny Nathan, Cancer Pain and Palliative Medicine Service, Department of Medical Oncology, Shaare Zedek Medical Center, Jerusalem, Israel

Ciardiello Fortunato, Second University of Naples, Naples, Italy

Comans Emile FI, Department of Nuclear Medicine & PET research, VUmc, Amsterdam, The Netherlands

Felip Enriqueta, Institut Català de la Salut, Vall d'Hebron Hospitals, Barcelona, Spain

Fizazi Karim, Institut Gustave Roussy, Villejuif, France

Girard Nicolas, Department of respiratory medicine, Reference center for orphan thoracic diseases, Pilot unit for the management of rare intra-thoracic tumors, Louis Pradel Hospital, Lyon (Bron) Cedex, France

Hansen H Heine, The Finsen Center, University Hospital, Copenhagen Denmark

Hoekstra Otto, Department of Nuclear Medicine & PET research, VUmc, Amsterdam, The Netherlands

Hutchings Martin, The Finsen Center, University Hospital, Copenhagen, Denmark

Jost Lorenz, Kantonsspital Bruderholz, Basel, Switzerland

Kiss Alexander, Universitätsspital Basel, Psychosomatik, Basel, Switzerland

Koehne Claus-Hoenning - Städtisches Klinikum Oldenburg, Oldenburg, Germany

Kosmidis Helen, Children's Hospital of Athens, Athens, Greece

Kosty P. Michael, Scripps Green Cancer Center, La Jolla, USA

Licitra Lisa, Medical Oncology Head and Neck Unit, Istituto Nazionale dei Tumori, Milan, Italy

Loehrer Patrick, Indiana University Simon Cancer Center, Indianapolis, USA

Markman Ben, Centre for Cancer Research, Monash Institute of Medical Research, Monash University, Victoria, Australia

Mellstedt Hakan, Cancer Centre Karolinska, Department of Oncology, Karolinska University Hospital Solna, Stockholm, Sweden

Muss Hyman, University of North Carolina, Geriatric Oncology, Lineberger Comprehensive Cancer Center, Chapel Hill, USA

Pavlidis Nicholas, Department of Medical Oncology, Ioannina University Hospital, Ioannina, Ioannina, Greece

Pentheroudakis George, Department of Medical Oncology, Ioannina University Hospital, Ioannina, Ioannina, Greece

Poveda Andres, Area Clinica de Oncologia Ginecologica, Fundación Instituto Valenciano de Oncologí, Valencia, Spain

Punt J.A. Cornelis, Department of Medical Oncology, Radboud University Nijmegen, Medical Centre, Nijmegen, The Netherlands

Remick Scot, West Virginia University, Mary Babb Randolph Cancer Center, Morgantown, USA

Schapira Lidia, Massachussetts General Hospital, Boston, USA

Schmoll Hans-Joachim, Klinik für Innere Medizin IV, Onkologie/ Hämatologie/ Hämostaseologie am Universitätsklinikum

Schouten Harry, University Hospital Maastricht, Maastricht, The Netherlands

Senn Hans-Joerg, Tumorzentrum ZeTuP St.Gallen und Chur, (Tumordiagnostik, Behandlung und Prävention), St.Gallen, Switzerland

Sternberg Cora, Department of Medical Oncology, San Camillo Forlanini Hospital, Rome, Italy

Stiefel Friedrich, Service de Psychiatrie de Liaison – Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland

Stupp Roger, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland

Tabernero Josep, Medical Oncology Department, Vall d'Hebron University Hospital and Vall d'Hebron Institute of Oncology, Barcelona, Spain

Von Roenn Jamie, Northwestern University, Section of Medical Oncology, Northwestern Memorial Hospital's Palliative Care, Chicago, USA

Vogel Victor, Geisinger Medical Center, Cancer Institute, Danville, USA

Reviewers of the ESMO/ASCO Global Curriculum in Medical Oncology 2010 updates:

Bajorin Dean, Memorial Sloan-Kettering Cancer Center, New York, USA

Bokemeyer Carsten, University Clinic, Hamburg, Germany

Gradishar William J, Robert Lurie Comprehensive Cancer Center, Chicago, USA

Hansen H Heine, The Finsen Center, University Hospital, Copenhagen, Denmark

Kosty P Michael, Scripps Green Cancer Center, La Jolla, USA

Correspondence to:
European Society for Medical Oncology
ESMO Head office
Via Luigi Taddei 4
CH-6962 Viganello, Lugano
Switzerland
Phone: + 41 91 973 19 99
e-mail: globalcurriculum@esmo.org

ASCO International Affairs
2318 Mill Road Suite 800
Alexandria, VA 22314
USA
Phone: + 1 571 483 1502

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1. Introduction

The Recommendations for a Global Curriculum in Medical Oncology (GC) are a set of common guidelines with a global perspective for the clinical training required for physicians to qualify as medical oncologist. The overall goal of the curriculum is to ensure that patients, wherever they live, have an equal chance of receiving treatment from well-trained physicians.

In the years since the first edition of the ESMO/ASCO Global Curriculum (GC) for the training in medical oncology (1, 2) was published by both societies in 2004, the Global Curriculum (GC) Task Force has received feedback from all over the world, representing a variety of perspectives and experiences; various, mainly due to the variable status of cancer care around the globe, the diversity of health systems in different countries, and the varying degree to which Medical Oncology is established as a medical specialty in these countries. The curriculum is used in different settings in a number of countries, and it has been published in 11 different languages (Bulgarian, Chinese, English, French, German, Italian, Japanese, Latvian, Portuguese, Russian, and Spanish) (3, 4). In addition, the Union for International Cancer Control (UICC) has endorsed the curriculum.

The chapters included in this second edition of the curriculum are based on contributions from esteemed colleagues around the world and shaped to a significant degree by the rapid advances in the management of patients with malignant diseases in the short time since the first edition was produced. Treatment options now comprise increased use of multidisciplinary treatment and more specific treatment approaches for the individual patient as a result of research in molecular biology (e.g., targeted therapy). The GC Task Force therefore felt it was timely to update the curriculum content.

The updated Curriculum represents a broad range of recommendations to be adopted by national educational and health bodies according to the resources and conditions of their country. The diversity of health and educational systems around the world may render some Curriculum recommendations aspirational at this stage, even for those systems with well-developed training programs in Medical Oncology. Reflecting this aspirational nature of the recommendations, the Task Force has renamed the updated curriculum from Global Core Curriculum to Global Curriculum.

The number of patients with malignancies in the world continues to increase. It is estimated that more than 12 million new cases are diagnosed every year and the corresponding estimates for total cancer deaths is 7.6 million per year (about 20,000 cancer deaths a day) (5). The last decades have seen a rapid growth in medical technology and advances in our fundamental knowledge of cancer cell biology, with impacts 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 have only increased the need to establish formal training based on a set of guidelines or a curriculum in the various major specialities such as surgery, radiotherapy, and medical oncology.

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 1973 (6). In 1998, ASCO published a training resource document for development of a curriculum in medical oncology (7) and in 2005 issued a second edition (8).

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-**M**edical **O**ncologist's **R**ecertification **A**pproval program, was introduced in 1994 (9).

The main objectives of these certification systems are 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. With the increasing internationalisation of health care, exchange of specialists, and rapid flow of information across borders, it was important to develop a set of common guidelines with a global perspective for the clinical training required for physicians to qualify as medical oncologists. This led ESMO and ASCO to form a joint task force to prepare a global curriculum. The first edition of the Global Curriculum in Medical oncology was published simultaneously in The Journal of Clinical Oncology (2) and Annals of Oncology (1). The curriculum was distributed worldwide to universities, training hospitals, and medical oncology societies.

The Curriculum was very well received and it is used as a model for development of the speciality of medical oncology in several countries around the world; in some countries the program is implemented at universities, e.g. Japan, Ireland, Latvia, Australia, India, and Panama, and some countries (e.g., Spain) reported that their medical oncology training programs have much in common with the GCC standards (10). Since 2004, the Task Force has organized several implementation programs, including 3 Symposia in Nordic-Baltic countries and initial round-table discussion with representatives of regional and national societies in Latin America, universities, and teaching staff in cancer hospitals. Overall interest in curriculum issues remains strong (10), and upon request the committee recently published article about GC in the Magazine of German Cancer Society (11).

In 2009, the GC Task Force launched the Log Book as a supplement to the curriculum (12, 13), with intention to serve as a learning portfolio with a record of the various parts of the training program. The Log book was modelled upon experience of colleagues involved in the development of medical oncology curriculum by Medical Oncology Group of Australia (14), and with the idea that mentors at the end of the training period fill in the box corresponding to the trainee's current assessment. As a further step in the assessment of trainees' knowledge, the GCC Task Force currently is looking at the ASCO Medical Oncology In-Training Examination (15) as an additional tool for curriculum and trainee assessment. This six hour examination given annually in the United States and internationally helps establish consistency in educational standards and

allows evaluation of trainees' knowledge as they progress through the program. Another knowledge assessment tool is the ESMO Examination (9, 16), which has been open to its Junior members since 2004.

2. Standard requirements for training in medical oncology

The standard requirements are a total training period of a minimum of 5 years, beginning with training in internal medicine for at least 2 years, followed by a training program in medical oncology for a minimum of 2 years.

The training program in medical oncology must include full-time clinical training in the diagnosis and management of a broad spectrum of neoplastic diseases.

Full-time clinical training means that 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 to pursue 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 fulfilment 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 specialities

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 specialities 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 translational and 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 immune regulatory functions. They should understand the inter-relationship between the tumor and the host immune system, including tumor antigenicity, immune-mediated humoral and cellular antitumor cytotoxicity of the innate and adaptive immune system.

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 accuracy of the tests employed and their net benefit. 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 yet defined. They should be aware of the principles and indications for genetic screening, counselling, and risk reduction interventions. They should become familiar with options for chemopreventive interventions, especially in breast, colon and prostate cancer. They should know the difference and relative value of primary, secondary, and tertiary cancer preventive measures.

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, national 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; application of biomarkers; 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; 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 subspecialities, and the majority of patients with malignant diseases are best managed in a multidisciplinary approach with integration of the various subspecialities 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/translational research

The trainee should know that the definite diagnosis of cancer is based on cytology or histology 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. 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, treatment decision making, and follow-up of patients. They should appreciate the utility of biomarkers as prognostic indicators, as well as predictive indicators in personalized treatment choices. Trainees should be aware of potentials of translational research, as an important process to implement in patient care.

4.2.2 Imaging

Trainees should be familiar with the principles and actual conduct of any ordered imaging test to the extent that they can adequately inform patients about these procedures. Trainees should be able to formulate a specified question in a referral form, to provide a clinical differential diagnosis to the imaging specialist. Trainees should know which comorbidity or other clinical data to provide on the referral form, to allow for correct interpretation of the specific test result by the imaging specialist. Trainees should be able to formulate a typical diagnostic strategy for specific tumour types, and have a basic understanding of cost-effectiveness of those algorithms. Trainees should understand the potential and limitations of the tests that are relevant in the specific clinical context. Trainees should be familiar with pretest probabilities of disease in individual patients, and should be able to assess the potential impact of the test on management, given the expected impact on post-test probabilities. Trainees should be able to communicate with imagers about validation strategies upon test results. Trainees should be familiar with the RECIST response system, and with the potential and limitations of tests which are proposed to be used as alternative biomarkers of response to therapy.

4.2.3 Staging procedures

Trainees should know the tumor–node–metastasis (TNM) staging system and how to adequately 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.

4.2.4 Therapy

4.2.4.1 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. The trainee must understand the major importance of multidisciplinary decisions at the beginning of patient's disease, for a better outcome. The trainee should be a promoter of this systematic multidisciplinary strategy.

4.2.4.2 Radiation oncology

The trainees should be familiar with the basic principles of radiation biology, including the effects of time, dose, fractionation and type of radiation. They should have in-depth knowledge about the indications of palliative and curative radiotherapy, including adjuvant, neo-adjuvant, and concomitant radiotherapy. They should know the basic

principles of modern radiotherapy planning and dosimetry, and they should be familiar with special techniques such as IMRT, stereotactic radiation, brachytherapy, proton therapy, and radioisotope therapy. They should know the tolerance and toxicity in different normal tissues and organs, and the risk of acute, late and cumulative late effects of radiotherapy. They should be familiar with the interactions between radiotherapy and sequenced or concomitant systemic anti-cancer therapies.

4.2.4.3 Anticancer agents

Trainees should be familiar with the indications and goals of treatment with anticancer agents in primary and recurrent malignant disorders. They should know the usefulness of these agents in the neo-adjuvant, concomitant, adjuvant and predictive 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.

4.2.4.4 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, small tyrosine kinase inhibitors, tumor vaccines, and cellular therapy.

4.2.4.5 Complications of treatment

4.2.4.5.1 Infections

4.2.4.5.1.1 *Risk factors*

Trainees should have an awareness of factors that predispose the cancer patient to infectious complications. They should know how to prevent, minimize or treat the occurrence of such factors. They should be familiar with measures for infection control.

4.2.4.5.1.2 *Bacterial*

Trainees should know the principles of prevention, diagnosis and management of bacterial infections in cancer patients. They should be aware of the common causative organisms according to the anatomical site of infection. They should be familiar with the types of anti-bacterial agents available, their spectrum of activity and their potential for side effects and drug interactions.

4.2.4.5.1.3 *Viral*
Trainees should know the principles of prevention, diagnosis and management of viral infections in cancer patients. They should be familiar with the types of anti-viral agents available, their spectrum of activity and their potential for side effects and drug interactions.

4.2.4.5.1.4 *Fungal*
Trainees should know the principles of prevention, diagnosis and management of fungal infections in cancer patients. They should be familiar with the types of anti-fungal agents available, their spectrum of activity and their potential for side effects and drug interactions.

4.2.4.5.1.5 *Neutropenic fever*
Trainees should appreciate that fever in a neutropenic patient constitutes a medical emergency. They should be adept in the work up of a septic cancer patient with known or suspected myelosuppression and need to know how to manage these patients empirically and urgently. Trainees should be aware of stratification systems, such as the Multinational Association for Supportive Care in Cancer (MASCC) risk index, that can be used to identify lower risk febrile neutropenic patients and assist decisions to implement less intensive or outpatient treatment strategies. They should know the indications for the use of hematopoietic growth factors.

4.2.4.5.2 Other complications of treatment

4.2.4.5.2.1 Alopecia
Trainees should be aware of which anti-cancer therapies cause alopecia. They should recognise the psychological impact that alopecia can have on cancer patients. They should be able to counsel these patients and provide advice regarding wigs, scarves and other head coverings.

4.2.4.5.2.2 Bleeding and thrombosis
Trainees should be familiar with which therapies are associated with thrombotic complications, including tamoxifen, thalidomide and anti-angiogenic agents, and how to diagnose deep venous thrombosis, pulmonary embolism and arterial thromboembolic events. They should know other haemostatic complications of treatment, including bleeding secondary to thrombocytopenia and anti-angiogenic agents, as well as disseminated intravascular coagulation and other consumptive coagulopathies. They should know the indications for and complications of anti-coagulant therapy and transfusions of platelets and fresh frozen plasma.

4.2.4.5.2.3 Bone complications
Trainees should recognise the spectrum of complications of the skeletal system and the causative agents, including arthralgias secondary to aromatase inhibitors and taxanes, osteoporosis consequent to hormonal therapies, and osteonecrosis of the jaw related to use of bisphosphonates, and/or denosumab. Trainees should be aware of bone pain related to G-CSF and GM-CSF.

4.2.4.5.2.4 Cardiovascular toxicity

4.2.4.5.2.4.1 *Impaired cardiac function*
Trainees should be able to recognize which agents are associated with impaired cardiac function, including anthracyclines, trastuzumab and radiotherapy. They should know how to manage the spectrum of impairment, from asymptomatic reductions in left ventricular ejection fraction through to symptomatic cardiac failure.

4.2.4.5.2.4.2 *Cardiac ischemia*
Trainees should know how to diagnose and manage cardiac ischemia secondary to fluoropyrimidines or other anticancer agents.

4.2.4.5.2.4.3 *Arrhythmias*
Trainees should be able to diagnose and treat QTc prolongation that is seen with many small molecule targeted agents. They should also be familiar with relevant risk factors for the development of QTc prolongation, such as concomitant medications (including commonly used anti-emetics) and electrolyte disturbances (especially hypokalemia and hypomagnesaemia).

4.2.4.5.2.4.4 *Hypertension*
Trainees should know how to diagnose and treat hypertension that develops consequent to use of many anti-angiogenic agents.

4.2.4.5.2.5 Catheter management

4.2.4.5.2.5.1 *Infection*
Trainees should know practical implications for the use or contraindications for catheters or port devices. Trainees should demonstrate proficiency in aseptic technique related to central venous catheters. They should be able to recognise and treat catheter sepsis. They should know the indications for catheter removal.

4.2.4.5.2.5.2 *Thrombosis*
Trainees should be able to diagnose and treat catheter-associated thrombotic events.

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

4.2.4.5.2.6 Electrolyte disorders
Trainees should know that both cytotoxic agents (such as platinums) and anti-EGFR targeted therapies can cause derangements of serum electrolyte levels. They need to be familiar with the signs, symptoms and complications of disorders of calcium, magnesium, potassium, phosphorus and uric acid. They need to know how to manage treatment-related electrolyte abnormalities, including “tumor-lysis syndrome”.

4.2.4.5.2.7 Endocrine and metabolic complications

4.2.4.5.2.7.1 *Adrenal insufficiency*
Trainees should know the causes of adrenal insufficiency in cancer patients, in particular radiation, antibody therapies and sudden withdrawal of exogenous glucocorticoid therapy. They should recognise the clinical presentation and laboratory abnormalities. They should know the principles of management.

4.2.4.5.2.7.2 *Hypothyroidism*
Trainees should be able to diagnose and treat thyroid function derangements that occur with the use of some molecular targeted therapies, in particular the multi-targeted kinase inhibitors, as well as following radiation therapy to the head and neck region.

4.2.4.5.2.7.3 *Hyperglycaemia*
Trainees should be familiar with which agents are associated with elevated blood glucose levels, including corticosteroids and inhibitors of IGF-1R and the PI3K/mTOR pathway. They should know how to manage hyperglycaemia.

4.2.4.5.2.7.4 *Lipid disorders*
Trainees should know how to manage hypercholesterolemia and hypertriglyceridemia consequent to anti-cancer agents such as hormonal therapies and targeted therapies.

4.2.4.5.2.7.5 *Amylase/lipase elevations*
Trainees should be able to diagnose and manage elevations of lipase or amylase related to treatment, especially with targeted therapies.

4.2.4.5.2.8 Fatigue
Trainees should be aware of the multifactorial nature of fatigue in cancer patients and that all types of anticancer therapies can contribute. They should know pharmacological and non-pharmacological strategies to treat fatigue.

4.2.4.5.2.9 Gastrointestinal complications

4.2.4.5.2.9.1 *Nausea and vomiting*
Trainees should know the various aetiologies of nausea and vomiting in patients with malignancies. They should know types of emesis caused by chemotherapy agents (acute, delayed, anticipatory), and classification of chemotherapy agents according their emetogenicity potential (high-, moderate-, low- and minimal). Trainees should recognize the mechanisms of action and pharmacology of oral and intravenous anti-emetic agents and should know how to use them in daily clinical practice.

4.2.4.5.2.9.2 *Diarrhoea and constipation*
Trainees should know the various aetiologies of altered bowel habit in patients with malignancies, and recognise the mechanisms of action and pharmacology of aperients and anti-diarrheal agents and how to use them in daily clinical practice.

4.2.4.5.2.9.3 *Wound healing/Gastrointestinal perforation*
Trainees should be aware that use of anti-angiogenesis drugs (e.g. bevacizumab) is associated with impairment of wound healing and a certain risk of gastrointestinal perforation. They should know that these agents should be discontinued prior to and following surgery, whenever possible, for at least 4-6 weeks or until the wound is fully healed.

4.2.4.5.2.10 Hepatotoxicity
Trainees should know that both cytotoxic and molecular targeted therapies can cause hepatotoxicity. They should be able to diagnose and treat hepatotoxicity. Trainees should also be aware of hepatic venoocclusive disease as a possible complication of therapy.

4.2.4.5.2.11 Hypersensitivity
Trainees should know that cytotoxic agents and monoclonal antibodies can cause acute hypersensitivity reactions. They need to be able to efficiently recognise and treat these reactions. They should also know indications for pre-medication, alterations to administration of the causative agent and when to permanently discontinue a drug. Trainees should be able to diagnose and treat delayed hypersensitivity reactions secondary to anticancer agents, in particular small molecule inhibitors.

4.2.4.5.2.12 Infertility/sterility/sexuality
Trainees should be able to counsel patients and their families regarding the risks of infertility or sterility secondary to cancer treatments. They should be aware of the prevention and treatment strategies available to the patient, and when referral to a specialist fertility clinic prior to treatment initiation is indicated. Trainees need to recognise the physical and psychological impact on sexuality that cancer and cancer therapies can have on patients. They should facilitate open communication regarding sexuality and offer counselling including discussion of possible interventions.

4.2.4.5.2.13 Lymphedema
Trainees should be able to diagnose lymphedema secondary to axillary lymph node dissection, in particular for breast cancer and sarcomas, and be aware of the functional limitations it can cause. They should know and be able to communicate to patients preventative and/or treatment measures, and should refer patients to lymphedema clinics when necessary.

4.2.4.5.2.14 Myelosuppression
Trainees should recognize that myelosuppression is a frequent side effect of cancer therapies. They should know how to diagnose and treat myelosuppression, including the indications and complications of administering blood products, hematopoietic growth factors and antibiotics. They should be familiar with how the occurrence and severity of myelosuppression will influence decisions related to future cycles of chemotherapy.

4.2.4.5.2.15 Nephrotoxicity
Trainees should know which cytotoxics are associated with renal tract lesions including the direct nephrotoxicity of platinum agents and ifosfamide-induced hemorrhagic cystitis.

They should know measures to protect renal function when using these agents and be aware of how to diagnose and manage treatment-associated renal damage. Trainees need to know the renal complications of new molecular targeted therapies, including proteinuria consequent to VEGF inhibition and magnesium wasting following use of monoclonal antibodies against the EGFR.

4.2.4.5.2.16 Neurotoxicity
Trainees should know which cancer therapies are associated with neurotoxicity, including platinums, taxanes and vinca alkaloids. They should be able to assess the severity of neurotoxicity and indications for altering the dose or schedule of the causative agent.

4.2.4.5.2.17 Oral complications

4.2.4.5.2.17.1 *Mucositis*
Trainees should know how to prevent, diagnose and manage treatment-induced mucositis, with emphasis on good oral hygiene, pain control and management of secondary infection. They should be aware of the nutritional implications of more severe or prolonged episodes and the indications for and complications of enteral or parenterel alimentation.

4.2.4.5.2.17.2 *Xerostomia*
Trainees should recognise that xerostomia is a frequent complication of radiation treatment in the head and neck area that can be chronic and hence can increase the risk of oral and dental disease, and impair quality of life. They should know non-pharmacological and pharmacological treatment measures.

4.2.4.5.2.18 Pulmonary toxicity
Trainees should know the spectrum of pulmonary complications and which therapies are implicated in the cancer patient, including pneumonitis secondary to various anticancer therapies (e.g. bleomycin, radiation, and EGFR tyrosine kinase inhibitors). They should be aware of treatment options available.

4.2.4.5.2.19 Second malignancy
Trainees should be able to identify patients at high risk for second malignancies due to past cancer treatments. They should be able to implement effective screening methods when available.

4.2.4.5.2.20 Skin toxicity
Trainees should be able to diagnose and treat dermatological complications of anticancer therapies, including manifestations of hypersensitivity, cutaneous toxicity related to molecular targeted therapies (anti-EGFR agents, multi-targeted kinase inhibitors), and acute and chronic radiation induced skin damage. They should be aware that these changes can cause significant psychological stress to the patient, especially when manifest on exposed areas such as the face and arms.

4.2.4.6 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 that palliative care is an integrated part of medical oncology, and it has a multidisciplinary dimension.

4.2.4.6.1 Supportive measurements

4.2.4.6.1.1 Nausea and vomiting
Please see page 20.

4.2.4.6.1.2 Infections and neutropenia
Please see pages 17 and 18.

4.2.4.6.1.3 Anemia
Please see page 21.

4.2.4.6.1.4 Thrombocytopenia
Please see page 21.

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

4.2.4.6.1.6 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).

4.2.4.6.1.7 Mucositis
Please see page 22.

4.2.4.6.1.8 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 paracenthesis

4.2.4.6.1.9 Extravasation
Please see page 19.

4.2.4.6.1.10 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.

4.2.4.6.1.11 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.

4.2.4.6.1.12 Nutritional support
Trainees should know that nutritional support can help cancer patients to get the nutrients needed to maintain body weight. They should know the indications for and complications of all enteral and parenteral support.

4.2.4.6.2 Palliative care and end-of life care

4.2.4.6.2.1 The palliative care role of the oncologist
It is the oncologist's responsibility to care for their patient along a continuum that starts at the moment of diagnosis and extends throughout the course of the illness. In addition to appropriate anticancer treatment, this includes symptom control, psychosocial support and the coordination of services to provide continuity of care and family support during all phases of care, including the last phase of life.

4.2.4.6.2.2 Interdisciplinary care
Trainees should be aware that the management of patients with advanced cancer will usually require close cooperation with clinicians of other disciplines including nurses, social workers, anesthesiologists, palliative care clinicians, psychologists, psychiatrists, chaplains, rehabilitation, physical therapy, occupational therapy, speech therapy and dietitians.
Trainees should be skilled at interdisciplinary care planning and coordination.

4.2.4.6.2.3 Pain
Trainees must be expert in the assessment and management of cancer pain.

4.2.4.6.2.3.1 Pain assessment
Trainees should be skilled in the comprehensive assessment of pain from cancer and its treatment. They should have an understanding of the use of pain scales. They should understand the mechanisms and pathophysiology of cancer pain syndromes, and be familiar with the clinical features of the full range of cancer pain syndromes and the diagnostic approaches to identify them.

4.2.4.6.2.3.2 Pharmacotherapy
Trainees should have an essential knowledge of the pharmacology and toxicity of medications commonly used in the management of cancer pain. They should be experienced in the initiation of analgesic therapy, monitoring patients for adequacy of

pain relief and titration of analgesics. They must be skilled in the evaluation and management of opioid adverse effects. Trainees should be familiar with the use of adjuvant analgesics for the management of neuropathic, visceral and bone pain. They must be familiar with approaches to the management of breakthrough pain.

4.2.4.6.2.3.3 Primary therapies

Trainees must be familiar with the role of primary anti-cancer treatments for the relief of pain, including the roles of radiotherapy and surgery e.g. in the setting of spinal cord compression and impending fractures.

4.2.4.6.2.3.4 Difficult pain syndromes

Trainees must be familiar with the range of options available to patients with difficult or refractory pain syndromes including the indications for experts consultations with a pain or palliative medicine specialist, invasive or neuroablative procedures and sedation as an option of last resort for dying patients with refractory pain.

4.2.4.6.2.4 Symptom evaluation and management

Trainees should be familiar with the use of scales to evaluate common physical symptoms in patients with cancer including dyspnea, nausea and vomiting, constipation, diarrhea and cancer related fatigue.

4.2.4.6.2.4.1 Dyspnea

Trainees should be familiar with the differential diagnosis of dyspnea in the patient with advanced cancer. Trainees should be able to identify potentially remediable causes and be familiar with specific treatment modalities. Trainees should be familiar with the use of opioids for the management of symptomatic dyspnea.

4.2.4.6.2.4.2 Nausea and vomiting

Trainees should be familiar with the differential diagnosis of nausea and vomiting in the setting of advanced cancer and be able to identify potentially remediable causes. Trainees should have an understanding of the mechanism of action of antiemetics and their appropriate use for symptom control.

4.2.4.6.2.4.3 Constipation

Trainees should be familiar with the factors that contribute to constipation in patients with advanced cancer. Trainees should be able to distinguish constipation from bowel obstruction. Trainees should be familiar with approaches to prevent constipation, provide supportive counseling and prescribe rational pharmacotherapy for the treatment of constipation.

4.2.4.6.2.4.4 Diarrhea

Trainees should be familiar with the differential diagnosis of diarrhea in patients with advanced cancer. Trainees should be able to identify potentially remediable causes and identify patients at high risk for obstruction. Trainees should be familiar with treatment strategies for the various causes of diarrhea in patients with advanced cancer. In

particular, trainees should be familiar with treatment strategies for chemotherapy- and radiation therapy-induced diarrhea and neutropenic enterocolitis.

4.2.4.6.2.4.5 Cancer-related fatigue

Trainees should be familiar with the factors that contribute to fatigue in patients with advanced cancer and the expected occurrence and duration of treatment-related fatigue. Trainees should be able to identify potentially remediable causes and recommend appropriate pharmacologic and supportive approaches for fatigue.

4.2.4.6.2.4.6 Delirium

Trainees should be familiar with the differential diagnosis of delirium in patients with advanced cancer. Trainees should be able to identify its medical causes. Trainees should be familiar with treatment strategies for the various causes of delirium in patients with advanced cancer and the use of delirium with antipsychotic medications.

4.2.4.6.2.4.7 Anorexia/cachexia and starvation

Trainees should be able to differentiate between starvation and cancer cachexia. They should be familiar with the pathophysiology of cancer cachexia. They should be able to formulate rational therapeutic plans for patients with starvation syndromes and cancer cachexia, recognizing the potential benefits, limitations of benefit and risks of the various treatment options.

4.2.4.6.2.5 Management of the complications of cancer

Trainees must be expert in the evaluation and management of the complications of cancer including bone metastases, CNS (brain and leptomeningeal) metastases, liver metastases and biliary obstruction, malignant pleural, peritoneal and pericardial effusion, obstruction of hollow viscera, metabolic consequences of cancer, anorexia and cachexia, hematologic consequences, neurological dysfunction, and sexual dysfunction.

4.2.4.6.2.6 Communication

Trainees must be skilled in effective and compassionate communication with cancer patients and their families regarding diagnosis, treatment, prognosis, potential risks and toxicities and end of life care and deaths.

4.2.4.6.2.7 Cultural competence

Trainees should be familiar with the impact of culture on the management of patients with cancer. Trainees should be able to discuss specific cultural-based preferences with patients and their families. Trainees should appreciate the need for cultural sensitivity.

4.2.4.6.2.8 Evaluation and management of psychological and existential symptoms of cancer

Trainees should understand the psychosocial influence of cancer. Trainees should be aware of available resources and recognize when intervention is indicated at all stages of disease. Trainees should appreciate the spiritual conflicts associated with the diagnosis and treatment of cancer. Trainees should learn to recognize adaptive and maladaptive

behaviour in coping with disease. Trainees should recognize acceptable coping mechanisms by patients and families within the context of the cancer diagnosis.

Trainees should be familiar with the indication and uses of psychotropic drugs. They should have knowledge of the bereavement process. Trainees should have an appreciation of the physician's personal coping. They must be familiar with the evaluation and management of the common psychological and existential symptoms of cancer including distress; anxiety; depression; demoralization; loss of dignity; delirium; suicidality, desire for death and requests for euthanasia or assisted suicide; death anxiety; anticipatory grief; and uncertainty.

4.2.4.6.2.9 Self care
Trainees should recognize the factors that contribute to burnout and compassion fatigue. They should be able to differentiate depression from burnout. Trainees should develop a plan for self care that includes recognizing and monitoring for symptoms of burnout, addressing symptoms if they occur, maintaining work-life balance and seek consultation if the symptoms are progressive or severe.

4.2.4.6.2.10 End-of-life care
Trainees should be able to discuss discontinuation of antineoplastic therapies, transitions in care, the anticipated clinical course, signs and symptoms of imminent death and the strategy to ensure optimal patient comfort as well as family support

They should be aware of options for end-of-life care including home-based care, inpatient care and hospice care and should be able to help negotiate care preferences with the patient and their family. Trainees should be aware that many patients and families are concerned that their oncologist will abandon them at the end of life and should be aware of the need to maintain availability and support.

4.2.4.6.2.11Rehabilitation
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, prevention, pathophysiology, genetics, signs and symptoms, diagnostic work-up, treatment, follow-up, supportive and palliative measures. 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 the risk factors for head and neck cancers and natural histories of the individual primary tumor sites. They should understand the importance of HPV infection. For this reason, during the training an adequate head and neck patients case mix should be ensured, including, nasopharyngeal cancer, salivary gland and thyroid cancer. Radiological and clinical staging of head and neck cancers should be emphasized as the proper evaluation for therapeutic recommendations. Trainees should understand the central role of interdisciplinary cooperation. Trainees should be able to discuss within multidisciplinary meetings the role of medical treatment, being able to assess the aims and feasibility of medical treatment in patients. Trainees should be able to prepare for assessment of nutrition status, oral health status and to adapt treatment plan in respect to patients preferences, comorbidity, age, social environment and multidisciplinary decisions. Trainees should be able to assess and manage toxicity induced by multidisciplinary treatment and of medical treatment alone, to evaluate response and to plan for individualised fluorouracil-platinum regimen and the role of cetuximab. Trainees should be able to advise patients to change lifestyle to better tolerate treatment and to reduce incidence of second tumors.

4.3.2 Chest tumors

Trainees should be familiar with the risk factors for developing lung cancer and mesothelioma and the incidence and mortality of these two diseases. They should be aware of smoking cessation strategies and lung cancer screening studies. Trainees should know international histopathologic classification and staging system and the most frequent molecular alterations in lung cancer.

4.3.2.1 Small-cell lung cancer

Trainees should be familiar with the risk assessment work-up, the staging system and the prognostic factors for small-cell lung cancer patients. They should be aware of the role of chemotherapy in small-cell lung cancer treatment. They should be aware of the multimodality approach to limited-stage disease and know the indications for central nervous system treatment.

4.3.2.2 Non-small-cell lung cancer

Trainees should be familiar with the non-invasive and invasive risk assessment work-up, the staging system and the prognostic factors for non-small-cell lung cancer patients. They should know the criteria of inoperability. They should be familiar with the indications and value of surgery, chemotherapy, biologic agents, and radiation therapy in localized disease, often used in combined modality treatment. They should know the role of chemotherapy and biologic agents in patients with advanced disease. They should be aware of the management of Pancoast tumors. Trainees should be aware of individualized targeted therapies on the basis of molecular findings such as e.g. EGFR mutations. They should be aware of supportive care strategies in advanced disease.

4.3.2.3 Mesothelioma
Trainees should be familiar with the risk assessment work-up, the staging system and the prognostic factors for mesothelioma patients. They should be aware of the criteria for operability, and the role of chemotherapy. They should be aware of supportive care strategies.

4.3.2.4. Thymoma – Thymic carcinoma
Trainees should understand the rarity and the malignant potential of thymic tumors. Trainees should know the prognostic value of the Masaoka staging system. They should be familiar with the pathological classification, especially the distinction between thymoma and thymic carcinoma. Trainees should recognize paraneoplastic syndromes. Trainees should learn the diagnostic management of mediastinal tumors. Trainees should know the predominant role of surgery in the management of thymic tumors. They should appreciate the indications of adjuvant radiotherapy for resected tumors, and the role of induction chemotherapy for marginally-resectable tumors. They should know the respective value of surgery, radiotherapy, and chemotherapy for non resectable, recurrent or metastatic tumors.

4.3.3 Gastrointestinal cancers

4.3.3.1Esophageal 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, the use of neoadjuvant and adjuvant therapy, as well as the role of palliative chemotherapy including targeted agents and other supportive measures.

4.3.3.3 Colon cancer
Trainees should appreciate the importance of surgical and pathological staging and recognize the indications for adjuvant therapies in colon and rectal cancers and the role of chemotherapy and targeted agents in advanced metastatic disease. Trainees should understand the importance of molecular predictive factors for individual selection of chemotherapy and targeted agents. 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, 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 for hepatocellular carcinoma. They also need to know the options of endoscopic palliative measures such as stent insertion. They should know the indications for the curative role of surgery in localized disease, the role of systemic, and intra-arterial chemotherapy and targeted agents.

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 role of adjuvant chemotherapy and the palliative role of chemotherapy including targeted agents 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, the prognostic categories associated with good, intermediate and poor survival and be familiar with paraneoplastic aspects of the disease. They should appreciate the curative role of surgery in localized disease and the role of nephron sparing procedures in RCC as well as the increasing use of laparoscopy. They should the value of systemic therapies, including anti-angiogenic therapies and immunotherapies, in the palliation of advanced disease. The expanded role of molecular targeted treatments has dramatically changed the treatment paradigm of RCC. Palliation of advanced disease and improved survival has been obtained with the access to and approval of novel biologic agents in the last few years particularly directed against angiogenesis, the VEGF and m-TOR pathways. Results with adjuvant and neo-adjuvant targeted agents are investigational.

4.3.4.2 *Urothelial cancers*
Trainees should know the risk factors associated with urothelial cancers, the important differences between superficial and muscle invasive bladder cancer, and the propensity for transitional-cell carcinoma to recur and to metastasize. They should recognize the role of urine cytology, diagnostic imaging 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 that muscle invasive disease can be treated by neo-adjuvant cisplatin based chemotherapy and cystectomy, by cystectomy alone or by the combination of radio sensitizing chemo-radiation. These modalities have not been adequately prospectively compared. They should understand the studies that have been

performed in the neo-adjuvant and adjuvant setting. Diagnostic full body imaging is fundamental in the management of metastatic transitional-cell carcinoma. Combination cisplatin containing chemotherapy is considered the standard.

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 surgery and radiation treatment. Treatment of metastatic disease usually involves combination cisplatin based chemotherapy.

4.3.4.4 *Prostate cancer*
Trainees should understand the epidemiology and the controversies on the screening of prostate cancer, including the evidence for and against the use of PSA screening and the practical indication of serum PSA measurement in different clinical settings. They should understand the fundamentals of proper diagnosis in prostate cancer and the role of MRI. They should appreciate the importance of histologic grading. They should recognize the role of observation, surgery, and radiation therapy in the management of early stage disease, and the application of hormone therapy and chemotherapy in advanced disease. They should understand the lack of evidence to support early treatment in most patients (e.g. for rising PSA), and emerging evidence for intermittent treatment and for second and third line hormonal treatments. They should be aware of the side effects and toxicity associated with hormonal treatments and the results obtained with chemotherapy in patients who have become castration resistant. They should be aware of new lines of treatment after failure of standard hormone and standard docetaxel chemotherapy. They should know the implications of the oncogeriatric approach in this tumor of the elderly.

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, chemotherapy and surveillance. They should know about the significance of carcinoma in situ, and when to use surveillance strategies in non seminoma and in seminoma. They should know that combination chemotherapy is curative in the majority of cases of advanced disease and that both conventional and high dose therapy has a role in relapsed disease. They should also be aware of the spectrum of potential late toxicities in long term survivors with this 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 both chemotherapy and new targeted therapies in localized and

advanced disease. They should understand the role of pathology and molecular biology in ovarian cancer and its implication in the prognosis of these patients.

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 and the emerging role of systemic 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. They should understand the role of pathology and molecular biology in the development and prognosis of uterine cancer.

4.3.5.3 Cervical cancer

Trainees should recognize unique risk factors for cervical cancer. They should also be informed about prevention strategies with HPV vaccination. 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 and the emerging role of targeted therapies.

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. They should know the strong relationship within HPV infection and VIN lesions.

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. They should understand the issues that affect the choice of primary treatments, including the value of determination of receptors (ER, PR, Her2). They should know how to use first generation of molecular tests for prognosis including UPA/PA1, recurrence score, breast cancer gene signatures. They should know the indications for (neo)adjuvant therapy, and which regimen is optimal according to patient characteristics. They should recognize the common and rare adverse events of drugs in order to adapt follow-up and to propose appropriate management. The need, together with the risk, for biopsy of suspected metastatic lesions should be known. The expected benefit of angiogenesis inhibitors in the metastatic setting should be known. They should recognize the importance of family history and the role for genetic testing and counselling.

4.3.7 Sarcomas

The trainees should appreciate the epidemiology of sarcomas as a variegated family of rare cancers. They should know best referral options available in their region, in case of clinical suspect or established diagnosis. They should be aware of the main aspects of the natural history of sarcomas, as distinct from carcinomas, and the role of surgery, including principles of surgery in localized sarcomas and those with isolated lung metastases.

4.3.7.1 Bone sarcomas
The trainees should know the main symptoms and signs of bone malignancies. They should be aware of the main clinical features and distinct treatment strategy of osteosarcoma, Ewing's sarcoma, chondrosarcoma, other rare sarcomas (with regard to the different roles of surgery, radiation therapy, neoadjuvant and adjuvant chemotherapy).

4.3.7.2 Soft tissue sarcomas (STS)
The trainees should be aware of the therapeutic relevance of histological variety of STS, including the distinct treatment implications of extraskeletal Ewing's sarcoma and rhabdomyosarcoma. They should know the overall treatment strategy for localized adult-type STS. They should know which agents are active in the medical treatment of advanced adult-type STS.

4.3.7.3 Gastrointestinal stromal tumors (GIST)
The trainees should be aware of the general molecular biology, natural history, and principles of surgery of GIST. They should know how to use molecular-targeted therapy in GIST, whether localized or advanced, including how to assess tumor response.

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 tumour 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 of the potential risks and benefits of chemotherapy and biologic therapies 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.

4.3.9.1. Thyroid Cancer

Trainees should understand the tissue of origin and pathologic classification of thyroid cancers. They should know the epidemiology of thyroid cancers, and its relation to environmental factors and genetic factors. Trainees should be familiar with principles of the TNM revised staging system. They should learn the diagnostic management and biochemical thyroid function profile of patients with thyroid cancer. Trainees should know indications for use of imaging modalities for staging. They should learn indications for radical surgery, radiolabelled iodine ablation therapy and external beam radiotherapy, chemotherapy and novel targeted agents in the management of localized, locally advanced and metastatic thyroid cancers. Trainees should be familiar with the most important prognosticators (TNM stage, histological diagnosis and grade).

4.3.9.2 Neuroendocrine cancers

Trainees should understand the enterochromaffin tissue of origin of neuroendocrine tumors (NET) and the embryologic definitions of foregut, midgut, hindgut. They should know the epidemiology and natural history of neuroendocrine tumors. Trainees should become familiar with the pathologic classification of the neuroendocrine tumors (WHO) and the principles of the TNM-ENETS staging system. Trainees should learn the diagnostic management and clinical/biochemical picture of syndromes caused by production of active substances from various NETs. They should know indications for use of imaging modalities for staging of NETs. They should learn indications of radical and palliative surgery for the management of localized and locally advanced NETs. Trainees should familiarize themselves with therapeutic modalities in the management of patients with unresectable disease (somatostatin analogs, interferon, radiolabelled somatostatin analog therapy, chemotherapy, novel targeted agents). Trainees should become familiar with use of most important prognosticators (TNM stage, histological grade, primary organ of origin).

4.3.10 Central nervous system malignancies

The trainee should be able to take care of a patient with a CNS presentation of malignancy. He/she should be knowledgeable on the main steps of initial care and symptom control (e.g. use and dosage of corticosteroids and antiepileptics). Basic competence need to be demonstrated in the interpretation of standard diagnostic procedures, notably MRI and CT scan, the principles for an efficient and economical workup and the distinction of primary or secondary (metastatic) brain tumors.

Knowledge of the nosology of CNS malignancies are expected. The trainee should be able to describe the main categories of gliomas and their molecular characterization. He/she should know the main indications, risks and toxicity for surgery, chemotherapy, radiotherapy or combined chemoradiotherapy. He /she should know the most frequently

used chemotherapy regimens and the required associated supportive care measures. The basics of management of medulloblastoma, meningioma and primary CNS lymphoma are expected.

The trainee should be able to name the most frequent origins of CNS metastases. He/she should know the role and indications for surgery, radiotherapy or chemotherapy in brain metastases, inclusive prophylactic measures (e.g. prophylactic cranial irradiation, intrathecal chemotherapy).

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 based on risk classifications and their applications for acute lymphoblastic and myeloid leukemia in both the standard adult population and the elderly. They should be aware of the indications for marrow transplantation. They should understand that clinical trials are urgently needed to further develop the quality of care. In addition they should be able to provide appropriate supportive care.

4.3.12.1.1 Acute leukemias and myelodysplasia:

Trainees should be familiar with the risk factors for developing leukemia: They should know the WHO 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, recognise the differences between CML, CLL and hairy cell leukemia.and other malignancies with leukemic features. Trainees should understand the current therapeutic approaches in the treatment of these chronic leukemias in addition to understanding the expectations of treatment. They should be aware of the indications for marrow transplantation. They should also be aware of the current recommendations for follow-up.

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. They should be familiar with proper management starting from the appropriate ways to get the relevant diagnostic specimens, staging procedures as well as response evaluation including the whole body PET examination with its strength and

limitation. They should understand that treatment is based on lymphoma subtype and prognostic indices and know the International Prognostic Index. They should understand that clinical trials are needed to further develop the quality of care.

4.3.12.2.1 Hodgkin's disease
Trainees should be experienced with the staging of Hodgkin's disease. They should be familiar with the current treatment options in patients with different stages of the disease, (limited, intermediate or advanced disease). They should know the indications for chemotherapy and radiotherapy in the different stages I, 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 high dose chemotherapy and/or alogenic marrow transplantation in patients with relapse respecting refractory disease.

4.3.12.2.2 Non-Hodgkin's lymphoma
Trainees should be aware of the enormous heterogeneity of Non-Hodgkin's lymphomas and their clinical classification in indolent and aggressive lymphomas and the pathological classification according to the WHO. Trainees should be aware of the association of lymphomas with HIV and immunosuppression. They should be familiar with the classification and the different indexes used for staging. They should recognize the curative role of (immuno-) chemotherapy and the value of marrow transplantation in relapsed or refractory disease. They should understand different types of indolent 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 the treatment of aggressive non-Hodgkin's lymphomas. They should know the challenge and unique clinical properties of mantle cell lymphoma, diffuse large B-cell lymphoma, lymphoblastic lymphoma and Burkitt's lymphoma and the role for intensive treatment of the most aggressive forms.

4.3.12.2.3 Cutaneous T-cell lymphoma (CTCL)
They should be able to apply the diagnostic criteria of the EORTC/WHO classification and understand that the CTCL subtypes are unique diseases. In addition they should know that there are new staging systems available for Mycosis Fungoides (MF) and Sézary syndrome and for non MF cases. They should be aware that CTCL therapy in general is skin directed in early stages and includes biologic agents in more advanced once. Aggressive chemotherapy plays only a role in the minority of cases with special aggressiveness and very advanced stage.

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 staging, prognostic factors and the indications for treatment in each instance. They should know the role of new targeted drugs in the treatment of multiple myeloma. In addition, they should recognize the role of bisphosphonates.

4.3.12.4 Myeloproliferative neoplasms
Trainees should recognize the various form of myeloproliferative neoplasms (Polycytemia Vera, Essential Trombocytosis and Myelofibrosis), know the diagnostic criteria (including molecular mutations) and principles of treatment.

4.4 AIDS-associated malignancies
While the incidence of AIDS-defining malignancies has declined as a result of the use of combination, potent, highly-active antiretroviral therapy (HAART), this remains a significant health problem worldwide, particularly in poor-resource regions. The trainee should recognize the increased incidence of malignancy in the HIV-positive population, especially CNS and systemic lymphoma, cervical cancer and Kaposi's Sarcoma as well as other non-AIDS defining malignancies. They should know the indications for treatment of those cancers and be aware of the potential of increased toxicities attributable to concurrent medical problems and medications. Trainees should know the appropriate prophylaxis and treatment for common opportunistic infections as well as opportunities for early detection and prevention of malignancies.

4.5 Special issues in the diagnosis and treatment of cancers in adolescents
Trainees should be familiar with incidence and special characteristics of malignancies observed in adolescence (15-18 years). Trainees should acknowledge that adolescence is a short period of somatic, social and spiritual evolution and that most of cancers in this age group have worse prognosis compared to the same cancers in children. Trainees should know that tumors in this age group may be a) pediatric with late onset (sarcoma, medulloblastoma) b) adult type with early onset (thyroid cancer, melanoma) c) adolescent tumors (bone tumors, testicular tumors) and d) tumors occurring at any age (leukemia, lymphoma). Trainees should be capable in communicating the diagnosis, in treating and psychosocially supporting and caring for adolescents. Trainees should appreciate that in this special age group, support from other disciplines is crucial. Trainees should know that compliance is a great issue and that long term follow up is necessary. Trainees should be aware of late toxicity after treating cancer in adolescents.

4.6 Special issues in the diagnosis and treatment of cancers in young adults
Trainees should acquire theoretical background knowledge and clinical experience in the following aspects of cancer in young adult patients (age group 18-39): incidence and epidemiology of cancer in young adults; risk factors and known causes of tumors in young adult patients; appropriate diagnostic work-up and staging; multidisciplinary evaluation and management of these patients in collaboration with surgeons, radiotherapists, nurses, social workers, psychologists, physical therapists; administration of chemotherapeutic, hormonal and targeted agents; psychosocial counselling and support; communication with the patient and evaluation of prognosis; implementation of fertility preservation strategies and advice on future childbearing; patient counseling on healthy lifestyle modifications; follow-up for relapse, late toxicity after treatment; unmeet needs, organization and endpoints of clinical and translational research in young adults with cancer; and investigation of molecular biology of tumors affecting young adults.

4.7 Cancer and pregnancy

Trainees should acquire theoretical background knowledge and some degree of clinical experience in the following aspects of gestational cancer: incidence and epidemiology of cancer during pregnancy; appropriate diagnostic work-up of pregnant women and exposure to ionizing radiation associated with each procedure; administration of chemotherapeutic, hormonal and targeted agents during the various gestational periods, nature and risk of maternal/fetal side-effects; indications for termination of pregnancy; need for multidisciplinary management involving obstetricians, pediatricians, neonatologists and oncologists; maternal and fetal prognosis; patient and family counselling on issues such as management, toxic effects, disease control, fetal outcome, breast feeding, and future pregnancies.

4.8 Geriatric oncology

The trainee should be familiar with the epidemiology of cancer and aging including incidence and mortality rates by age for their region or nation. They should be familiar with physiologic changes that occur with aging and how these changes can effect treatment (for example chemotherapy drug dosing and toxicity, efficacy and safety of opioids, and the impact of polypharmacy). Trainees should be familiar with the components of geriatric assessment such as functional status, cognition, nutrition, and comorbidity and how such assessment may help in treatment selection as well as identify vulnerable and frail patients. They should be aware of geriatric syndromes such as falls, incontinence, and delirium, and learn to identify and manage depression in older cancer patients. Trainees should also be familiar with the psychosocial implications of age and cancer including personal care, homemaking, and legal and financial issues.

5. Psychosocial aspects of cancer

Trainees need to learn a conceptual framework for assessing a patient's psychosocial needs and provide timely and efficient referral to mental health professionals, social workers or chaplains depending on individual needs and available resources.

The trainee should show appreciation for the fact that cultural issues impact on the patient's experience of illness and affects their preference for disease specific therapy.

Trainees need to learn how to inquire about religious and spiritual beliefs and provide appropriate referrals.

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

They should acquire competence and familiarity in recognizing common coping mechanisms frequently used by patients and relatives in dealing with a crisis.

Trainees should develop competence in conducting a family meeting and providing clear guidance about end of life care.

The trainee should recognize that cancer impacts on body image and sexuality and may result in dysfunction as a result of multiple factors including the disease itself, treatments received or psychological consequences.

Trainees should be familiar with the indication and uses of psychotropic drugs for delirium, anxiety and depression.

Trainees should have knowledge of the bereavement process.

Trainees need to develop self awareness about the impact of their work on their own emotions and personal life. They should receive appropriate instruction and mentoring in order to develop healthy coping and problem-solving skills.
Trainees should be taught to work in multidisciplinary teams with nurses, chaplains, physical therapists, mental health professionals and referring physicians. They also need to develop collegial relationships with professionals delivering hospice care in the community setting.
Trainees should develop mastery in communication with patients and their families. They should receive instruction as well as coaching and feedback in the areas of collaborative decision-making, breaking bad news, discussing prognosis and goals of care.

6. Communications
Communication skills training has been shown to be effective to improve skills if the training is learner centered, use role play and structured feedback, and is conducted in small groups by trained facilitators. Follow up supervisions and booster sessions are recommended.

7. Patient education

7.1 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.

7.2 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.

7.3 Long-term complications
Trainees should recognize long-term complications of each treatment modality employed including the following:

- Risk of treatment-induced cancers, acute myeloid leukemia after chemotherapy, and radiation induced sarcomas
- Endocrine dysfunctions, hypothyroidism after neck radiation, sterility with chemotherapy.

7.4 Trainees should be aware of chemoprevention measures/clinical trials.

7.5 Trainees should be aware of testing and intervals for follow-up.

7.6 Trainees should be aware of developing depressive symptoms during/after therapy.

8. Bioethics, legal, and economic issues

8.1 Informed consent
The trainee should know the legal requirements for obtaining informed consent and the ethical principles that guide the process of patients making appropriately informed decisions regarding offered systemic therapies.

8.2 Research ethics
The trainee should understand the key ethical principles that guide the conduct of medical oncology research including respect for human dignity, respect for free and informed consent, respect for privacy and confidentiality, respect for justice and inclusiveness, and balancing harms and benefits.

8.3 Ethical and legal issues in end of life care
Trainees should understand the legal and ethical principles that guide the limits of care at the end of life including decisions regarding instituting, withholding and withdrawing life-sustaining treatments.
Trainees should be able to discuss an approach to end-of-life decision-making with capable people including advance care planning and working with substitute decision makers for those who are incapable. Trainees should be able to discuss the ethical and legal issues relevant to euthanasia/assisted suicide.

8.4 Cost-effectiveness of new cancer drugs
Trainees should understand how cost-effectiveness and cost-utility analysis of new cancer medications are determined. Trainees should understand the ethical, legal and health policy principles that govern the use of evidence, economic data and other relevant information used to make drug funding/coverage decisions for their patients

8.5 Conflict of interest
Trainees should understand the ethical principles that govern and guidelines that define conflict of interest within their professional activities.

8.6 Professional attitude
Trainees must demonstrate the highest standards of professionalism and humanism in their care of patients and their families

9. Cancer care delivery in low resource environments
Trainees should be familiar with the definitions of low and middle income countries (LMCs) and to understand that these LMCs include a range of nations which vastly differ in available resources, political and social conditions, and healthcare infrastructure. They should be familiar with the epidemiology of cancer in LMCs including incidence and mortality rates by regions of the world. They should understand the etiology of cancer in LMCs particularly as related to infectious diseases, including HIV-associated malignancies, and recognize opportunities for cancer prevention and early detection.

They should be familiar with common barriers to cancer control in LMCs including public awareness and education, healthcare provider training and workforce issues, financial resources, and governmental prioritization; they should understand how each barrier relates specifically to prevention, screening, treatment and palliation.

10. Skills

10.1 Anticancer agent administration

The trainees should have knowledge of how to prescribe and safely administer anticancer agents by both oral and parenteral routes. 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.

10.2 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.

10.3 Ommaya reservoir and lumbar puncture

Trainees 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.

10.4 Paracentesis, thoracentesis

Trainees must be exposed to the techniques of paracentesis and thoracentesis. They should be familiar with the indications for and administration of intraperitoneal chemotherapy, and the use of sclerosing agents for management of malignant pleural effusions. They should be familiar with the complications of these techniques and their management.

10.5 Tumor assessment

Trainees should have the ability to assess tumor size and response to therapy by physical examination and radiologic techniques. They should be familiar with RECIST response criteria and definitions of complete and partial responses, stable disease and progressive disease. They should understand the appropriate use of radiologic studies in the initial staging of patients and in the monitoring of response to treatment

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Conflict of interest disclosure

Member	Employment or Leadership Position	Consultant or Advisory Role	Stock Ownership	Honoraria	Research Funding	Expert Testimony	Other Remuneration
Scott R. Berry		Roche (M,C) Sanofi-aventis (M,C)		Amgen (M) Novartis (M) Roche (M) Sanofi-aventis (M)			
Michael P. Kosty				Genentech (M) Lilly (M) OSI Pharmaceuticals (M) Sanofi-aventis(M)	Genentech (M) OSI Pharmaceuticals (M) Sanofi-aventis (M)		
Patrick J. Loehrer		Aueon (M,C) ImClone Systems (M,C)			AstraZeneca (M) ImClone Systems (M) Lilly (M) Novartis (M)		
Hyman Bernard Muss		Abraxis BioScience (M,C) Boehringer Ingelheim (M,C) Genentech (M,C) Pfizer (M,C) Roche (M,C) Sandoz (M,C)					
Lidia Schapira							
Jamie H. Von Roenn							
Victor G. Vogel		Endece (M, C)					

KEY: **(M)** Myself **(I)** Immediate Family Member **(B)** Myself and Immediate Family Member **(U)** Uncompensated **(C)** Compensated

Member	Employment or Leadership Position	Consultant or Advisory Role	Stock Ownership	Honoraria	Research Funding	Expert Testimony	Other Remuneration
Andre Fabrice							
Bonvalot Sylvie				Novartis	PharmaMar		
Casali Paolo		Merck Glaxo SK Infinity Novartis Pfizer PharmaMar Sanofi-Aventis		Novartis Pfizer	Amgen Merck Glaxo SK Eli Lilly Novartis Pfizer PharmaMar Sanofi-Aventis Schering-Plough		Novartis PharmaMar
Cherny Nathan							Perdue Pharma
Ciardiello Fortunato							
Comans Emile FI							
Felip Enriqueta							
Fizazi Karim							
Girard Nicolas							
Hansen H. Heine							
Hoekstra Otto							
Hutchings Martin							
Jost Lorenz							
Kiss Alexander							
Koehne Claus-Hoenning		Merck Pfizer Amgen Sanofi-Aventis Roche		Merck Pfizer Amgen Sanofi-Aventis Roche			
Kosmidis Helen							
Licitra Lisa							

Markman Ben							
Mellstedt Hakan							
Member	**Employment or Leadership Position**	**Consultant or Advisory Role**	**Stock Ownership**	**Honoraria**	**Research Funding**	**Expert Testimony**	**Other Remuneration**
Pavlidis Nicholas							
Pentheroudakis George							
Poveda Andres							
Punt J.A. Cornelis							
Schmoll Hans-Joachim							
Schouten Harry							
Senn Hans-Joerg							
Sternberg Cora							
Stiefel Friedrich							
Stupp Roger							
Tabernero Josep							