# ESMO / ASCO Recommendations for a Global Curriculum in Medical Oncology Edition 2016

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## ABSTRACT

The European Society for Medical Oncology (ESMO) and the American Society of Clinical Oncology (ASCO) are publishing a new edition of the ESMO/ASCO Global Curriculum (GC) thanks to contribution of 64 ESMO-appointed and 32 ASCO-appointed authors. First published in 2004 and updated in 2010, the GC edition 2016 answers to the need for updated recommendations for the training of physicians in medical oncology by defining the standard to be fulfilled to qualify as medical oncologists. At times of internationalisation of healthcare and increased mobility of patients and physicians, the GC aims to provide state-of-the-art cancer care to all patients wherever they live. Recent progress in the field of cancer research has indeed resulted in diagnostic and therapeutic innovations such as targeted therapies as a standard therapeutic approach or personalised cancer medicine apart from the revival of immunotherapy, requiring specialised training for medical oncology trainees. Thus, several new chapters on technical contents such as molecular pathology, translational research or molecular imaging and on conceptual attitudes towards human principles like genetic counselling or survivorship have been integrated in the GC. The GC edition 2016 consists of 12 sections with 17 subsections, 44 chapters and 35 subchapters, respectively. Besides renewal in its contents, the GC underwent a principal formal change taking into consideration modern didactic principles. It is presented in a template-based format that subcategorises the detailed outcome requirements into learning objectives, awareness, knowledge and skills. Consecutive steps will be those of harmonising and implementing teaching and assessment strategies.

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## 1 INTRODUCTION

**Christian Dittrich**
**Michael Kosty**

With the increasing internationalisation of healthcare as well as the increased exchange of specialists and knowledge across borders, the European Society for Medical Oncology (ESMO) and the American Society of Clinical Oncology (ASCO) identified more than a decade ago the need for a set of international recommendations for the clinical training of physicians to qualify them as medical oncologist. Patients, wherever they live, should have an equal chance of receiving state-of-the-art treatment from well-trained physicians.

In 2004, a joint ESMO/ASCO Task Force produced the first outline for a Global Core Curriculum (GCC) for training in medical oncology. This outline was subsequently distributed to universities as well as medical oncology societies and was simultaneously published in the *Annals of Oncology* and the *Journal of Clinical Oncology*.[1 2] The Global Curriculum (GC) Task Force also produced a Log Book as a support tool for medical oncologists in training and their supervisors with the purpose of keeping a record of oncology trainees' educational programmes and their progress.[3 4]

Interest in using the GCC outline has increased considerably since its inception, as evidenced by translations in different languages available on the ESMO and ASCO websites.[5 6] It is also used as a model for the development of the specialty of medical oncology in several countries around the world. The GCC was updated in 2010.[7 8] The corresponding Log Book was updated in 2016 by the Global Curriculum Working Group (GC WG) which evolved from the GC Task Force.[9 10]

In 2011, the European Commission based its formal recognition of medical oncology as a medical specialty on the recommendations of the ESMO/ASCO GC.[11]

The Curriculum 2010 covered a broad range of recommendations to be adopted by national educational and health authorities and to be implemented according to the resources and conditions of their countries. Furthermore, it was perceived that the diversity of health and educational systems around the world may have rendered some curriculum recommendations aspirational at the stage of its implementation, even for those systems with well-developed training programmes in medical oncology. Reflecting this aspirational nature of the recommendations, the former GC Task Force had changed the updated Curriculum title from 'Global Core Curriculum' to 'Global Curriculum'.

An analysis of the ESMO GC European Landscape data still identified a high degree of heterogeneity, mainly at the organisational level as well as in the duration and structure of the internal medicine part of the training in medical oncology in Europe.[12] This heterogeneity relates to whether or not medical oncology is recognised as separate specialty in each country and to the degree of adoption, adaptation and applicability of the GC recommendations by the different countries in Europe. Despite the unequivocal progress towards the establishment of medical oncology and the harmonisation of its implementation in Europe and beyond, this effort has to be pursued further.

Important advances in medical oncology have been achieved in recent years, notably in the integration of molecular pathology and molecular profiling to determine the presence of biomarkers as a rationale for the appropriate selection of new therapies. The unequivocal demands of personalised medicine and of completely different developments like the constantly increasing survivorship community—to mention two examples of the changes in oncology over the last few years—have let us to prepare a new edition of the GC.

With regard to content, multiple changes and innovations have been taken into account in the GC 2016, such as:

- targeted therapies are integrated into the (sub)chapters of the separate tumour entities wherever suitable;
- immunotherapy is presented in a new separate chapter to reflect its actual impact;
- biological therapy and immunotherapy are now presented in separate chapters;
- pathology, molecular pathology, laboratory medicine, translational research and principles of personalised cancer medicine have been transformed into separate chapters due to their importance, accepting therewith even some unavoidable overlap;
- tumour immunology has been separated into 'tumour immunology' which was kept under 'basic scientific principles', and into 'immunotherapy' which was shifted as separate chapter to the subsection 'therapy';
- imaging and molecular imaging have been separated into two chapters and are followed by the additional chapter on 'RECIST';
- rare cancers have been established as a novel subsection;
- cancer treatment in patients with comorbidities is treated in a new subsection;
- genetic counselling is given increased attention due to its emerging role in the clinical routine as a separate section;
- survivorship with its tremendously increasing impact is presented in a separate section.

There exist general attitudes or conceptions, respectively, which are of importance for several or all tumour entities; therefore, separate (sub)sections have been dedicated to them:

- integration of palliative or supportive care measures;
- consideration of psychosocial aspects;
- consideration of adequate communication;
- provision of bioethical, legal or economic issues.

In addition to the integration of novel contents, it seemed necessary to change the format of the GC 2016 according to actually acknowledged pedagogical principles. Therefore, a template-based framework is used that subcategorises the quality of the outcome requirements of detailed learning objectives into awareness, knowledge and skills, where appropriate. As far as applicable,

the more general teaching items are also presented in this new format.

References provided in the GC 2016 can be used for the training and the individual information, but the trainees should feel stimulated not only to restrict their learning process to these citations but also to use other sources such as guidelines or e-learning tools offered by the two carrier societies and by other authorities.

Although the GC 2016 is very comprehensive, it does not claim to be a textbook. Moreover, it is the intention of the GC to represent a meticulously structured collection of requirements to be fulfilled in order to qualify as medical oncologist. A corresponding Log Book for the documentation of the assessment of the learning progress according to the GC 2016 will follow.

**References**


1. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *Ann Oncol* 2004;15:1603–12.
2. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *J Clin Oncol* 2004;22:4616–25.
3. ESMO/ASCO Global Core Curriculum for training in medical oncology, Log Book, 2008. https://www.esmo.org/content/download/8176/168808/file/The-ESMO-ASCO-Global-Core-Curriculum-for-Training-in-Medical-Oncology-Log-Book.pdf
4. ESMO/ASCO Global Core Curriculum for training in medical oncology, Log Book, 2008. http://www.asco.org/sites/new-www.asco.org/files/content-files/international-programs/documents/2008-ESMO-ASCO-Log-Book-pdf.pdf
5. ESMO/ASCO recommendations for a Global Curriculum in medical oncology. http://www.esmo.org/Career-Development/Global-Curriculum-in-Medical-Oncology
6. ESMO/ASCO recommendations for a Global Curriculum in medical oncology. http://www.asco.org/international-programs/global-curriculum
7. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 Update. https://www.esmo.org/content/download/8171/168764/file/ESMO-ASCO-Revised-Recommendations-for-a-Global-Curriculum-in-Medical-Oncology.pdf
8. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 Update. http://www.asco.org/sites/default/files/esmo-asco_revised_recommendations.pdf
9. ESMO/ASCO Global Curriculum for training in medical oncology, Log Book, second edition, 2016. http://www.esmo.org/content/download/81967/1487517/file/The-ESMO-ASCO-Global-Curriculum-for-Training-in-Medical-Oncology-Log-Book-2016.pdf
10. ESMO/ASCO Global Curriculum for training in medical oncology, Log Book, second edition, 2016. https://www.asco.org/sites/new-www.asco.org/files/content-files/international-programs/documents/2016-ESMO-ASCO-Log-Book-interactive.pdf
11. The European Parliament and the Council of the European Union. Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications (text with EEA relevance). *OJ* 2005;L255:22–142.
12. Pavlidis N, Alba E, Berardi R, *et al*. The ESMO/ASCO Global Curriculum and the evolution of medical oncology training in Europe. *ESMO Open* 2015;1. doi: 10.1136/esmoopen-2015-000004.


## 2 STANDARD REQUIREMENTS FOR TRAINING IN MEDICAL ONCOLOGY

**Michael Kosty**
on behalf of the ESMO/ASCO GC Working Group

The standard requirement is for a total training period of at least 5 years, beginning with training in internal medicine for 2–3 years, followed by a training programme in medical oncology for a minimum of 2–3 years.

The training programme in medical oncology must include full-time clinical training in the diagnosis and management of a broad spectrum of neoplastic diseases comprising solid tumours and haematological malignancies. Trainees should have access to a wide variety of general and specialty consultative support, including general surgery and surgical subspecialties, internal medicine and its subspecialties, as well as pathology, laboratory medicine, diagnostic and therapeutic radiology, psychiatry, neurology, physiotherapy and nutrition.

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 patients with cancer, supervision of patients with cancer on the general medical service or in designated medical oncology inpatient units, oncological consultations and consultation rounds, oncology ambulatory and day unit 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. There should be multidisciplinary tumour conferences held on a regular basis, and trainees should be active participants in these conferences.

Clinical activities may also include research involving patient contact, care and treatment. Research activities of a maximum of 6 months may be counted for the total training period of at least 5 years. Research experience of longer duration, including international training, is strongly recommended, especially for oncologists who want to pursue an academic career.

**References**


1. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *Ann Oncol* 2004;15:1603–12.
2. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *J Clin Oncol* 2004;22:4616–25.
3. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. https://www.esmo.org/content/download/8171/168764/file/ESMO-ASCO-Revised-Recommendations-for-a-Global-Curriculum-in-Medical-Oncology.pdf
4. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. http://www.asco.org/sites/default/files/esmo-asco_revised_recommendations.pdf


## 3 SPECIAL REQUIREMENTS

**Nagi El-Saghir**
**Jean-Pierre Lotz**
on behalf of the ESMO/ASCO GC Working Group

### 3.1 Programme Leader/Director of Medical Oncology Training Programme

The Medical Oncology Programme Leader (or Director of Medical Oncology Training Programme) must be qualified to supervise and educate trainees in medical oncology. Thus, the leader must be certified in medical oncology or possess equivalent qualifications. The leader will have a major commitment to the training programme and related activities, and must be based at the primary training site of the medical oncology programme.

The trainee will maintain a record of his/her training. The programme leader will countersign it, as appropriate, to confirm the satisfactory fulfilment of the required training experience and the acquisition of the competencies that are gained in the specialty curriculum. The record will remain the property of the trainee and must be signed at the annual reviews by the responsible programme leader/director of medical oncology training programme.

## 3.2 Faculty

### 3.2.1 Faculty members

The medical oncology programme faculty must include a minimum of three full-time, qualified teaching faculty members, including the programme 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 clinical rounds, teaching and research, with the trainees as well as to 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 the personal experience of working in a medical oncology clinical practice and multidisciplinary team; continuing his/her own medical education; active membership in regional, national and international scientific societies; ideally active participation in research and presentation and publication of scientific studies.

## 3.3 Educational Programme

The educational programme in medical oncology must be organised to provide training and experience at a level high enough for the trainee to acquire the competency of a specialist in the field. The programme must emphasise scholarship, self-instruction, development of critical analysis of clinical problems and the ability to make appropriate decisions, in addition to active involvement in regularly scheduled conferences and multidisciplinary clinics and/or tumour boards. Appropriate supervision of the trainees must be provided for the duration of their educational experience. The programme should foster all aspects of the roles required of an oncologist, including being an effective communicator with patients, a collaborator in the treatment team, a manager of the healthcare system, a health advocate not just for the patient but for the community and a scholar with lifelong commitment and high professional ethics and standards.

The following principles require special emphasis:

### 3.3.1 Educational environment

Medical oncology training programmes must provide an intellectual environment for acquisition of the knowledge, skills, clinical judgement and attitudes essential to the practice of medical oncology in the context of multidisciplinary care. 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

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 encouraged to participate in the educational activities of professional organisations, community programmes and institutional committees.

### 3.3.3 Responsibility

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

### 3.3.4 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 programmes such as courses, symposia or self-learning processes on a regular basis.

### 3.3.5 Perception of other specialties

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

### 3.3.6 Institutional requirements

#### *3.3.6.a Clinical setting*

The clinical setting must include opportunities to observe and manage patients with a wide variety of neoplastic diseases on an inpatient and outpatient basis. The trainee must be given the opportunity to assume the continuing responsibility for acute and chronically ill patients in order to learn the natural history of cancer, the extent of the effectiveness of the various therapeutic programmes and how to impart information to the patient, including bad news. The scenario should include everything from prevention, treatment, to the long-term follow-up of patients with cancer.

#### *3.3.6.b Hospital facilities*

Modern inpatient, ambulatory care and laboratory facilities necessary for the overall educational programme 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 tumour immunology/biology. A general surgical service and its support must be available, in addition to access to radiation therapy. The programme must also include a set-up for multidisciplinary tumour

conferences, and preferably participation in clinical trials according to guidelines on good clinical practice (GCP).

#### 3.3.7 Facilities

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

**References**


1. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *Ann Oncol* 2004;15:1603–12.
2. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *J Clin Oncol* 2004;22:4616–25.
3. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. https://www.esmo.org/content/download/8171/168764/file/ESMO-ASCO-Revised-Recommendations-for-a-Global-Curriculum-in-Medical-Oncology.pdf
4. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. http://www.asco.org/sites/default/files/esmo-asco_revised_recommendations.pdf


## 4 COMPETENCIES REQUIRED IN THE CURRICULUM

**Julia Lee Close**
**Michael Kosty**
**Jill Gilbert**

The following curriculum should be considered as the educational framework for the training of physicians in medical oncology. The current version represents an expansion of each topic to now include more specific details on curricular content. Each topic is divided into four areas: Objectives, Awareness, Knowledge and Skills. The 'Objectives' section provides an overview of the scope of knowledge a trainee is expected to master in the topic. 'Awareness' defines components integral to the topic. 'Knowledge' provides a listing of concepts necessary to practice. 'Skills' provides the activities included in practicing oncology in the specific area covered.

### 4.1 Basic scientific principles

**Ahmad Awada**

As a foundation for managing and treating malignant disease, the trainee should learn and understand the following:

1. The hallmarks of cancer including the complexity of cancer cell biology and the interaction with the tumour microenvironment (immune system, etc);
2. The management and treatment of malignant diseases (by organ and/or by biological subtypes);
3. Specific systemic anticancer therapies (cytotoxics/cytostatics, (anti)hormones, biological agents (interferon, IL-2), targeted agents (small molecules) and immunotherapeutics (monoclonal antibodies));
4. Supportive measures in relation to all kinds of systemic anticancer therapies;
5. Palliative measures including end-of-life care;
6. How to properly conduct and participate in translational and clinical research.

It should be noted that the management and treatment of malignant diseases are continuously evolving fields, in view of the advances in molecular biology and imaging techniques. In addition, a multidisciplinary approach to malignant diseases is the basis for optimal quality of patient care.

#### 4.1.1 Cancer biology

**Yosef Yarden**

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| Objectives | • To be able to critically consider and clinically apply newly proposed and existing models referring to molecular/cellular mechanisms of disease, modes of action of specific drugs, significance of biomarkers, as well as potential bases of adverse effects and acquired resistance to specific treatments |
| Awareness | • Awareness of the organisation of biological systems in multicomponent networks and availability of signal transduction pathways and protein–protein interaction maps linking protein complexes to specific functions of cancer cells<br>• Awareness of the availability of high-resolution maps and nucleotide sequences of all human chromosomes, including epigenetic marks and genomic aberrations prevalent in various types of tumours<br>• Awareness of the availability of custom, high-throughput analyses of full exome sequences able to identify putative driver mutations in solid or liquid specimens<br>• Awareness of the availability of mouse models of many driver mutations, including some combinations of oncogenic mutations<br>• Awareness of accessible technologies permitting establishment of in vitro cultures, as well as tumour implants derived from patient specimens and available for screening of individual drugs or drug combinations<br>• Recognition of the importance of liquid biopsies as sources of early indicators of relapse and emergence of new mutations |
| Knowledge | • Familiarity with mechanisms underlying stepwise transition from a normal cell to a malignant cell, along with their relevance to mutations affecting tumour suppressor genes, oncogenes, DNA repair systems or immune checkpoints |

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| | • Understanding of the exact tissue of origin of a cancer cell, the heterogeneity of epithelial and other cell lineages within all tissues, as well as relations of cancer cells to the linear transition from a stem cell to progenitors and, eventually, to differentiated cells<br>• Familiarity with the complex and variable tumour-to-stroma interactions and the cellular heterogeneity of the host tissue, including the extracellular matrix and neighbouring non-cancerous cells (eg, fat cells, fibroblasts and various lymphoid and myeloid cells)<br>• Understanding of the coexistence within cancer cells of mutually interacting networks that process information (signalling), substances (metabolic) and ATP (energy), to maintain homeostasis<br>• Familiarity with the control of gene expression by epigenetic, transcriptional and post-transcriptional processes, including covalent modifications of DNA and chromatin, as well as regulation by non-coding RNAs<br>• Familiarity with phases and checkpoints of the cell cycle, their regulation by growth factors and control by protein complexes involved in carcinogenesis, as well as inhibition by apoptosis-inducing radio- and chemotherapeutic modalities<br>• Understanding of basic biochemical and molecular biological techniques, including polymerase chain reaction (PCR) to be inserted, western blots, immunofluorescence (IF), transgenic animal procedures and mass-spectrometry of proteins and metabolites<br>• Understanding of the mechanisms of drug resistance due to compensatory responses and emergence of new mutations<br>• Understanding of the terminology of biological systems, network biology and features conferring functional robustness to biological systems while exposing vulnerabilities of cancer |
| Skills | • Ability to use information technology and data sets to understand the big landscape of disease and patient care<br>• Ability to discuss critically pharmacological interception strategies (eg, kinase inhibitors and monoclonal antibodies) and potential adverse effects based on cellular maps of signalling and metabolism, as well as phenotypes of genetically engineered animals<br>• Ability to discuss critically tumour heterogeneity and Darwinian evolution of rare, pre-existing clones in the face of environmental stress (eg, metastasis to a new tissue environment and switching to a new therapeutic modality) |

## References


1. Alberts B, Johnson A, Lewis J, *et al. Molecular biology of the cell*. 6th edn. New York: Garland Science, 2015:1465 pp.
2. DeVita VT Jr, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's cancer: principles & practice of oncology*. 10th edn. Alphen aan den Rijn, the Netherlands: Wolters Kluwer, 2014.
3. Gelmann EP, Sawyers CL, Rauscher FJ III, eds. *Molecular oncology: causes of cancer and targets for treatment*. Cambridge: Cambridge University Press, 2014:961 pp.
4. Hanahan D, Weinberg RA. Hallmarks of cancer: the next generation. *Cell* 2011;144:646–74.
5. Weinberg RA. *The biology of cancer*. 2nd edn. New York: Garland Science, 2013:960 pp.
6. Cancer browser that includes mainly TCGA datasets and information, such as copy number variations, mutations and DNA methylation. https://genome-cancer.ucsc.edu/ or http://www.cbioportal.org/data_sets.jsp
7. Genome browser that includes gene annotations, epigenetic marks, transcription factor binding sites, conservation of genomic regions and also the useful link to 'Phenotype and Literature'. http://genome-euro.ucsc.edu/cgi-bin/hgGateway
8. UCSC Genome Bioinformatics browser website containing reference sequences and working draft assemblies for a large collection of genomes. http://genome-euro.ucsc.edu/index.html


### 4.1.2 Tumour immunology

**Priya K Gopalan**
**Dennie V Jones Jr**
**Ulrich Keilholz**

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| Objectives | • To have a basic knowledge of the components of the immune system<br>• To understand the interrelationship between the host's immune system and the tumour<br>• To understand mechanisms operational in immunotherapy strategies |
| Awareness | • Awareness of the difference between tumour-associated antigens and neo-antigens<br>• Awareness of the role of cellular immunity in tumour killing<br>• Awareness of the existence of different effector immune cells<br>• Awareness of the concept of immune tolerance and immune regulation<br>• Appreciation of the principles of tumour vaccines |
| Knowledge | • Understanding of the difference between cellular and humoral immunity, including the different components<br>• Understanding of the difference between innate and adaptive immunity, including the different components |

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| | • Knowledge of the different classes of immunoglobulin molecules, their roles and the mechanism of class-switching<br>• Understanding of the different parts of an immunoglobulin molecule (Fab/Fc portions, heavy/light chains, variable/constant domains, hypervariability region)<br>• Familiarity with the mechanism of antibody-dependent cell-mediated toxicity<br>• Understanding of the role of inhibitory immune checkpoint molecules, including cytotoxic T-lymphocyte-associated protein 4 (CTLA-4), programmed cell death protein 1 (PD-1), T-cell immunoglobulin and mucin-domain containing-3 (TIM3), indoleamine 2,3-dioxygenase and lymphocyte-activation gene 3 (LAG3)<br>• Understanding of the components of the T-cell receptor complex, as well as costimulatory signals necessary to activate T-cells<br>• Familiarity with the difference between the two types of major histocompatibility complex (MHC) classes: MHC class 1 and MHC class 2<br>• Understanding of the mechanism of tolerance to self-antigens and the locations where this takes place<br>• Understanding of the role of macrophages, T-cells and natural killer (NK) cells and their subsets in the immune system, including their role in recognising self-antigens<br>• Familiarity with the locally-produced cytokines which promote tumour growth and which effect the immune response<br>• Understanding of the process of cancer immuno-editing<br>• Familiarity with chimaeric antigen receptor (CAR)-expressing autologous T-cells<br>• Familiarity with the basic mechanisms of action of tumour immunotherapeutic agents, including checkpoint inhibitors, vaccines and CAR-expressing autologous T-cells |
| Skills | • Ability to recognise indications for tumour immunotherapeutic agents, including checkpoint inhibitors, vaccines and CAR-expressing autologous T-cells<br>• Ability to recognise and appropriately manage adverse effects of immunotherapeutic agents<br>• Ability to recognise differences in objective tumour assessments after therapy with immunomodulatory agents versus traditional cytotoxic agents |

## References


1. Abbas AK, Lichtman AH. *Basic immunology: functions and disorders of the immune system*. 3rd edn. Philadelphia, PA: Saunders Elsevier, 2008.
2. Hanahan D, Weinberg RA. Hallmarks of cancer: the next generation. *Cell* 2011;144:646–74.
3. Rosenberg SA, Robbins PF, Restifo NP. Cancer immunotherapy. In: DeVita VT Jr, Lawrence TS, Rosenberg SA, eds. Cancer: principles & practice of oncology. 9th edn. Philadelphia, PA: Lippincott, Williams & Wilkins, 2011:332–44.


### 4.1.3 Aetiology, epidemiology, screening and prevention

**Jennifer Duff**
**Eva Schernhammer**

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| Objectives | • To recognise population-wide clinical problems associated with cancer and translate this perspective into meaningful context for an individual patient<br>• To identify comorbid conditions and understand their trends from a population level and the frequency of being associated with malignancy<br>• To engage in activities geared at raising community awareness and counselling patients and their next-of-kin in terms of disease prevention<br>• To list the available cancer-specific screening tests and identify which populations each is recommended for<br>• To acknowledge the role of genetic, demographic and environmental risk factors in oncogenesis<br>• To define and describe types of chemoprevention and to list specific populations they are used in |
| Awareness | • Appreciation of the fundamental difference between statistical probabilities for a given population in comparison to an individual patient<br>• Recognition that, if patient counselling is based on mere statistics, the actual impact of these numbers for a given patient may be of limited value<br>• Recognition that patients have the right to make poor health decisions as long as they are adequately informed about potential negative health effects<br>• Awareness of Hill's criteria for causation |

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| Knowledge | • Knowledge of cancer statistics such as incidence and survival for main demographic groups, nationally and globally<br>• Understanding of the impact of prevalence on sensitivity and specificity<br>• Understanding of the difference between efficacy and effectiveness as end points in clinical trials<br>• Knowledge of the accuracy of screening tests employed<br>• Familiarity with situations where screening has a well-defined role and scenarios where the role is unclear or not yet defined<br>• Understanding that screening studies are subject to multiple biases, including healthy volunteer selection bias, lead time bias and overdiagnosis<br>• Understanding of confounding and effect modification and their impact on interpreting population-based data<br>• Understanding of epidemiological descriptors (eg, incidence, prevalence) and risk factors for cancer<br>• Familiarity with hereditary cancer syndromes associated with specific germline gene mutations<br>• Understanding of efforts to promote community awareness of early cancer detection and prevention |
| Skills | • Ability to use biomarkers in oncology research and clinical practice<br>• Ability to integrate molecular pathological and other biomarkers into daily practice<br>• Ability to define primary, secondary and tertiary cancer preventive measures, and to describe the relative value of each<br>• Ability to identify the biases associated with screening studies<br>• Ability to distinguish between incidence and prevalence; sensitivity and specificity; and absolute risk and relative risk<br>• Ability to describe lifestyle and dietary habits that increase one's risk for developing cancer<br>• Ability to communicate population statistics appropriately to individual patients<br>• Ability to critically analyse the results from descriptive and analytical observational studies and clinical trials<br>• Ability to identify the malignancies for which screening is recommended and which patient populations screening is offered to<br>• Ability to recognise the indications for genetic counselling and gene mutation testing when hereditary cancer syndromes are suspected<br>• Ability to identify chemopreventive measures that are available for breast, colon, prostate, head and neck, and gynaecological cancers<br>• Ability to define the concept of overdiagnosis and describe a clinical scenario this applies to<br>• Ability to define lead time bias and explain a scenario where this fundamental concept can have an impact on survival |

## References


1. Adami HO, Hunter D, Trichopoulos D, eds. *Textbook of cancer epidemiology*. 2nd edn. New York, NY: Oxford University Press, 2008.
2. Loprinzi CL, Appelbaum FR, Hensley ML, *et al*. eds. *ASCO-SEP*. 4th edn. Alexandria, VA: American Society of Clinical Oncology, 2015.
3. Schottenfeld D, Fraumeni JF, eds. *Cancer epidemiology and prevention*. 3rd edn. New York, NY: Oxford University Press, 2006.


### 4.1.4 Clinical research

**Emile Voest**

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| Objectives | • To translate a scientific concept into a well-designed clinical trial |
| Awareness | • Appreciation of the scientific background of preclinical research and its limitations<br>• Appreciation of the differences in types of clinical trials (phase I, II, III and IV)<br>• Appreciation of the conceptual basis of basket trials and umbrella trials<br>• Awareness of trials through inhouse studies or (inter)national cooperative groups<br>• Awareness of the existence of an ethical committee or institutional review board to review clinical studies |
| Knowledge | • Familiarity with the most appropriate choice of clinical trial for a clinical research question<br>• Familiarity with various statistical designs and methodologies<br>• Familiarity with the legal, ethical and regulatory aspects to conduct a clinical trial<br>• Familiarity with selecting appropriate end points of the study<br>• Familiarity with criteria for response to treatment, assessment of quality of life and their limitations |

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| | • Familiarity with reporting toxicity and attributing toxicity to the study interventions<br>• Familiarity with the incorporation of biomarkers (including, but not limited to, DNA sequencing) in clinical studies and their opportunities and limitations<br>• Familiarity with correct interpretation of clinical data<br>• Familiarity with grant writing, and writing and presenting a study report to communicate the study outcome to the community<br>• Familiarity with preparing informative material for patients and asking informed consent<br>• Familiarity with the responsibilities of a clinical trial steering committee or an independent data safety monitoring committee<br>• Understanding of the bioinformatics of DNA sequencing and the ethical issues surrounding germ line sequencing |
| Skills | • Ability to contribute actively to a variety of phase I/II clinical trial scenarios and patient presentations<br>• Ability to contribute actively to scientific discussions between preclinical and clinical scientists<br>• Ability to discuss critically the optimal design of a clinical study<br>• Ability to select primary, secondary, tertiary and exploratory end points of a study<br>• Ability to determine therapy according to molecular marker status<br>• Ability to appreciate considerations in the management of a phase I study depending on the side effects and treatment outcomes<br>• Ability to prepare an amendment to a clinical trial<br>• Ability to follow Good Clinical Practice (GCP) rules<br>• Ability to critically evaluate publications on clinical trials<br>• Ability to present a study report to communicate the study outcome to the community<br>• Ability to critically evaluate clinical trial data and to apply them to individual patient decision-making and to use this information to obtain informed consent |

**Reference**

1. DeVita VT Jr, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's cancer: principles & practice of oncology*. the 10th edition. Alphen aan den Rijn, the Netherlands: Wolters Kluwer, 2014.

### 4.1.5 Statistics

**Jan Bogaerts**

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| Objectives | • To develop a working knowledge of clinical trial and medical statistics<br>• To develop the capacity to interact with statistics and data interpretation professionals<br>• To develop the capacity to critically interpret medical statistics, as presented in any format |
| Awareness | • Awareness of the concepts of statistical variability (random events)<br>• Awareness of cognitive biases, and how they exist in data interpretation<br>• Awareness of the sources of clinical data (randomised trial, observational data, case reports etc)<br>• Awareness of numbers, quantities<br>• Awareness of key clinical trial and epidemiology outcomes (such as response rate, hazard ratio (HR) etc) |
| Knowledge | • Knowledge of the design and conduct of clinical trials<br>• Knowledge of the development and conduct of clinical trials through international cooperative groups, national or inhouse protocols including the following:<br>◦ scientific methodology<br>◦ clinical trial design<br>◦ trial objectives<br>◦ end points<br>◦ basic understanding of sample size calculation<br>◦ understanding of p values (frequentist), Bayesian statistics<br>◦ statistical analysis methods<br>◦ bias and how it interplays with proper interpretation of data presented in any format |
| Skills | • Ability to discuss the design of clinical trials<br>• Ability to critically assess the scientific value of data being presented, and to deduce knowledge from such information |

**References**

1. Armitage P, Berry G, Matthews JNS. *Statistical methods in medical research*. 4th edn. Chichester: Wiley-Blackwell, 2001.
2. Breslow NE, Day NE, eds. *Statistical methods in cancer research, Volume I–IV*. Lyon CEDEX 08: IARC Publications.
3. Kelley WK, Halabi S, Schilsky R, eds. *Oncology clinical trials: successful design, conduct and analysis*. 1st edn. New York: Demos Medical Publishing, 2010.

## 4.2 Basic Principles in the Management and Treatment of Malignant Diseases

**Hans-Joachim Schmoll**

The management of malignant diseases requires the expertise of many different medical subspecialties, and the majority of patients with malignant diseases are best managed in a multidisciplinary approach with the integration of the various subspecialties because of the increasing complexity of modern treatment. The trainee should recognise the contributions of each of these subspecialties in making the diagnosis, assessing disease stage and treating the underlying disease and its complications, as well as those derived from its treatment. The trainee should interact with each of these disciplines in order to gain an appreciation of the benefits and limitations of each modality. Participation of the trainee in multidisciplinary meetings is encouraged. The trainee 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.

**Reference**

1. El Saghir NS, Keating NL, Carlson RW, *et al*. Tumor boards: optimizing the structure and improving efficiency of multidisciplinary management of patients with cancer worldwide. *Am Soc Clin Oncol Educ Book* 2014:e461–6. doi:10.14694/EdBook_AM.2014.34.e461

### 4.2.1 Pathology

**Julie Steele**
**Sarah Coupland**

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| Objectives | • To understand the pathological diagnosis and report, and be able to explain the information and its associated management implications to the patient<br>• To be able to discuss the pathology report with the multidisciplinary team in a conference setting/tumour board<br>• To be able to incorporate the information contained in the Cancer Checklist (Synoptic Summary) into the pathological stage (eg, Tumour Node Metastasis (TNM), Ann Arbor or other)<br>• To be able to use the additional prognostic and predictive information contained in the Cancer Checklist to help formulate the best treatment plan for the patient |
| Awareness | • Awareness that there is a difference between cytology specimen preparation and histology specimen preparation<br>• Awareness of the different fixatives used in specimen preservation and transport<br>• Awareness of histology specimen processing and the requirement for adequate fixation to ensure good-quality sections as well as reliable immunohistochemistry (IHC) and fluorescence in situ hybridisation (FISH) testing on the material if necessary<br>• Awareness of the different preparations used in a bone marrow biopsy<br>• Recognition of the indications for and limitations of frozen section diagnostics<br>• Awareness that pathologists use gross and microscopic information to make assessments of certain elements in the report, such as size of the tumour and distance from the margins<br>• Awareness of the value and indication of histomorphology, IHC, flow cytometry or FISH to confirm and make specific diagnoses<br>• Recognition of limitations in pathological evaluation, including a small tissue sample, crush artefact or tumour of unknown primary<br>• Awareness of pertinent history, clinical findings and radiographic findings needed to make adequate pathological diagnoses<br>• Awareness that grading is predominantly based on differentiation and, in some tumours, mitotic activity<br>• Awareness of the importance of direct communication with a pathologist in patient care<br>• Awareness that invasive tumours are often composed of two components: the malignant tumour cells and the surrounding stroma (often desmoplastic)<br>• Awareness that many pathology departments have associated biobanks, which enable the collection of surplus diagnostic tissue/fluids from consenting patients<br>• Recognition that many patients are willing to provide their consent for biosample usage in ethically approved research studies |
| Knowledge | • Knowledge and understanding of the nomenclature of neoplasia (eg, benign vs malignant, borderline, dysplasia, in situ vs invasive disease, carcinoma vs sarcoma etc) and knowledge of the local growth or metastatic potential of these different types of neoplasms<br>• Knowledge of grading schemes in different types of tumours<br>• Knowledge of the WHO classification of tumours<br>• Knowledge of the TNM staging system, and other staging systems used in particular tumours (eg, Ann Arbor for lymphoid malignancies)<br>• Knowledge of metastasis and the different mechanisms of spread (eg, haematogenous, lymphatic, perineural, perivascular and peritoneal)<br>• Knowledge of the indications for requesting a biopsy of a new lesion, and selection of the best site to perform the biopsy<br>• Knowledge of the different procedures and the types of specimens that are obtained<br>• Knowledge of the role of genetic and epigenetic alterations in malignant tumour formation and dissemination |

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- Knowledge of the role of infectious agents in the development of some cancers
- Knowledge of predictive and prognostic factors—such as oestrogen receptor, progesterone receptor and human epidermal growth factor receptor-2 (HER-2)—and how to interpret and use the results in forming a treatment plan
- Knowledge about the use of IHC, and particular markers in establishing diagnoses
- Knowledge about the applications of IHC on whole sections of tumours, on microdissected areas or on tissue microarrays (TMAs)
- Knowledge about the limitations of interpretation of IHC
- Knowledge of ethical, consenting and storage procedures involved in biobanking, and the various techniques offered in association with them

Skills

- Ability to interpret the pathology report and explain it to the patient
- Ability to discuss the pathology report with the pathologist and the other members of the multidisciplinary team
- Ability to recognise a discrepancy or discordance in the pathological diagnosis with the clinical findings and to discuss with the pathologist
- Ability to use the information in the pathology report to develop the best treatment plan for the patient
- Ability to use the information within the pathology report to formulate research projects to help answer gaps in our understanding of cancer, and to propose improved therapeutic options

## References


1. Hammond MEH, Hayes DF, Dowsett M, *et al*. American Society of Clinical Oncology/College of American Pathologists guideline recommendations for immunohistochemical testing of estrogen and progesterone receptors in breast cancer. *Arch Pathol Lab Med* 2010;134:907–22.
2. Kumar V, Abbas AK, Fuaso N, *et al*. eds. *Robbins and cotran pathologic basis of disease*. 9th edn. Philadelphia: Elsevier Saunders, 2015.
3. Lester SC. *Manual of surgical pathology*. 3rd edn. Philadelphia: Elsevier Saunders, 2010.
4. Lindeman NI, Cagle PT, Beasley MB, *et al*. Molecular testing guideline for selection of lung cancer patients for EGFR and ALK tyrosine kinase inhibitors guideline from the College of American Pathologists, International Association for the Study of Lung Cancer, and Association for Molecular Pathology. *Arch Pathol Lab Med* 2013;137:828–60.
5. *WHO classification of tumours series*. Lyon: WHO Press. http://whobluebooks.iarc.fr/
6. Wolff AC, Hammond ME, Hicks DG, *et al*. Recommendations for human epidermal growth factor receptor 2 testing in breast cancer: American Society of Clinical Oncology/College of American Pathologists clinical practice guideline update. *Arch Pathol Lab Med* 2014;138:241–56.


### 4.2.2 Molecular pathology

**Roberto Salgado**
**Torsten Nielsen**

Objectives

- To be able to describe how genomics might improve the understanding and management of patients with cancer, within a frame of coordinated clinical case, interacting with pathologists and clinical geneticists for adequate analytical and postanalytical interpretation of results
- To be able to accurately assess the clinical validity and clinical utility of genomic variants and technologies
- To be able to critically appraise new genomic technologies taking into account the downstream costs secondary to genomic analysis for the laboratory and the patient, including the costs associated with new technologies

Awareness

- Awareness of the key metrics and parameters that govern projects involving molecular pathology techniques such as next-generation sequencing (NGS), with an awareness of the differences in detection limit of the assays, the limitations of the different assays and the importance of pre-analytical variables on the results
- Appreciation that some molecular pathology technologies—for example, gene expression profiling (GEP) and multigene cancer panels—may not give absolute, binary results, rather than they may lead to results that are equivocal in terms of classification, and indeed even to results with uncertain clinical validity and utility
- Recognition of the importance of current and future applications in clinical practice of any molecular pathology technology, such as NGS, being aware of the need to have uniformity in planning genomic single versus multiplex testing only when there is a clear purpose and clinical need, with an appropriate use of multigene panels and full integration with all clinicopathological variables, participation and discussion within established expert Molecular Advisory Boards, and with disclosure of results according to established levels of evidence
- Awareness of the distinction between established clinical variants versus promising variants in genomics, being aware that the importance of these variants may change in time, being aware of potential false calls of non-validated variants with no clinical utility, with a need to have an evidence-based approach to germline variants encountered in somatic mutation profiling
- Appreciation of the need to discuss with patients the implications of genomic testing and of direct-to-consumer test marketing for patients, including awareness of the importance of interaction with general practitioners on genomic testing, informed consent and pre-test counselling, access to genetic services whenever applicable, disclosure of genomic information of uncertain significance, message framing and understanding the limitations of patients' knowledge on the concepts and goals of precision medicine

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| | • Appreciation of the importance of appropriate regulatory endorsement and regulation for somatic and germline genomic testing, with awareness of the costs of the assay and the often limited or unavailable funding for the assay within most healthcare systems<br>• Awareness of the need of oncology providers to communicate the potential for incidental and secondary germline information to patients before conducting somatic mutation profiling, with an assessment on the potential benefits, limitations and risks before testing<br>• Awareness that there are different types of assays that can be used in a laboratory, namely regulatory-approved assays, laboratory-developed assays with internal evidence for analytical validity and purely research assays<br>• Awareness that different assays do provide different types of information, namely diagnostic, prognostic and/or predictive information |
| Knowledge | • Knowledge about the main clinical diagnostic test modalities, namely cytogenetics, flow cytometry, immunohistochemistry (IHC), fluorescence in situ hybridisation (FISH), reverse transcriptase polymerase chain reaction (RT-PCR), Sanger sequencing, microarrays (eg, single-nucleotide polymorphism (SNP) chips) and NGS<br>• Knowledge on the interpretation of genomic information of whatever kind (FISH, PCR, multiplex ligation-dependent probe amplification (MLPA), mass spectrometry analysis (MSA), array comparative genomic hybridisation (aCGH), array SNP (aSNP), NGS, GEP etc) in association with personal medical and health information<br>• Knowledge of the standards of scientific genomic and clinical evidence for all types of assays (FISH, PCR, NGS etc)<br>• Knowledge on the current and near-future diagnostic applications of NGS<br>• Knowledge that within NGS there is a conceptual distinction between panel sequencing, exome sequencing and genome-wide sequencing<br>• Knowledge on the interpretation of key metrics and parameters that govern projects involving molecular pathology, especially when NGS is being used<br>• Knowledge on how to ascertain patient preferences regarding the receipt of germline information and assessment on how to allow patients to decline receiving of germline information<br>• Knowledge on how to apply basic concepts of cancer genetics, risk assessment and currently available testing into patient care practices<br>• Knowledge on how to recognise genetic testing for common cancer syndromes and how to interpret variants of unknown significance (VUS)<br>• Knowledge on the basic laboratory-specific concepts, the laboratory sample flow, different turn-around times for different molecular pathology techniques and understanding of the limitations of data generation using high throughput technologies such as NGS<br>• Knowledge on the emergent strategies and the latest advances using molecular pathology techniques such as NGS in the early detection of cancers (breast, gastrointestinal etc)<br>• Knowledge on the patient's perspective on preferences for somatic testing, the importance of costs of the assay for the patient and the potential need of return of results when multiparameter testing is performed<br>• Knowledge on the basic physiological and pathophysiological mechanisms of normal and diseased tissues, for example the immune system, DNA-repair mechanisms etc |
| Skills | • Ability to distinguish between established clinical variants versus promising variants in genomics<br>• Ability to adequately assess the clinical validity and clinical utility of genomic variants and technologies<br>• Ability to identify whether an assay is directed to DNA, RNA or protein<br>• Ability to identify the concept the assay is based on, namely either testing for a specific analyte, a panel test that is used for multiple analytes or an open, so-called unbiased, genome-wide assay<br>• Ability to recognise when the molecular result is considered the most important and definitive finding, as opposed to being just one piece of information that goes into determination of: diagnosis (where it is subordinate to haematoxylin & eosin (H&E) histology); prognosis (where it is subordinate to or may have to be integrated with other staging information); and prediction (where expression of a drug's target does not necessarily mean that the drug will work and provide clinical response or clinical benefit)<br>• Ability to identify that different molecular changes are relevant in different clinical situations: point mutations, copy number aberrations, translocations, gene expression levels and protein levels, and that these need different types of samples that are tested using different techniques |

## References


1. Laudadio J, McNeal JL, Boyd SD, *et al*. Design of a genomics curriculum: competencies for practicing pathologists. *Arch Pathol Lab Med* 2015;139:894–900.
2. Manolio TA, Chisholm RL, Ozenberger B, *et al*. Implementing genomic medicine in the clinic: the future is here. *Genet Med* 2013;15:258–67.
3. Manolio TA, Murray MF, Inter-Society Coordinating Committee for Practitioner Education in Genomics. The growing role of professional societies in educating clinicians in genomics. *Genet Med* 2014;16:571–2.

4. Robson ME, Bradbury AR, Arun B, *et al*. American Society of Clinical Oncology policy statement update: genetic and genomic testing for cancer susceptibility. *J Clin Oncol* 2015;33:3660–7.
5. Yu PP, Hoffman MA, Hayes DF. Biomarkers and oncology: the path forward to a learning health system. *Arch Pathol Lab Med* 2015;139:451–6.

### 4.2.3 Laboratory medicine

**Thomas Lion**
**Krisztian Homicsko**

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| Objectives | • To be able to judiciously use laboratory diagnostic testing for the diagnosis and follow-up of patients with cancer |
| Awareness | • Awareness of the availability of relevant laboratory diagnostic tests<br>• Recognition of the existence, utility and costs of diagnostic and prognostic biomarkers<br>• Appreciation of novel technologies, including particularly molecular methodologies with emerging diagnostic applicability, such as blottings (Western, Southern, Northern), polymerase chain reaction (PCR) and quantitative reverse transcription (qRT)-PCR, interference with gene expression (siRNAs, shRNAs, overexpression), cloning and mutagenesis of genes, the CRISPR system, fluorescence-activated cell sorting (FACS), mass spectrometry (MS), high-performance liquid chromatography (HPLC), tissue culture techniques, basic histology techniques (fluorescence in situ hybridisation (FISH)), immunohistochemistry (IHC), immunofluorescence (IF), Sanger sequencing and next-generation sequencing (NGS), arrays (mRNA, miRNA, protein, kinase, antibody), single-cell technologies, microscopy (fluorescence resonance energy transfer (FRET), confocal), animal models of cancer (xenograft, patient-derived xenografts (PDX), genetically engineered mouse models (GEMM)), liquid biopsies: circulating tumour cells (CTCs), exosomes, circulating cell-free DNA (cfDNA)<br>• Recognition of the importance of controls (positive, negative), assessment of data quality and limitations of techniques |
| Knowledge | • Knowledge of which laboratory testing is appropriate for diagnosis, staging, treatment decision-making and follow-up<br>• Familiarity with relevant biomarkers and their clinical value<br>• Familiarity with the review and interpretation of laboratory findings pertaining to the management of patients with cancer<br>• Understanding of the principles of laboratory methods relevant for appropriate interpretation, including particularly cytogenetic and molecular analyses<br>• Knowledge of which clinical materials are required/appropriate for specific diagnostic tests<br>• Knowledge of adequate frequencies of laboratory diagnostic analyses in different clinical settings<br>• Knowledge about some of the basic techniques (PCR, western blot, cell culture techniques, histology) |
| Skills | • Ability to critically assess, interpret and discuss the utility of specific laboratory parameters<br>• Ability to evaluate costs of laboratory tests in relation to their clinical relevance<br>• Ability to determine further diagnostic and treatment options on the basis of laboratory test results<br>• Ability to integrate laboratory findings and other diagnostic procedures into clinical decision-making<br>• Ability to contribute to discussions on the interpretation of laboratory findings with regard to clinical consequences<br>• Ability to explain the results of laboratory tests to patients and colleagues |

## References

1. Bhasker CR, Hardiman G. Advances in pharmacogenomics technologies. *Pharmacogenomics* 2010;11:481–5.
2. Bremnes RM, Sirera R, Camps C. Circulating tumour-derived DNA and RNA markers in blood: a tool for early detection, diagnostics, and follow-up? *Lung Cancer* 2005;49:1–12.
3. Cuenca AG, Jiang H, Hochwald SN, *et al*. Emerging implications of nanotechnology on cancer diagnostics and therapeutics. *Cancer* 2006;107:459–66.
4. Durmaz AA, Karaca E, Demkow U, *et al*. Evolution of genetic techniques: past, present, and beyond. *Biomed Res Int* 2015;2015:461524.
5. Grodzinski P, Silver M, Molnar LK. Nanotechnology for cancer diagnostics: promises and challenges. *Expert Rev Mol Diagn* 2006;6:307–18.
6. Iorio MV, Croce CM. MicroRNA dysregulation in cancer: diagnostics, monitoring and therapeutics. A comprehensive review. *EMBO Mol Med* 2012;4:143–59.
7. Kalia M. Personalized oncology: recent advances and future challenges. *Metabolism* 2013;62(Suppl 1):S11–14.
8. Kumar S, Mohan A, Guleria R. Biomarkers in cancer screening, research and detection: present and future: a review. *Biomarkers* 2006;11:385–405.
9. Luthra R, Chen H, Roy-Chowdhuri S, *et al*. Next-generation sequencing in clinical molecular diagnostics of cancer: advantages and challenges. *Cancers (Basel)* 2015;7:2023–36.
10. Tahara H, Sato M, Thurin M, *et al*. Emerging concepts in biomarker discovery; the US-Japan workshop on immunological molecular markers in oncology. *J Transl Med* 2009;7:45.
11. Tainsky MA, Chatterjee M, Levin NK, *et al*. Multianalyte tests for the early detection of cancer: speedbumps and barriers. *Biomark Insights* 2007;2:261–7.
12. Vockley JG, Niederhuber JE. Diagnosis and treatment of cancer using genomics. *BMJ* 2015;350:h1832.
13. Xue H, Lu B, Lai M. The cancer secretome: a reservoir of biomarkers. *J Transl Med* 2008;6:52.

## 4.2.4 Translational research

**Krisztian Homicsko**

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| Objectives | • Cancer biology: to be able to conceptualise the most common alterations leading to cancer development<br>• Molecular assays: to be able to describe the techniques, their potential uses and limitations<br>• Biological sample collection: to understand the processes of sample collection and storage<br>• Biomarkers: to be able to define the uses of biomarkers in clinical trials<br>• Data analysis and public databases: to understand the importance of statistical planning and analyses of translational data; basic knowledge of access to databases for correlative studies<br>• Transitioning results of translational research to clinical practice: to understand how translational oncology information can lead to pertinent clinical studies |
| Awareness | • Cancer biology: awareness of the tumour heterogeneity within a single patient as well as the population heterogeneity of the same type of cancer<br>• Molecular assays: recognition that translational research is mainly based on the application of molecular biology techniques to proteins, RNA, DNA as well as metabolites; awareness of the main methods as a prerequisite in orderto understand and interpret results (see for details under chapter 4.2.3 Laboratory medicine)<br>• Biological sample collection: awareness of the complex regulatory environment of sample collection and the difficulties and opportunities of sample processing<br>• Biomarkers: appreciation of the regulatory requirements in performing biomarker studies; reporting of biomarker studies (REMARK recommendations)<br>• Data analysis and public databases: awareness, that is, in order to validate the hypothesis of translational studies, analysis of the data should be performed; awareness of the analysis options available as well of the databases that could be used to enrich translational research |
| Knowledge | • Cancer biology: it is fundamental in translational oncology to understand and integrate the wealth of already-existing molecular oncology information, which in part was generated by translational oncology studies. The integration is challenging even for experts; hence integrative publications—reviews—which provide a critical overviews of the state of the art of the field are highly recommended. A good start is the *Hallmarks of Cancer* by Hanahan and Weinberg. This work not only conceptualises and integrates the wealth of cancer studies of the last 50 years but also provides a framework by which cancer can be viewed in all of its complexities. In addition, *Hallmarks of Cancer* can incentivise cancer therapy by laying the ground for rational treatments and treatment combinations. The extensive bibliography of *Hallmarks of Cancer* is a good starting point for newcomers in translational oncology<br>• Molecular assays: knowledge about some of the basic techniques (PCR, western blot, cell culture techniques, histology)<br>• Biological sample collection: the collection of good-quality biospecimens is critical for translational studies; knowledge about: (1) the types of sample that can be collected; (2) the need and process for gaining consent from the patient to collect specimens; (3) storage of samples, retrieving samples from biobanks<br>• Biomarkers: biomarker studies connect clinical outcomes with a biological variable; knowledge about the type of biomarkers that can be studied: (1) prognostic versus predictive; (2) single versus multiplex biomarkers; (3) clinical trials of biomarkers (hypothesis-generating versus hypothesis-driven, observational, interventional)<br>• Data analysis and public databases: knowledge of statistical analyses; knowledge of when to look for help in statistics and the need for statistical planning prior to initiation of translational studies; knowledge that scientific databases already exist and how to identify such databases and the basic methods of data mining<br>• Transitioning results of translational research to clinical practice: knowledge about the necessity and basic methods of validating the findings/biomarkers/molecular targets in additional clinical trials |
| Skills | • Ability to find useful information on biomedical research on the internet; the collection of sites provided herein is a good start for translational research<br>• Ability to explain emerging laboratory technologies and molecular findings through the review of primary literature<br>• Transitioning results of translational research to clinical practice: ability to plan novel, hypothesis-driven trials to test treatment schemes based on translational oncology results (especially phase I studies) |

## References

*Cancer biology*

1. Hanahan D, Weinberg RA. Hallmarks of cancer: the next generation. *Cell* 2011;144:646–74.
2. Hanahan D, Coussens LM. Accessories to the crime: functions of cells recruited to the tumour microenvironment. *Cancer Cell* 2012;21:309–22.
3. Tuveson D, Hanahan D. Translational medicine: cancer lessons from mice to humans. *Nature* 2011;471:316–17.
4. Weinberg RA. *The biology of cancer*. Oxon: Garland Science, 2013.

*Molecular assays*

1. eMICE: electronic Models Information, Communication, and Education. http://emice.nci.nih.gov/
2. Ignatiadis M, Lee M, Jeffrey SS. Circulating tumor cells and circulating tumor DNA: challenges and opportunities on the path to clinical utility. *Clin Cancer Res* 2015;21:4786–800.

3. *Journal of Biological Sciences: Molecular Biology*. http://www.protocol-online.org/prot/Molecular_Biology/index.html
4. Molecular biology techniques. https://en.wikipedia.org/wiki/Category:Molecular_biology_techniques
5. Sander JS, Joung JK. CRISPR-Cas systems for editing, regulating and targeting genomes. *Nat Biotechnol* 2014;32:347–55.
6. Science Education. Science Education Database. http://www.jove.com/science-education-database/2/basic-methods-in-cellular-and-molecular-biology

*Biological sample collection*

1. Hansson MG. Ethics and biobanks. *Br J Cancer* 2009;100:8–12.
2. Hewitt RE. Biobanking: the foundation of personalized medicine. *Curr Opin Oncol* 2011;23:112–19.
3. Shevde LA, Riker AI. Current concepts in biobanking: development and implementation of a tissue repository. *Front Biosci (Schol Ed)* 2009;1:188–93.
4. Zika E, Schulte In den Bäumen T, Kaye J, *et al*. Sample, data use and protection in biobanking in Europe: legal issues. *Pharmacogenomics* 2008;9:773–81.

*Biomarkers*

1. Altman DG, McShane LM, Sauerbrei W, *et al*. Reporting Recommendations for Tumor Marker Prognostic Studies (REMARK): explanation and elaboration. *PLoS Med* 2012;9:e1001216.
2. Buyse M, Sargent DJ, Grothey A, *et al*. Biomarkers and surrogate end points—the challenge of statistical validation. *Nature Rev Clin Oncol* 2010;7:309–17.
3. Pesch B, Brüning T, Johnen G, *et al*. Biomarker research with prospective study designs for the early detection of cancer. *Biochim Biophys Acta* 2014;1844:874–83.
4. Subramanian J, Simon R. What should physicians look for in evaluating prognostic gene-expression signatures? *Nature Rev Clin Oncol* 2010;7:327–34.

*Data analysis and public databases*

1. http://cancer.sanger.ac.uk/cosmic
2. http://cancergenome.nih.gov/
3. http://fiji.sc/Fiji
4. http://www.cbioportal.org/
5. http://www.genecards.org/
6. http://www.uniprot.org/
7. https://en.wikipedia.org/wiki/List_of_biological_databases#Protein_structure_databases
8. https://www.oncomine.org/
9. https://www.r-project.org/
10. http://onlinestatbook.com/
11. http://statpages.org/
12. www.proteinatlas.org/

*Transitioning results of translational research to clinical practice*

1. Andre F, Mardis E, Salm M, *et al*. Prioritizing targets for precision cancer medicine. *Ann Oncol* 2014;25:2295–303.
2. Le Tourneau C, Lee JJ, Siu LL. Dose escalation methods in phase I cancer clinical trials. *J Natl Cancer Inst* 2009;101:708–20.
3. Sleijfer S, Bogaerts J, Siu LL. Designing transformative clinical trials in the cancer genome era. *J Clin Oncol* 2013;31:1834–41.

## 4.2.5 Principles of personalised cancer medicine

**Luigi De Petris**
**Jonas Bergh**

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| Objectives | • To be able to integrate biomarker analysis of prognostic and therapy predictive factors into the treatment-decision process, aiming at personalised medicine (precision medicine) therapy selection based on the individual patient's marker signatures in the cancer cells and normal cells, respectively<br>• To understand that proper marker analyses and interpretation are the bases for personalised cancer medicine |
| Awareness | • Recognition that a biomarker should prognosticate and predict response to specific therapies, being an indicator of normal biological processes, pathogenic and pathological processes; the marker must have analytical and clinical validity (verifications and replications in several independent data sets) as well as clinical utility, adding clinical value for management<br>• Awareness that each marker platform should either be analysed centrally in a certified laboratory or, if analysed locally, it should be validated locally, prior to clinical implementation<br>• Recognition that, in the absence of a specific prognostic and/or predictive target, but linked to a high tumour biology significance, results from unsupervised high-throughput analyses, validated on independent data sets, may rely on extensive bioinformatics processing of raw data<br>• Awareness that molecular features may be heterogeneous in different areas of the same tumour lesion and may differ between the primary tumour and the corresponding distant metastases, and between the latter ones, which underlines the need for 'liquid biopsies' and functional target imaging<br>• Recognition that molecular characterisation of a tumour in patients should not only focus on the tumour cells but also involve characterisation of the microenvironment, including the tumour stroma, angiogenesis and tumour–host immune interactions |
| Knowledge | • Understanding of the critical importance of prospective biobanking of tumour (frozen and paraffin-embedded material) and corresponding normal samples (normal tissue, normal genomic DNA) for research purposes and for retrospective analyses in cases of clinical implementation of novel tests, and for routine use for some upcoming markers<br>• Understanding of the proper terminology for high-throughput Omics technologies (genomics (gene expression and RNA sequencing, exome sequencing and whole sequencing), proteomics, transcriptomics, epigenomics, metabolomics, lipidomics)<br>• Understanding of the general principles of targeted (PCR, FISH, IHC) and non-targeted (NGS, mRNA assays) technologies for molecular analysis (see chapter 4.2.2 and 4.2.3)<br>• Familiarity with the definition of diagnostic, prognostic, therapy-predictive and surrogate biomarkers, respectively<br>• Familiarity with the statistical basis required to interpret the performance of a biomarker (sensitivity, specificity, positive- and negative-predictive values, accuracy, identification of an optimal cut-off value (receiver operating characteristic (ROC) curves), hazard ratios (HRs), interaction test for therapy prediction of outcomes) |

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| | • Familiarity with the most common targetable mutations in the different cancer forms (eg, epidermal growth factor receptor (EGFR) mutations and anaplastic lymphoma kinase (ALK) translocations in non-small-cell lung cancer (NSCLC), oestrogen receptor (ER) expression, human epidermal growth factor receptor 2 (HER-2) amplification/overexpression in breast cancer, other malignancies, gastric cancer etc, B-Raf mutations in malignant melanoma, breakpoint cluster region (BCR)-Abelson (Abl) translocation in chronic myelogenous leukaemia (CML), EGFR expression, K-Ras and B-Raf status in colorectal cancer etc) |
| Skills | • Ability to interpret and contextualise in current practice results from biomarker-driven clinical trials and from biomarker-based post hoc analysis of trials and marker results for routine clinical patient care<br>• Ability to implement biomarker-based enrichment strategies in patient selection, including inclusion in so-called basket studies (analyses of multiple-drug targets at the same time and offering the patient a specific study, based on the results) for clinical trials and to use for routine clinical care<br>• Ability to discuss with patients the possibilities and limitations of a personalised approach based on current understanding and available technologies |

**References**


1. Biankin AV, Piantadosi S, Hollingsworth SJ. Patient-centric trials for therapeutic development in precision oncology. *Nature* 2015;526:361–70.
2. Jonsson B, Bergh J. Hurdles in anticancer drug development from a regulatory perspective. *Nat Rev Clin Oncol* 2012;9:236–43.
3. McDermott U. Next-generation sequencing and empowering personalised cancer medicine. *Drug Discov Today* 2015;20:1470–5.
4. Tobin NP, Foukakis T, De Petris L, *et al*. The importance of molecular markers for diagnosis and selection of targeted treatments in patients with cancer. *J Intern Med* 2015;278:545–70.


### 4.2.6 Staging procedures (clinical staging)

**Yuichiro Ohe**

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| Objectives | • To know the principles and general rules of staging systems, mainly the TNM (tumour-node-metastasis) staging system<br>• To be able to do adequate staging |
| Awareness | • Appreciation of the relationship between the TNM system and contemporary practice in order to assign each stage<br>• Appreciation of the difference between clinical and pathological staging<br>• Awareness of post-therapy or post-neoadjuvant therapy staging and re-staging<br>• Awareness of stage migration by use of more sensitive methods<br>• Appreciation of the principles and general rules of the TNM system |
| Knowledge | • Understanding of the TNM classification<br>• Understanding of different systems of staging in each tumour type, Lugano Classification for lymphoma, the Union for International Cancer Control (UICC) Classification for colorectal cancer, staging system for small-cell lung cancer, International Federation of Gynecology and Obstetrics (FIGO) stages for gynaecological tumours<br>• Understanding of the correlation between stage and prognosis<br>• Understanding of the differences in treatment choice based on staging |
| Skills | • Ability to choose the adequate procedures such as physical examinations, imaging studies, laboratory tests and pathological or cytological examinations |

**Reference**


1. Sobin LH, Gospodarowicz MK, Wittekind C, eds. *UICC TNM classification of malignant tumours*. 7th edn. Chichester: Wiley, 2009.

## 4.2.7 Imaging

**Marius Mayerhoefer**
**Christian Herold**

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| Objectives | • To develop state-of-the-art diagnostic strategies for different tumour types<br>• To be able to communicate with imagers and patients with regard to the different diagnostic imaging tests |
| Awareness | • Awareness of the existence of different imaging techniques, particularly cross-sectional imaging techniques (computed tomography (CT), magnetic resonance imaging (MRI)) and hybrid imaging techniques (positron emission tomography (PET)/CT, MR/PET)<br>• Awareness of image-guided diagnostic interventions and image-guided therapies<br>• Awareness of staging systems based on imaging examinations<br>• Awareness of the existence and limitations of general and cancer-specific treatment response systems<br>• Appreciation of imaging-related safety issues<br>• Awareness of the cost-effectiveness of different imaging techniques |
| Knowledge | • Knowledge of the principles and technical limitations of different diagnostic imaging techniques, in particular CT and MRI, and their associated costs<br>• Familiarity with safety-related issues concerning CT: radiation exposure in relation to patients' age and prognosis, iodinated contrast media-related risks and side effects<br>• Familiarity with safety-related issues and contraindications to MRI: relevance of implantable medical devices, pregnancy and claustrophobia, gadolinium-based contrast media-related risks and side effects<br>• Understanding of the usage of image-guided diagnostic and therapeutic interventions, their limitations, as well as potential complications<br>• Familiarity with pre-test probabilities of disease in individual patients, and estimation of the potential impact of the non-invasive imaging tests and invasive image-guided tests on management, given the expected impact on post-test probabilities<br>• Knowledge of the role of different imaging tests (particularly CT and MRI) in staging of specific tumours, eg, TNM (see chapter 4.2.6), Ann Arbor, International Federation of Gynecology and Obstetrics (FIGO)<br>• Familiarity with the breast imaging reporting and data system (BI-RADS) and prostate imaging reporting and data system (PI-RADS) classifications, and their clinical implications<br>• Familiarity with the Response Evaluation Criteria in Solid Tumours (RECIST) (see chapter 4.2.9)<br>• Familiarity with cancer-specific treatment response criteria, eg, the Lugano Classification of the International Conference on Malignant Lymphoma (ICML; previously known as Cheson Criteria) for lymphoma, and the Choi Response Criteria for gastrointestinal stromal tumour (GIST) |
| Skills | • Ability to formulate a specific question in a referral form, to provide a clinical differential diagnosis to the imaging specialist; include comorbidities or other clinical data relevant to the examination<br>• Ability to explain the basic principles and actual conduct of any ordered imaging test or image-guided intervention to patients; include information on special preparations (eg, fasting) for the imaging examination, where appropriate<br>• Ability to provide patients with information on complications, side effects, contraindications, as well as radiation exposure related to imaging examinations or image-guided interventions<br>• Ability to assign patients to radiography, ultrasound, CT, MRI or hybrid imaging (PET/CT, MR/PET) examinations, based on tumour type, specific question and patient safety profile<br>• Ability to order image-guided diagnostic interventions in cases where non-invasive imaging examinations are inconclusive or inappropriate<br>• Ability to order image-guided therapeutic interventions in cases where systemic treatment or surgery are not applicable<br>• Ability to apply TNM, Ann Arbor and FIGO staging systems, based on information provided in the imaging reports (supplemented by biopsy, where appropriate)<br>• Ability to apply RECIST 1.1, Lugano and Choi Criteria for treatment response assessment, based on information provided in the imaging reports (supplemented by biopsy, where appropriate)<br>• Ability to interpret BI-RADS and PI-RADS scores, and to draw conclusions for the clinical management<br>• Ability to discuss imaging findings and reports, as well as strategies of validation, with radiologists and nuclear medicine physicians during multidisciplinary tumour boards |

## References

1. Berrington de González A, Mahesh M, Kim KP, *et al*. Projected cancer risks from computed tomographic scans performed in the United States in 2007. *Arch Intern Med* 2009;169:2071–7.
2. Cheson BD. Staging and response assessment in lymphomas: the new Lugano classification. *Chin Clin Oncol* 2015;4:5.
3. Eisenhauer EA, Therasse P, Bogaerts J, *et al*. New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). *Eur J Cancer* 2009;45:228–47.
4. Kanal E, Froelich J, Barkovich AJ, *et al*. American College of Radiology Subcommittee on MR Safety. Standardized MR terminology and reporting of implants and devices as recommended by the American College of Radiology Subcommittee on MR Safety. *Radiology* 2015;274:866–70.
5. Mercado CL. BI-RADS update. *Radiol Clin North Am* 2014;52:481–7.
6. Thomsen HS, Morcos SK, Almén T, *et al*. ESUR Contrast Medium Safety Committee. Nephrogenic systemic fibrosis and gadolinium-based contrast media: updated ESUR Contrast Medium Safety Committee guidelines. *Eur Radiol* 2013;23:307–18.
7. Tirkes T, Hollar MA, Tann M, *et al*. Response criteria in oncologic imaging: review of traditional and new criteria. *Radiographics* 2013;33:1323–41.
8. Weinreb JC, Barentsz JO, Choyke PL, *et al*. PI-RADS prostate imaging—reporting and data system: 2015, version 2. *Eur Urol* 2015. pii:S0302-2838(15)00848-9.

### 4.2.8 Molecular imaging

**Elisabeth G E de Vries**
**Andor W J M Glaudemans**

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| Objectives | • To be able to use molecular imaging adequately in daily practice |
| Awareness | • Awareness of different molecular imaging techniques and tracers<br>• Appreciation of geographical variation in the availability of different molecular imaging techniques and tracers<br>• Recognition of upcoming molecular imaging techniques that are potentially of benefit for the patient<br>• Awareness of the existence of hybrid imaging systems<br>• Appreciation of radionuclide therapies<br>• Recognition of potentially relevant novel tracers such as $^{68}$Ga-DOTATOC, 3,4-dihydroxy-6-(18)F-fluoro-l-phenylalanine [$^{18}$F-FDOPA], $^{18}$F-fluoroestradiol [$^{18}$F-FES], $^{11}$C or $^{18}$F-choline and $^{11}$C-methionine |
| Knowledge | • Understanding of the complementary role of molecular and anatomic imaging<br>• Familiarity with the indications for single-photon emission computed tomography (SPECT) and positron emission tomography (PET) scans for the different tumour types as defined in guidelines<br>• Familiarity with the patient preparation before the different scans<br>• Familiarity with the principles of SPECT and PET imaging<br>• Understanding of the behaviour and biodistribution of standard molecular imaging tracers (technetium-99m [$^{99m}$Tc]-labelled diphosphonates scan, $^{18}$F-fluorodeoxyglucose [$^{18}$F-FDG]-PET, Indium-111 [$^{111}$In]-octreotide scan, $^{123}$I-metaiodobenzylguanidine [$^{123}$I-MIBG] scan and $^{123}$I/$^{131}$I-iodine scans)<br>• Familiarity with the guidelines for the relevance of $^{99m}$Tc-labelled diphosphonates scan, $^{18}$F-FDG-PET, $^{111}$In-octreotide scan, $^{123}$I-MIBG scan and $^{123}$I/$^{131}$I-iodine scans<br>• Familiarity with the role of $^{18}$F-FDG-PET in Response Evaluation Criteria in Solid Tumours (RECIST) 1.1<br>• Familiarity with the role of $^{18}$F-FDG-PET in lymphoma staging and response measurement<br>• Familiarity with the indications and interpretation of a multigated acquisition (MUGA) scan with $^{99m}$Tc-pertechnetate<br>• Understanding of how information derived from imaging influences treatment decision-making<br>• Familiarity with the radiation doses administered with molecular imaging techniques<br>• Familiarity with existing radionuclide therapies |
| Skills | • Ability to interpret a physiological biodistribution, pathological uptake and pitfalls and artefacts of molecular imaging techniques<br>• Ability to contribute to the presentation of molecular imaging findings of patient cases<br>• Ability to apply RECIST 1.1<br>• Ability to use imaging information for patient care<br>• Ability to select the right indications for molecular imaging for staging and response measurements<br>• Ability to interpret left ventricular ejection fraction<br>• Ability to take care of patients who receive radionuclide therapy |

## References

1. Boellaard R, Delgado-Bolton R, Oyen WJ, *et al*. FDG PET/CT: EANM procedure guidelines for tumour imaging: version 2.0. *Eur J Nucl Med Mol Imaging* 2015;42:328–54.
2. Eisenhauer EA, Therasse P, Bogaerts J, *et al*. New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). *Eur J Cancer* 2009;45:228–47.
3. Koopmans KP, Neels ON, Kema IP, *et al*. Molecular imaging in neuroendocrine tumors: molecular uptake mechanisms and clinical results. *Crit Rev Oncol Hematol* 2009;71:199–213.
4. Meignan M, Gallamini A, Haioun C, *et al*. Report on 2th International Workshop on interim positron emission tomogrpahy in lymphoma held in Menton, France, 8–9 April 2010. *Leuk Lymphoma* 2010;51:2171–80.
5. Meignan M, Barrington S, Itti E, *et al*. Report on the 4th International Workshop on Positron Emission Tomography in Lymphoma held in Menton, France, 3–5 October 2012. *Leuk Lymphoma* 2014;55:31–7.
6. Van Kruchten M, de Vries EG, Brown M, *et al*. PET imaging of oestrogen receptors in patients with breast cancer. *Lancet Oncol* 2013;14:465–75.

### 4.2.9 RECIST

**Saskia Litière**

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| Objectives | • To be able to use Response Evaluation Criteria in Solid Tumours (RECIST) for assessment of tumour response as (part of) an end point in the context of clinical trials |
| Awareness | • Awareness that RECIST is the result of an initiative to harmonise the definition of tumour response to establish a credible end point that can be used uniformly across centres in a multicentre trial, but also to compare results across clinical trials on different tumour types and treatment modalities |

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| | • Recognition that RECIST was developed to be broadly applicable, ie, across different solid tumours, but can be of limited use in certain settings due to specificities of some tumour types; for these, alternative response criteria may exist<br>• Appreciation that RECIST was developed primarily for assessing activity (in terms of tumour shrinkage) of cytotoxic agents, as an end point in phase II trials, but is increasingly used as an end point for treatment efficacy in phase III trials (progression-free survival based on RECIST assessments) of non-cytotoxic agents<br>• Awareness that RECIST was developed for clinical trials; for the individual patient, treatment benefit should be based on medical judgement that results from a synthesis of clinical, imaging and laboratory data<br>• Awareness of the existence of a dedicated website which addresses frequently asked questions (http://www.eortc.org/recist/) |
| Knowledge | • Familiarity with RECIST 1.1<br>◦ Difference between measurable and non-measurable disease<br>◦ Difference between the evaluation of target and non-target lesions<br>◦ Number of lesions to be assessed<br>◦ How to integrate lymph nodes in the assessment<br>◦ The role of confirmation of response |
| Skills | • Ability to contribute in tumour board reviews with imaging specialists<br>• Ability to use the RECIST for evaluating the response and to base further treatment or follow-up decisions upon |

**Reference**

1. Eisenhauer EA, Therasse P, Bogaerts J, New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). *Eur J Cancer* 2009;45:228–47.

## 4.3 Therapy

**Pia Österlund**
**Gunta Purkalne**
on behalf of the ESMO/ASCO GC Working Group

Medical oncology includes a wide variety of treatment modalities. The key to cure or efficient palliation is often a combination of treatment modalities, and thus basic knowledge of chemotherapy, hormonal therapy, immunotherapy, targeted drugs and other systemic treatments is essential, but not enough. Surgery, radiotherapy and radioisotopes are additional substantial parts of the medical oncologist's toolbox to be considered. Knowledge of the opportunities and limitations of the different treatment modalities is of utmost importance in multidisciplinary team work. Supportive/palliative care modalities, such as nutritional therapy, physiotherapy, psychosocial support etc, facilitate the use of these therapeutic options, and basic knowledge of these measures is mandatory.

### 4.3.1 Surgical oncology

**Piotr Rutkowski**
**Chandrajit Raut**

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| Objectives | • To develop an understanding of the indications and contraindications of oncological surgery by interacting with surgeons<br>• To become knowledgeable about the role of oncological surgery in the staging, cure and palliation of patients with malignant diseases |
| Awareness | • Recognition of the availability of different diagnostic procedures in various cancer types<br>• Awareness of the existence of different prognostic factors in oncological entities<br>• Appreciation of the importance of the multimodality approach to treat patients with solid tumours<br>• Appreciation of the principles of the multimodality approach in patients with limited-stage disease<br>• Appreciation how to assess a patient for suitability for surgery, including appropriate tests and their interpretation<br>• Recognition of the importance of value based healthcare delivery regarding new surgical techniques and technical devices, respectively |
| Knowledge | • Familiarity with the indications for organ preservation, reconstructive surgery, the extent of definitive surgery and the sequencing of surgery with other treatment modalities<br>• Familiarity with the risks and benefits of surgery as a definitive treatment and as an adjunct to radiotherapy and/or systemic therapy, and how the risks and benefits differ based on whether neoadjuvant therapy is used<br>• Knowledge of postoperative complications and the expected length of recovery, and the impact thereof on planned postoperative therapy |

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| | • Understanding of the major importance of multidisciplinary decisions at initial presentation of the patient's disease, to achieve a better outcome<br>• Understanding of the role of surgery in the metastatic and palliative setting<br>• Understanding of the importance of prospective trials and why planning of surgical trials is different from planning of medical oncology and radiotherapy trials<br>• Understanding of the importance of prospective data and tissue collection |
| Skills | • Ability to contribute actively in presenting patient cases during multidisciplinary team meetings and to promote this systematic multidisciplinary strategy<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to contribute to discussions with colleagues and patients on general management strategies in the neoadjuvant and the adjuvant setting, as well as at advanced stage |

## References

1. European Society of Surgical Oncology Core Curriculum, 2010. http://www.essoweb.org/eursso/education/core-curriculum.html
2. Michelassi F. 2010 SSO presidential address: subspecialty certificate in advanced surgical oncology. *Ann Surg Oncol* 2010;17:3094–103.

### 4.3.2 Radiation oncology

**Marcel Verheij**
**Stephen M Hahn**

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| Objectives | • To understand the role of radiation oncology in the multidisciplinary management of patients with cancer |
| Awareness | • Recognition of the importance of providing patient-centric care<br>• Recognition of the importance of the multidisciplinary approach to treat patients with cancer<br>• Awareness of the difference between palliative and curative (definitive) radiotherapy indications<br>• Appreciation of the difference between external beam radiotherapy ('teletherapy') and internal radiotherapy ('brachytherapy')<br>• Appreciation of the relevance of the temporal relationship with other treatment modalities (neoadjuvant, concomitant, adjuvant)<br>• Awareness of the existence of different radiation planning, delivery and position/dose-verification techniques<br>• Awareness of a therapeutic window between tumour control and normal tissue toxicity<br>• Awareness of the published research evidence and guidelines for radiation oncology<br>• Appreciation of the importance of safety culture, a robust quality and safety infrastructure, and process improvement<br>• Recognition of the importance of value-based healthcare delivery |
| Knowledge | • Understanding of the indications for treatments and the risks and benefits of different radiation treatment options<br>• Familiarity with the basic principles of radiation biology, including the effects of time, dose, fractionation and type of radiation<br>• Understanding of the indications for curative radiation therapy and its side effects<br>• Understanding of the benefits and toxicity of palliative radiation treatment<br>• Understanding of the acute, late and very late reactions/complications of radiation treatment<br>• Knowledge of differences in radiation tolerance of organs/tissues at risk<br>• Familiarity with the risks of re-irradiation based on normal tissue tolerance limits<br>• Understanding of the interaction between radiation and systemic drugs<br>• Familiarity with the type and severity of the toxicity from the use of concomitant systemic drugs and radiation<br>• Understanding of the interaction of radiation therapy on surgery in the preoperative and postoperative settings<br>• Understanding of the basic principles of different radiation planning and delivery techniques such as intensity-modulated radiation therapy (IMRT), stereotactic, particle and adaptive radiotherapy<br>• Understanding of the basic principles of brachytherapy and radionuclide therapy<br>• Understanding of the basic principles of different radiation position/dose-verification techniques such as electronic portal imaging devices (EPID), image guided radiation therapy (IGRT) and in vivo dosimetry<br>• Familiarity with the role of surgery, interventional radiology, radiation oncology, systemic antitumour therapy, symptom control and supportive/palliative care measures in patients with relapsed disease |

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| | • Knowledge of relevant published research evidence, of the results of major randomised trials that have influenced present practice, of ongoing trials of radiation oncology and systemic therapy, and of national/international guidelines<br>• Understanding of the fundamental concepts of value-based healthcare |
| Skills | • Ability to deliver effective interdisciplinary consultations and contribute effectively to the discussions of multidisciplinary teams<br>• Ability to elicit the patient's wishes with regard to the aims of treatment and to give the treatment alone or in collaboration with other specialists<br>• Ability to inform patients on different radiation treatment options and discuss the risk/benefit ratio and to explain these in lay terminology to patients and families<br>• Ability to communicate about considerations in prescribing external beam radiation and/or brachytherapy<br>• Ability to communicate about basic considerations in prescribing various systemic agents and their potential interactions with radiation therapy<br>• Ability to modulate the concomitant treatment of systemic drugs and radiation according to the patient's situation in collaboration with the multidisciplinary team<br>• Ability to communicate about different radiation planning, delivery and position/dose-verification techniques<br>• Ability to discuss relevant clinical trials and evidence-based guidelines<br>• Ability to discuss options of entering a clinical trial involving radiotherapy<br>• Ability to foster a robust safety culture, including the reporting of events and involvement in process improvement |

## References


1. ASTRO Guidelines. https://www.astro.org/clinical-practice/guidelines/index.aspx
2. Gunderson LL, Tepper JE. *Clinical radiation oncology*. 4th edn. New York: Elsevier, 2016.
3. Joiner M, Van der Kogel A. *Basic clinical radiobiology*. 5th edn. New York: CRC Press, 2014.


### 4.3.3 Anticancer agents

**Edward Chu**
**Cristiana Sessa**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients who are receiving systemic therapy, including chemotherapy, (anti)hormonal therapy, biological therapy, targeted therapy or immunotherapy, for their specific cancer |
| Awareness | • Awareness of the existence of the different types of cancer chemotherapy agents<br>• Awareness of the existence of the different types of (anti)hormonal agents<br>• Awareness of the existence of the different types of biological agents<br>• Awareness of the existence of the different types of targeted agents<br>• Awareness of the existence of the different types of immunotherapy agents<br>• Awareness of the importance of the multimodality approach to treat individual cancers with locally advanced disease<br>• Awareness of the importance of the multimodality approach to treat individual cancers with advanced, metastatic disease<br>• Awareness of the importance of using biomarkers to administer personalised therapy for patients with specific cancer types |
| Knowledge | • Knowledge of the classification of an anticancer agent as cytotoxic chemotherapy, (anti)hormonal agent, biological agent, targeted agent and/or immunotherapy<br>• Knowledge of the specific mechanisms of action of an individual anticancer agent<br>• Knowledge of the specific mechanisms of resistance that have been identified for an individual anticancer agent<br>• Knowledge of key clinical pharmacology principles of individual anticancer agents, including absorption, distribution, metabolism and clearance/elimination (ADME)<br>• Knowledge of the main clinical indications for an individual anticancer agent<br>• Knowledge of the recommended dosing for an individual anticancer agent and how to adapt it to individual tolerability<br>• Knowledge of food–drug interactions for an individual anticancer agent, especially as they relate to the use of oral anticancer therapy |

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| | • Knowledge of drug–drug interactions, which include drug–herb and drug–nutritional supplement interactions, for an individual anticancer agent<br>• Knowledge of the main side effects associated with an individual anticancer agent<br>• Knowledge of the specific black-box warnings for an individual anticancer agent<br>• Knowledge of dosing of an individual anticancer agent in the setting of liver and/or kidney dysfunction (see subsection 4.12)<br>• Knowledge of specific considerations for an individual anticancer agent, such as potential interactions with the oral anticoagulants coumarin or warfarin, monitoring for signs and symptoms of fluid retention, close monitoring of complete blood counts (CBCs), monitoring of QT interval, monitoring for infusion reactions etc<br>• Knowledge of the use of molecular biomarkers and specific diagnostic tests for the selection of targeted agents in the treatment of specific cancer types (see subsection 4.2)<br>• Knowledge of newly registered anticancer agents and their indication |
| Skills | • Ability to contribute to discussions on the role of anticancer agents for the treatment of individual cancer types<br>• Ability to contribute to multimodality discussions as to the specific role of anticancer agents and to determine the optimal sequence for the multidisciplinary strategy<br>• Ability to prescribe anticancer agents as monotherapy and in combination regimens with other anticancer agents, such as immunotherapeutic agents, targeted agents and/or with radiation therapy<br>• Ability to adequately appreciate the role of anticancer agents in the neoadjuvant treatment setting for patients with locally advanced disease<br>• Ability to adequately appreciate the role of anticancer agents in the adjuvant setting following surgical resection of the primary tumour<br>• Ability to adequately appreciate the role of anticancer agents in the treatment of advanced, metastatic disease<br>• Ability to adequately appreciate the key clinical factors (such as performance status, age, presence of comorbid illnesses, prior therapies and organ functional status) that are important for considering when to initiate and when to stop treatment with anticancer agents<br>• Ability to prescribe and administer chemotherapeutic agents parenterally<br>• Ability to assess how to administer targeted therapy according to the molecular marker status of the individual cancer type<br>• Ability to prevent and/or manage the short-term acute side effects associated with anticancer agents including prevention and management of chemotherapy extravasation (see chapter 4.3.6)<br>• Ability to prevent and/or manage the long-term chronic side effects associated with anticancer agents (see chapter 4.3.6)<br>• Ability to contribute actively to discussions on the pros and cons of treatment choice and alternative treatment strategies with patients |

## References


1. Chabner BA. Chemotherapy of neoplastic diseases. In: Brunton LL, Chabner BA, Knollman BC, eds. *Goodman and Gilman's the pharmacological basis of therapeutics*. 12th edn. New York: McGraw Medical, 2015.
2. Chu E, Sartorelli AC. Cancer chemotherapy. In: Katzung BG, Trevor AJ, eds. *Basic and clinical pharmacology*. 13th edn. New York: McGraw Medical, 2015.
3. Chu E, DeVita VT. *Physicians' cancer chemotherapy drug manual 2016*. 16th edn. Jones and Bartlett Learning, 2016.
4. Perry MC. *Perry's the chemotherapy source book*. 5th edn. Philadelphia: Lippincott Williams & Wilkins, 2012.
5. Sessa C, Gianni L, Garassino M, *et al. ESMO handbook of clinical pharmacology of anticancer agents*. Viganello-Lugano: ESMO Press, 2012.
6. Tortora G, Sessa C, Scarpa A, Banerjee S. *ESMO handbook of translational research*. Viganello-Lugano: ESMO Press, 2014.


### 4.3.4 Biological therapy

**Roisin Connolly**

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| Objectives | • To become familiar with all aspects of pharmacology and mechanisms of action of biological therapies, comprising cytokines and haematopoietic growth factors, and expected adverse events in patients with malignancies (for immunotherapy, see chapter 4.3.5)<br>• To be able to appropriately select biological therapy and to perform specialist care for patients receiving these therapies |
| Awareness | • Awareness of the existence of different biological therapy options for the management of patients with malignancies<br>• Appreciation of the principles of pharmacology and mechanisms of action of the various biological therapies<br>• Awareness of the existence of established biomarkers guiding choice of therapy |

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| | • Awareness of the existence of different adverse events profiles of biological therapies and management strategies for same<br>• Awareness of the principles of incorporation of biological therapy with other treatment modalities where appropriate |
| Knowledge | • Familiarity with the different classes of biological therapy available for management of patients with advanced malignancies<br>• Familiarity with the pharmacology and mechanisms of action of these agents<br>• Familiarity with the indications for use of biological therapy and factors guiding appropriate selection of therapy for patients<br>• Familiarity with the work-up of patients prior to initiation of biological therapy and appropriate monitoring during therapy<br>• Familiarity with the dosing, schedule and dose-adjustment parameters<br>• Familiarity with the side-effect profiles of biological therapy, and their management in terms of supportive care and appropriate alteration of the treatment plan in response to same<br>• Understanding of the role of biological therapy in the management of patients with malignancies<br>• Knowledge of the expected treatment outcome of biological therapy in patients with malignancies |
| Skills | • Ability to contribute actively to the decision to prescribe and appropriately select biological therapy for patients with malignancies, through discussions in the clinic and case presentations<br>• Ability to contribute actively to the counselling process with patients regarding treatment indication and options, dosing and schedule of therapy, and expected adverse effects of therapy as well as management strategies to deal with same<br>• Ability to recognise and manage the capillary leak syndrome seen with cytokines<br>• Ability to contribute actively to the discussion on the pros and cons of treatment choice and alternative treatment strategies with patients<br>• Ability to recognise considerations in the work-up of patients prior to therapy, and the management of side effects of biological therapy |

## References


1. Avendaño C, Menéndez JC. Biological therapy of cancer. In: *Medicinal chemistry of anticancer Drugs*. 2nd edn. New York: Elsevier, 2015.
2. Awada G, Kourie HR, Awada AH. Novel mechanisms and approaches in the medical therapy of solid cancers. *Discov Med* 2015;20:33–41.
3. Dietel M, Jöhrens K, Laffert MV, *et al*. A 2015 update on predictive molecular pathology and its role in targeted cancer therapy: a review focussing on clinical relevance. *Cancer Gene Ther* 2015;22:417–30.
4. Huang M, Shen A, Ding J, *et al*. Molecularly targeted cancer therapy: some lessons from the past decade. *Trends Pharmacol Sci* 2014;35:41–50.
5. Liu S, Kurzrock R. Toxicity of targeted therapy: implications for response and impact of genetic polymorphisms. *Cancer Treat Rev* 2014;40:883–91.
6. Tobin NP, Foukakis T, De Petris L, *et al*. The importance of molecular markers for diagnosis and selection of targeted treatments in patients with cancer. *J Intern Med* 2015. doi: 10.1111/joim.12429.
7. Widakowich C, de Castro G Jr, de Azambuja E, *et al*. Review: side effects of approved molecular targeted therapies in solid cancers. *Oncologist* 2007;12:1443–55.


### 4.3.5 Immunotherapy

**Jeffrey S Weber**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with cancer who will be receiving immunotherapy (for cytokines and haematopoietic growth factors, see chapter 4.3.4) |
| Awareness | • Appreciation that the basic principles of tumour immunology provide the biological justification for the use of different types of immunotherapy for cancer<br>• Appreciation that monoclonal antibodies such as checkpoint inhibitors, and adoptive cell therapies can be used in different malignancies<br>• Appreciation that immunotherapies may have a unique spectrum of toxicity not seen with chemotherapy or targeted therapy<br>• Awareness that unconventional patterns of response occur with immunotherapies including late responses or regression after progression<br>• Appreciation that immunotherapy has the potential for achieving responses of long duration |
| Knowledge | • Familiarity with the different arms of the immune system that comprise immunotherapy<br>• Understanding how the use of antibodies differs from cellular therapy<br>• Familiarity with the differences between immunotherapy and targeted therapy or chemotherapy<br>• Familiarity with the signs and symptoms of immune-related adverse events and their management |

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| | • Familiarity with cytokine release syndrome seen with adoptive cell therapy and its management<br>• Familiarity with the management of unconventional responses and the need to verify progression in selected patients that may have pseudo-progression or a mixed response<br>• Understanding that the duration of immunotherapies varies, with prolonged use of checkpoint inhibitors to limited use of adoptive cell therapy |
| Skills | • Ability to contribute actively to a variety of immunotherapy clinical scenarios and patient presentations<br>• Ability to discuss immunotherapy treatment options/recommendations critically<br>• Ability to perform a history and physical examination in immunotherapy patients<br>• Ability to contribute to discussions on choosing the right patient for immunotherapy, based on histology, staging, tumour burden, performance status and tolerance of toxicity<br>• Ability to contribute to discussions on choosing the optimal sequence of immunotherapy with other standard therapies<br>• Ability to recognise and manage the immune-related adverse events seen with checkpoint inhibition, most commonly including skin, endocrine, gastrointestinal, pulmonary and hepatic systems<br>• Ability to assemble a multidisciplinary group of consultants to facilitate the care of patients suffering from immune-related adverse events<br>• Ability to recognise and manage the cytokine release syndrome seen with adoptive cell therapy<br>• Ability to distinguish immune-related toxicity from progression of disease<br>• Ability to perform a risk–benefit assessment for patients considering adjuvant immunotherapy<br>• Ability to determine the optimal duration of immunotherapy, including checkpoint inhibitors based on their toxicity profile and the likelihood of having an unconventional response |

## References


1. Chen DS, Mellman I. Oncology meets immunology: the cancer-immunity cycle. *Immunity* 2013;39:1–10.
2. Ribas A. Adaptive immune resistance: how cancer protects from immune attack. *Cancer Discov* 2015;5:915–19.
3. Topalian SL, Drake CG, Pardoll DM. Immune checkpoint blockade: a common denominator approach to cancer therapy. *Cancer Cell* 2015;27:450–61.


### 4.3.6 Complications/Toxicities of treatment

**Ben Markman**
**Josep Tabernero**

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| Objectives | • To be able to assess, diagnose and treat patients with complications/toxicities of anticancer therapies |
| Awareness | • Recognition that different classes of cancer treatments (cytotoxic, (anti)hormonal, targeted and immunotherapy) are associated with a different spectrum of complications/toxicities<br>• Appreciation that toxicities of different anticancer therapies can be overlapping<br>• Awareness that newer classes of cancer drug therapy (targeted therapy, immunotherapy) are associated with some complications not seen with more traditional therapies (cytotoxic, (anti)hormonal)<br>• Appreciation that organs and body systems can be affected by complications/toxicities with variable frequency, severity and chronicity<br>• Recognition that severity and chronicity will have implications for management decisions<br>• Awareness that complications/toxicities can be acute or chronic<br>• Awareness that complications/toxicities can be temporary or permanent<br>• Appreciation that drug interactions can contribute to complications/toxicities of treatment<br>• Recognition that clinical assessment is of critical importance in the evaluation of treatment-related adverse events<br>• Awareness of the existence of the available diagnostic tests<br>• Awareness that the complications/toxicities of treatment can have physical and psychological impacts on the patient<br>• Recognition that management is often multidisciplinary<br>• Awareness that preventative/prophylactic measures exist for some complications/toxicities<br>• Appreciation that complications/toxicities from therapy can impact the deliverability of subsequent anticancer treatment |
| Knowledge | • Familiarity with the complications/toxicities associated with classes of anticancer therapy (cytotoxic, (anti) hormonal, targeted and immuno-therapy) and with single agents<br>• Familiarity with the frequency with which adverse events occur, how severity can be assessed and the natural history of such events |

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| | • Understanding that prescription, over-the-counter and complementary medicines have the potential to interact with anticancer therapy and thus contribute to adverse events<br>• Understanding of the diagnostic approach to complications of therapy, in particular the relevant history, examination and investigational findings<br>• Familiarity with the spectrum of therapeutic options available for complications of treatment, including pharmacological and non-pharmacological strategies<br>• Knowledge of evolving treatment paradigms for targeted therapy and immunotherapy<br>• Understanding that many other healthcare professionals will have a role in the diagnosis and management of the complications/toxicities of treatment, including medical, nursing, pharmacy and allied health personnel<br>• Understanding that effective prevention and/or prophylactic strategies can be employed to reduce the frequency and/or severity of some complications/toxicities<br>• Familiarity with potential mechanisms of complications/toxicities<br>• Familiarity with potential drug interactions contributing to complications/toxicities and the mechanisms of these interactions<br>• Familiarity with the psychological impact of treatment-related adverse events and the supportive measures available to the patient<br>• Understanding how the complications/toxicities of treatment will impact future delivery of anticancer therapy and when a dose delay, dose modification or treatment cessation may be applied |
| Skills | • Ability to contribute actively to a wide variety of presentations of complications/toxicities of different classes of anticancer therapy<br>• Ability to perform a thorough history and clinical examination<br>• Ability to contribute actively to present patient cases<br>• Ability to discuss potential diagnostic investigations including the merits and limitations of the tests<br>• Ability to contribute to discussions on management strategies with reference to pharmacological and non-pharmacological methods<br>• Ability to discuss the role of other healthcare professionals for each scenario<br>• Ability to discuss prophylactic/preventative measures that can be instituted to protect patient safety |


## References

1. American Society of Clinical Oncology (ASCO). Clinical practice guidelines: supportive care and treatment-related issues. http://jco.ascopubs.org/site/misc/specialarticles.xhtml
2. Bragalone DL. *Drug information handbook for oncology*. 13th edn. Hudson, OH: Lexi-Comp, 2015.
3. Dy GK, Adjei AA. Understanding, recognising, and managing toxicities of targeted anticancer therapies. *CA Cancer J Clin* 2013;63:249–79.
4. European Society of Medical Oncology (ESMO). Clinical practice guidelines: supportive care. http://www.esmo.org/Guidelines/Supportive-Care
5. Gangadhar TC, Vonderheide RH. Mitigating the toxic effects of anticancer immunotherapy. *Nat Rev Clin Oncol* 2014;11:91–9.
6. Naidoo J, Page DB, Li BT, *et al*. Toxicities of the anti-PD-1 and anti-PD-L1 immune checkpoint antibodies. *Ann Oncol* 2015;26:2375–91.
7. National Comprehensive Cancer Network (NCCN). Guidelines for supportive care. http://www.nccn.org/professionals/physician_gls/f_guidelines.asp


## 4.4 Supportive and palliative care

### 4.4.1 Supportive measures

**Timothy Moynihan**
**Jørn Herrstedt**

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| Objectives | • To be able to understand, evaluate and provide supportive care to patients with cancer, including management of symptoms from the cancer and side effects of therapy from the time of diagnosis until death or until rehabilitation and survivorship issues have been successfully managed<br>• To know the indications for the different supportive treatments and their limitations and side effects<br>• To be aware of the importance of a multidisciplinary approach |
| Awareness | • Appreciation of common symptoms of malignant disease<br>• Appreciation of the pathophysiology of symptoms of malignant disease<br>• Awareness of common side effects of antineoplastic therapies<br>• Appreciation of the prevention and management of side effects of antineoplastic therapies<br>• Recognition of the need for multidisciplinary approach to supportive care<br>• Awareness of evidence-based supportive care guidelines—usage and limitations<br>• Awareness of agents used in the management of symptoms associated with the treatment of malignant disease |

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| Knowledge | *Haematological disease-related complications and toxicity*<br>Infections and neutropenia<br>• Understanding of treatment-related and patient risk factors for neutropenia and infections<br>• Understanding of the use of appropriate and timely antibiotics in neutropenic patients<br>• Understanding of the use of growth factor support<br>• Understanding of the evaluation, prophylaxis and treatment of febrile neutropenia in different patient populations<br>Anaemia and thrombocytopenia<br>• Understanding of the causes of anaemia and evaluation<br>• Understanding of the role for transfusion support (red cell and platelets)<br>• Understanding of the indications for growth factor support<br>• Understanding of the toxicities of blood transfusions and growth factor support<br>Thrombosis/Thromboembolism<br>• Understanding of the pathophysiology of cancer-induced thrombosis/thromboembolism<br>• Understanding of the prophylaxis and management of thrombosis/thromboembolism<br>*Lymphoedema*<br>• Understanding of the pathophysiology of cancer-induced and treatment-induced lymphoedema<br>• Understanding of the prophylaxis and management of lymphoedema<br>*Cardiovascular disease-related complications and toxicity*<br>Cardiac toxicity<br>• Understanding of the cardiac toxicities of antineoplastic therapies:<br>◦ Chemotherapeutic agents—dose restrictions<br>◦ Targeted agents<br>• Knowledge of appropriate cardiac supportive treatment<br>Pericardial effusion (see Respiratory disease-related complications and toxicity)<br>*Superior/inferior vena cava syndrome*<br>• Understanding of the diagnosis and treatment of superior/inferior vena cava syndrome<br>*Respiratory disease-related complications and toxicity*<br>Pulmonary toxicity<br>• Understanding of pulmonary toxicities of antineoplastic therapies:<br>◦ Chemotherapeutic agents—dose restrictions<br>◦ Targeted agents<br>Malignant effusions<br>• Understanding of the pathophysiology of malignant pericardial and pleural effusions and of ascites<br>• Understanding of the management of malignant pericardial and pleural effusions and of ascites<br>• Knowledge of appropriate respiratory supportive treatment<br>*Gastrointestinal disease-related complications and toxicity*<br>Nausea and vomiting<br>• Understanding of the pathophysiology of nausea and vomiting:<br>◦ Acute, delayed and anticipatory nausea and vomiting from chemotherapy<br>◦ Radiotherapy-induced nausea and vomiting<br>◦ Nausea and vomiting from combined radio-chemotherapy<br>◦ Nausea and vomiting not induced by cancer therapy but tumour-related with bowel obstruction, brain metastases, electrolyte disturbances<br>• Understanding of the mechanisms of action of antiemetic therapies<br>• Understanding of the emetogenic potential of antineoplastic therapies and patient-related risk factors<br>• Knowledge of appropriate antiemetic therapy prophylaxis based on treatment regimen<br>Oral<br>• Understanding of the pathophysiology diagnosis and management of:<br>◦ Dental problems<br>◦ Hyposalivation<br>◦ Xerostomia<br>◦ Mucositis (oral and gastrointestinal)<br>• Understanding of common causes of mucositis<br>• Understanding of the prevention and treatment of mucositis<br>• Understanding of osteonecrosis of jaw<br>Liver<br>• Understanding of liver toxicities of antineoplastic agents |

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Constipation
- Understanding of constipation induced by antineoplastic/supportive agents
- Understanding of tumour-induced constipation
- Understanding of the prevention and treatment of constipation

Diarrhoea
- Understanding of the pathophysiology, diagnosis and management of:
  - Diarrhoea induced by chemotherapy
  - Diarrhoea induced by targeted agents, including immune therapy
  - Diarrhoea induced by radiation therapy
  - Tumour-induced diarrhoea
- Understanding of the prevention and treatment of diarrhoea

Ascites (see Respiratory disease-related complications and toxicity)

Fistula
- Understanding of the symptomatology and management of tumour-associated fistulas

Nutritional support
- Understanding of the role for use of nutritional support
- Understanding of the limitations and toxicities of nutritional support
- Knowledge when nutritional support should be withheld or withdrawn

*Urological disease-related complications and toxicity*
- Understanding of the pathophysiology and management of:
  - Renal toxicities of antineoplastic agents
  - Ureteric obstruction
  - Incontinence
  - Haematuria
  - Urethral obstruction
  - Vesicovaginal and vesicoenteric fistulas

*Gynaecological disease-related complications and toxicity*
- Understanding of the pathophysiology and management of:
  - Lymphoedema (see Lymphoedema complications and toxicity)
  - Malignant intestinal obstruction
  - Vaginal bleeding
  - Fistulas (see Gastrointestinal and urological disease-related complications and toxicity)
  - Sexual dysfunction

*Neurological disease-related complications and toxicity*

Central nervous system symptoms
- Headache, seizures, encephalopathy, cognitive impairment due to cancer or therapy

Peripheral neuropathy
- Understanding of common therapies that cause peripheral neuropathy
- Understanding of the evaluation of peripheral neuropathy
- Understanding of the treatments for peripheral neuropathy

Eye symptoms and toxicity
- Eye symptoms such as cataract, glaucoma and blepharitis induced by chemotherapy, targeted agents and immunotherapy

*Reproductive disease-related complications and toxicity*

Hormonal effects
- Understanding of menopausal symptoms from cancer therapies
- Understanding of the management of menopausal symptoms
- Understanding of the long-term effects of induced hypogonadism in males and females

Fertility preservation
- Understanding of the causes of infertility related to antineoplastic therapies
- Understanding of prevention and preservation strategies

Sexuality
- Understanding of sexual complications from antineoplastic therapies

*Skin disease-related complications and toxicity*

Skin toxicity induced by:
  - Chemotherapy
  - Targeted agents
  - Immunotherapy
- Understanding of the prevention and treatment of skin toxicity

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| | Extravasation<br>• Knowledge of common vesicant chemotherapeutic agents<br>• Understanding of strategies for prevention of extravasation<br>• Understanding of the treatment of acute extravasation<br>Alopecia<br>• Knowledge of common chemotherapeutic agents causing hair loss<br>• Knowledge of indications for scalp cooling as a preventive tool for alopecia<br>*Endocrine and metabolic disease-related complications and toxicity*<br>• Understanding of the pathophysiology, symptomatology and management of:<br>◦ Hypopituitarism<br>◦ Hypothyroidism, eg, induced by targeted therapy<br>◦ Adrenal insufficiency<br>◦ Tumour lysis syndrome (oncological emergencies)<br>◦ Electrolyte disturbances, eg, hypomagnesaemia, hypercalcaemia<br>◦ Tumour-related fever<br>*Bone disease-related complications and toxicity*<br>• Knowledge of skeletal complications of cancer therapies<br>• Understanding of the mechanism of action of bone-active agents<br>• Understanding of preventive and treatment strategies for skeletal complications<br>*Supportive care in the special subpopulation of geriatric patients*<br>• Knowledge how to evaluate the elderly patient as part of a multidisciplinary team<br>• Understanding of comorbidity and polypharmacy in the elderly patient<br>• Knowledge how to manage complications and toxicity of particular high risk in elderly patients, eg, neutropenia, osteoporosis, undernutrition<br>*Oncological emergencies*<br>• Knowledge of common oncological emergencies<br>• Knowledge how to evaluate and treat oncological emergencies<br>*Paraneoplastic syndromes*<br>• Understanding of the common paraneoplastic syndromes<br>*Education* (see section 8. Patient education)<br>*Fatigue* (see chapter 4.4.2 Palliative care)<br>*Psychosocial aspects* (see section 5. Psychosocial aspects of cancer)<br>*Pain* (see chapter 4.4.2 Palliative care) |
| Skills | • Ability to provide supportive care measures to manage successfully all cancer-related symptoms of any tumour entity<br>• Ability to counsel patients on side effects of therapy:<br>◦ Sexual<br>◦ Hormonal<br>◦ Fertility<br>◦ Nausea<br>◦ Cardiac<br>◦ Renal<br>• Ability to provide preventive and treatment strategies for common side effects of therapy<br>• Ability to manage oncological emergencies |

## References


1. ESMO clinical practice guidelines: supportive care. http://www.esmo.org/Guidelines/Supportive-Care
2. Lewis MA, Hendrickson AW, Moynihan TJ. Oncologic emergencies: pathophysiology, presentation, diagnosis, and treatment. *CA Cancer J Clin* 2011;61:287–314.
3. Olver I, ed. *The MASCC textbook of cancer supportive care and survivorship*. New York: Springer, 2011.

## 4.4.2 Palliative care

**Timothy Moynihan**
**Florian Strasser**
**Jamie Von Roenn**

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| Objectives | • To be able to screen for, assess, prevent and manage symptoms of patients with cancer such as pain, fatigue, anorexia, anxiety, depression, breathlessness and nausea<br>• To communicate effectively with patients and families about illness understanding and coping with it, prognosis, difficult decisions, end-of-life and its preparation<br>• To recognise the role of cancer rehabilitation, including physical therapy and nutrition<br>• To recognise the importance of culturally competent, multidisciplinary care including families<br>• To understand how to integrate palliative interventions in routine multidisciplinary cancer care<br>• To recognise the difference between burnout, compassion fatigue and depression |
| Awareness | • Appreciation of the role of palliative care interventions across the trajectory of illness for patients with cancer<br>• Recognition of the effects of palliative care interventions integrated into decision-making for anticancer treatments<br>• Awareness of the frequency, impact and interaction of common symptoms, including psychological and existential symptoms, associated with advanced cancer<br>• Appreciation of the principles of mechanism-based, classification-guided and individualised management<br>• Recognition of the role of various professions involved in palliative, supportive and postcurative rehabilitation<br>• Appreciation of synergistic competencies of different disciplines in care pathways of patients with cancer<br>• Appreciation of the effectiveness of structured and compassionate communication with patients and families<br>• Awareness of the impact of culture on cancer management<br>• Awareness of the need for self-care by oncology professionals |
| Knowledge | • Familiarity with the role of multiple disciplines in the care of patients with advanced cancer<br>• Familiarity with how to screen patients for common symptoms and syndromes in routine practice and how to use scales to evaluate their severity<br>• Understanding of the main components of a comprehensive assessment of cancer symptoms and how to make a differential diagnosis<br>• Understanding of the pharmacology and toxicity of medications used for the control of main symptoms<br>• Familiarity with non-pharmacological interventions for symptom control such as counselling, nursing, physical or music therapy, including their indications, efficacy and side effects<br>• Familiarity with an integrated competencies-based management approach to common symptoms in patients with advanced cancer<br>• Familiarity with the evaluation and management of the complications of advanced and metastatic cancer, such as spinal cord compression, bowel obstruction, thrombosis or bleeding<br>• Understanding of the main elements of a decisional process for invasive treatments and end-of-life care<br>• Familiarity with the different roles and burdens of family caregivers and supportive interventions<br>• Understanding of the main components of preparing for end-of-life such as legacy work, finishing business, legal preparation, premortal grief, postmortal caregiver role and place of death<br>• Understanding of the approach to conducting difficult conversations with patients and families<br>• Familiarity with the culturally-based preferences of patients and their families<br>• Understanding of the causes of burnout and potential approaches to prevent it |
| Skills | • Ability to describe criteria for referral to specialised palliative care teams, such as triggers<br>• Ability to describe the mechanisms and pathophysiology of common cancer syndromes, including pain, fatigue, weakness, anorexia, cachexia, anxiety, depression, breathlessness and nausea<br>• Ability to contribute actively in a structured, competencies-aware, respectful way in a multidisciplinary team to plan and coordinate care for patients with advanced cancer and their families<br>• Ability to perform a comprehensive assessment of main symptoms (pain, fatigue, anorexia, anxiety, depression, breathlessness and nausea), including the use of scales<br>• Ability to demonstrate understanding of the pharmacology of medications used to treat main symptoms by appropriately prescribing and titrating opioids, adjuvant analgesics and other drugs<br>• Ability to demonstrate understanding of the toxicities of symptomatic medications by prescribing medications to prevent toxicities<br>• Ability to assess a patient with complex symptoms using cognitive assessment, symptom assessment scales and modular assessments for main syndromes |

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- Ability to discuss the role of anticancer therapies for the relief of cancer-related symptoms and to demonstrate how a patient can be prepared for the decisional encounter
- Ability to demonstrate a structured approach to making decisions for managing complications of metastatic/advanced cancer, and how to evaluate and manage the most common, including but not limited to spinal cord compression, bowel obstruction, thrombosis or bleeding
- Ability to demonstrate the steps required for skilled and compassionate communication with patients and families, including breaking bad news, prognosis discussion, preparation for end-of-life or family conflicts about care decisions
- Ability to discuss specific culturally-based preferences with patients and their families
- Ability to evaluate and manage psychological and existential symptoms and distress of having advanced cancer, including anxiety, depression, anger and despair
- Ability to share a personal plan for self-care and to describe its importance for yourself
- Ability to discuss the role of postcurative, supportive and palliative rehabilitation in the care of patients with advanced cancer and different models of outpatient and inpatient and home care
- Ability to demonstrate how a patient is characterised who is in need of specialised palliative care
- Ability to understand the causes of burnout and potential approaches to prevent it

## References


1. Bruera E, Higginson I, von Gunten CF, *et al*. eds. *Textbook of palliative medicine and supportive care*. 2nd edn. New York: CRC Press, 2015.
2. Cherny N, Fallon M, Kaasa S, eds. *Oxford textbook of palliative medicine*. 5th edn. Oxford: Oxford University Press, 2015.
3. EPEC-O Self-Study. http://www.cancer.gov/resources-for/hp/education/epeco
4. Distelhorst SR, Cleary JF, Ganz PA, *et al*. Breast Health Global Initiative Global Summit on Supportive Care and Quality of Life Consensus Panel Members. Optimisation of the continuum of supportive and palliative care for patients with breast cancer in low-income and middle-income countries: executive summary of the Breast Health Global Initiative, 2014. *Lancet Oncol* 2015;16:e137–47.
5. Kloke M, Cherny N, ESMO Guidelines Committee. Treatment of dyspnoea in advanced cancer patients: ESMO clinical practice guidelines. *Ann Oncol* 2015;26(Suppl 5):v169–73.
6. NCCN Guidelines for Palliative Care. http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#supportive
7. Schrijvers D, Cherny NI, ESMO Guidelines Working Group. ESMO clinical practice guidelines on palliative care: advanced care planning. *Ann Oncol* 2014;25(Suppl 3):iii138–42.
8. Walsh TD. *Palliative medicine: expert consult: online and print*. 1st edn. Philadelphia: Saunders, 2011.


### 4.4.3 End-of-life care

**Timothy Moynihan**
**Florian Strasser**
**Jamie Von Roenn**

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| Objectives | • To recognise the unique aspects of end-of-life care, such as decision-making processes, symptom management, involvement of family members and spiritual aspects<br>• To understand how to recognise pseudo-refractory symptoms and when to refer to specialist palliative care teams for management of refractory symptoms<br>• To understand how to maintain patients' cognition until close to death with good symptom control<br>• To be able to assess, treat and counsel patients who are approaching end-of-life<br>• To incorporate the family and beloved ones into goal planning |
| Awareness | • Recognition that discussions of end-of-life care and planning should begin early in the disease<br>• Appreciation that multidisciplinary care is always needed to meet unique patient and family needs, including psychosocial, physical, spiritual and emotional needs<br>• Recognition that oncologists should be skilled in providing primary palliative care interventions and when specialist palliative care referral is required<br>• Awareness of religious and cultural differences as well as sensitivities<br>• Appreciation of illness and prognosis, concrete preparation for end-of-life, and the likelihood, that the benefit and side effects of anticancer treatment meet patient goals, influence decisions for it |
| Knowledge | • Familiarity with how cancer disease leads to symptoms and syndromes close to end-of-life and how anticancer treatment may influence them<br>• Understanding of decisional processes regarding invasive and aggressive treatments, including prognosis, progression, probability that intervention will help, prevention, price and preferences |

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| | • Understanding of the management of symptoms and syndromes at end-of-life, including dyspnoea, pain, nausea, diarrhoea, fatigue, weakness, anorexia, cachexia seizures, delirium, anxiety, depression and despair<br>• Familiarity with the indications for and limitations of artificial nutrition and hydration at end-of-life<br>• Understanding of the cultural and religious differences of individual families and needs for rituals or ceremonies at end-of-life and after death<br>• Understanding of the main components of preparing for end-of-life such as legacy work, finishing business, legal preparation, premortal grief, pot-mortal caregiver role and place of death |
| Skills | • Ability to describe how to elicit illness and prognosis understanding by patients and family, to prepare patients to the dying process by legacy work, grief processes, finishing business and spirituality<br>• Ability to describe the indications for and limitations of aggressive care in poor performance status patients or those with short life expectancy<br>• Ability to elicit from patients their understanding of their health condition, what the expected outcome will be and how therapies may impact that outcome<br>• Ability to demonstrate how to communicate prognosis, including impending death clearly and sensitively<br>• Ability to communicate the benefits and limitations of anticancer therapies by assessing and educating patients and family, by clarifying understanding, and by discussing and weighing options<br>• Ability to run effective family care conferences by preparation and structured, sensible approach<br>• Ability to coordinate and run multidisciplinary and interprofessional care conferences<br>• Ability to establish patient preferences for end-of-life care, including structured advanced care planning consistent with patients' and families' values and care goals<br>• Ability to counsel and support family members in their double role as grieving family and caregivers<br>• Ability to demonstrate how to initiate and titrate essential medications for symptoms<br>• Ability to follow and steer main steps of a terminal care pathway protocol together with a team<br>• Ability to demonstrate how to symptomatically manage terminal delirium, dyspnoea and pain<br>• Ability to identify refractory symptoms and to initiate specialist-supported palliative care, including palliative sedation<br>• Ability to use physical findings to help predict the length of survival, to detail concrete consequences of preparatory steps to death and specific treatments and to communicate these to the family<br>• Ability to coordinate referrals to palliative home care, nursing homes and hospice |


## References

1. Bruera E, Higginson I, von Gunten CF, *et al*. eds. *Textbook of palliative medicine and supportive care*. 2nd edn. New York: CRC Press, 2015.
2. Cherny N, Fallon M, Kaasa S, eds. *Oxford textbook of palliative medicine*. 5th edn. Oxford: Oxford University Press, 2015.
3. EPEC-O Self-Study. http://www.cancer.gov/resources-for/hp/education/epeco
4. Kloke M, Cherny N, ESMO Guidelines Committee. Treatment of dyspnoea in advanced cancer patients: ESMO clinical practice guidelines. *Ann Oncol* 2015;26(Suppl 5):v169–73.
5. NCCN Guidelines for Palliative Care. http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#supportive
6. Schrijvers D, Cherny NI, ESMO Guidelines Working Group. ESMO clinical practice guidelines on palliative care: advanced care planning. *Ann Oncol* 2014;25(Suppl 3):iii138–42.
7. Walsh TD. *Palliative medicine: expert consult: online and print*. 1st edn. Philadelphia: Saunders, 2011.


### 4.5 Management and treatment of specific cancers

**Rossana Berardi**

Having understood the general principles of treatment, the trainee should be instructed in the care of specific cancer types and the unique considerations for each malignant disease.

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| Objectives | • To be able to perform specialist assessment, management and counselling of patients with cancer, including supportive, palliative, end-of-life and survivorship care<br>• To know the risk factors, epidemiology, screening, prevention, pathophysiology, genetics, biomarkers, signs and symptoms, diagnostic work-up, treatment, follow-up as well as supportive and palliative measures for each specific disease<br>• To be able to communicate and discuss these topics with patients; for each tumour, specific items may be more important |

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| Awareness | • Awareness of the existence of different prognostic factors<br>• Awareness of the existence of different biological and pathological subtypes of cancer for the selection of the appropriate treatment strategies<br>• Awareness of the availability of different diagnostic procedures<br>• Recognition of the importance of the multimodality approach to treat patients with cancer<br>• Awareness of the principles of the multimodality approach in patients with different extents of disease (limited-stage disease or advanced disease)<br>• Awareness of the established biomarkers guiding therapy for selected tumours<br>• Appreciation of the importance and timing of follow-up for the main tumour entities |
| Knowledge | • Knowledge of the implications of the different biological and pathological subtypes of different tumours for the selection of the appropriate treatment strategies<br>• Knowledge of the indications for, expectations from and limitations of the different diagnostic tools available for the identification of different kinds of tumours (including fine needle aspiration (FNA), open biopsy, surgery or radiological assessment and imaging)<br>• Knowledge of the risk assessment workup of prognostic factors, especially the staging system for the main tumour types<br>• Knowledge of the indications for and impact of surgery, radiation therapy, systemic therapy such as chemotherapy, immunotherapy and targeted therapy, or supportive and palliative care in cancer<br>• Knowledge of the limitations of therapy (eg, criteria of inoperability, contraindications to radiation, other loco-regional or systemic treatment)<br>• Understanding of the role of systemic therapy in the management of patients with different stages of disease such as localised, locally advanced or metastatic disease<br>• Understanding of the strengths of treatment personalisation opportunities and the importance of offering individualised targeted therapies on the basis of molecular findings, specifically for each type of tumour<br>• Understanding of the complications that derive from disease progression and those that are treatment-associated, in the context of being familiar with supportive and palliative care strategies<br>• Familiarity with clinical trials in specific tumour entities |
| Skills | • Ability to contribute actively to a variety of clinical tumour scenarios<br>• Ability to contribute actively to present patient cases<br>• Ability to discuss critically the available treatment options/recommendations<br>• Ability to perform a history and physical examination (in patients with different tumour entities, including different subtypes)<br>• Ability to contribute to discussions on general management strategies (in patients with different tumour entities, including different subtypes) in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic and non-chemotherapeutic agents considering their potential interactions with different kinds of loco-regional therapy<br>• Ability to make differential indications for the neoadjuvant/preoperative and the adjuvant therapy in the different tumour entities<br>• Ability to take regard to the advanced stage particularities for the different tumour entities<br>• Ability to evaluate conditions (such as performance status, concomitant disease(s), previous treatments etc) that are important for considering when to start and to stop treatment or to switch to another treatment option<br>• Ability to determine therapy according to molecular marker status<br>• Ability to manage side effects of various chemotherapeutic and non-chemotherapeutic agents, and potential pharmacological interactions<br>• Ability to use information technology to improve knowledge and patient care<br>• Ability to discuss prevention strategies with patients<br>• Ability to interpret clinical trials results with a critical mind and to incorporate this knowledge into daily patient care as appropriate to practice evidence-based medicine |

## References


1. Ajzen I. Action control: From cognitions to behaviors. In: Kuhl J, Beckman J, eds. *From intentions to action: a theory of planned behavior*. New York: Springer, 1985:11–39.
2. Cave J, Woolf K, Dacre J, *et al*. Medical student teaching in the UK: how well are newly qualified doctors prepared for their role caring for patients with cancer in hospital? *Br J Cancer* 2007;97:472–78.
3. Cheung WY, Fishman PN, Verma S. Oncology education in Canadian undergraduate and postgraduate training programs. *J Cancer Educ* 2009;24:284–90.
4. Del Giudice ME, Grunfeld E, Harvey BJ, *et al*. Primary care physicians' views of routine follow-up care of cancer survivors. *J Clin Oncol* 2009;27:3338–45.
5. Egnew TR, Wilson J. Role modeling the doctor–patient relationship in the clinical curriculum. *Fam Med* 2011;43:99–105.
6. Francis JJ, O'Connor D, Curran J. Theories of behaviour change synthesised into a set of theoretical groupings: introducing a thematic series on the theoretical domains framework. *Implement Sci* 2012;7:35.
7. Geller AC, Prout MN, Miller DR, *et al*. Evaluation of a cancer prevention and detection curriculum for medical students. *Prev Med* 2002;35:78–86.

8. Jochemsen-van der Leeuw HGAR, van Dijk N, de Jong W, *et al*. Educating the clinical trainer: professional gain for the trainee? A controlled intervention study in general practice. *Perspect Med Educ* 2014;3:455–73.
9. Michie S, Johnston M, Francis J, *et al*. From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques. *Appl Psychol* 2008;57:660–80.
10. Robèrt KH, Einhorn J, Kornhuber B, *et al*. European undergraduate education in oncology: a report of the EORTC Education Branch. *Acta Oncol* 1988;27:423–5.
11. World Health Organization. *WHO patient safety: curriculum guide for medical schools*. UK: World Health Organization, 2009.

## 4.5.1 Head and neck cancers

**Lisa Licitra**
**Everett Vokes**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with head and neck cancer (H&NC), including prevention and human papilloma virus (HPV)-related issues |
| Awareness | • Awareness of the existence of different individual H&NC primary tumour sites with biological and pathological subtypes for the selection of the appropriate treatment strategies<br>• Awareness of the availability of different diagnostic procedures<br>• Awareness of the existence of H&NC-related prognostic factors such as age and HPV<br>• Appreciation of the importance of the multimodality approach to treat patients with H&NC<br>• Awareness of risk factor counselling and smoking cessation<br>• Appreciation of the importance of viral aetiology in specific anatomical subsites |
| Knowledge | • Familiarity with stage-based treatment approaches<br>• Familiarity with recognising patients with or at risk of airway obstruction<br>• Familiarity with the implications of the different subsites, histotypes and biological subtypes of H&NC for the selection of the appropriate treatment strategies<br>• Familiarity with the risk assessment work-up, especially the staging system for H&NC<br>• Familiarity with the indications and value of surgery, radiation therapy, chemotherapy and monoclonal antibodies in H&NC, but also with their limitations (eg, treatment-related sequelae)<br>• Familiarity with preventive measures in preparation for multimodality treatment<br>• Understanding of the role of chemotherapy and monoclonal antibodies in the management of patients with advanced disease<br>• Understanding of the strengths of treatment personalisation opportunities and the importance of offering individualised treatment plans based on a global patient assessment (performance status, age, caregiver, nutritional status, patient preferences)<br>• Understanding of the complications derived from treatment and disease progression in the context of being familiar with supportive and palliative care strategies<br>• Understanding of the value of follow-up for rehabilitation |
| Skills | • Ability to contribute actively to a variety of H&NC clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in H&NC patients, including different subtypes<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various therapeutic agents considering their potential interactions with radiation therapy<br>• Ability to correctly advise organ-preservation strategies<br>• Ability to evaluate conditions (such as performance status and patient's clinical condition, concomitant disease(s), previous treatments etc) that are important for considering whether and when to start and to stop treatment or to switch to another option<br>• Ability to manage side effects of various chemotherapeutic agents and monoclonal antibodies as well as radiation therapy<br>• Ability to discuss prevention strategies with patients<br>• Ability to counsel about HPV related infections patients, partners and family |

### References

1. ESMO clinical practice guidelines: head and neck cancers. http://www.esmo.org/Guidelines/Head-and-Neck-Cancers
2. DeVita VT Jr, Lawrence TS, Rosenberg SA, eds. *DeVita, Hellman, and Rosenberg's cancer: principles & practice of oncology*. 10th edn. Alphen aan den Rijn, the Netherlands: Wolters Kluwer, 2014.
3. NCCN Clinical Practice Guidelines in Oncology. http://www.nccn.org/professionals/physician_gls/f_guidelines.asp

4.5.2 Thoracic malignancies

*4.5.2.a Small-cell lung cancer*

**Saad Khan**
**Enriqueta Felip**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with small-cell lung cancer (SCLC), including secondary prevention |
| Awareness | • Recognition that staging and determining the extent of SCLC are critical for guiding initial therapy<br>• Awareness of the availability of different diagnostic procedures and that not all are appropriate to be ordered<br>• Awareness of the existence of different prognostic factors<br>• Appreciation of the importance of the multimodality approach to treat patients with SCLC<br>• Awareness of the principles of personalising the multimodality approach in limited-stage and extensive-stage disease<br>• Recognition of the importance of avoiding delays in diagnostic work-up and management, compared to other solid malignancies |
| Knowledge | • Familiarity with the different presentations of SCLC, especially the limited versus extensive and TNM staging of SCLC<br>• Familiarity with the indications for and limitations of the different diagnostic tools available for the identification of SCLC (including fine needle aspiration (FNA), bronchoscopy)<br>• Familiarity with the available treatments and the usual sequence in which they are given<br>• Familiarity with the indications and value of surgery, radiation therapy and chemotherapy in SCLC, but also with their limitations (eg, limited role of surgery in most patients)<br>• Understanding of the role of chemotherapy and therapeutic/prophylactic irradiation in the management of patients<br>• Understanding of the importance of initial response to therapy (and its duration) in determining patient survival<br>• Knowledge which complications arise from disease progression and which are treatment-associated<br>• Familiarity with supportive and palliative care strategies |
| Skills | • Ability to perform a history and physical examination in SCLC patients and to interpret imaging studies to appropriately stage the patients<br>• Ability to effectively identify and present relevant information about the patient at multidisciplinary settings<br>• Ability to contribute to discussions on general management strategies, including limited and extensive stage in order to understand the rationale for selecting and sequencing treatments in a multidisciplinary setting<br>• Ability to identify situations where initiating systemic therapy quickly is more appropriate than waiting to start multimodality therapy<br>• Ability to prescribe various chemotherapeutic agents considering their potential interactions with radiation therapy<br>• Ability to effectively discuss data with patients regarding the impact of various treatments, and what would be recommended for them specifically<br>• Ability to minimise and manage side effects from various systemic therapies and irradiation to the brain/thorax<br>• Ability to guide a patient discussion about continuing systemic or radiation therapy versus pursuing supportive care only |

## References

1. ESMO clinical practice guidelines: lung and chest tumours. http://www.esmo.org/Guidelines/Lung-and-Chest-Tumours
2. NCCN. http://www.nccn.org/professionals/physician_gls/pdf/sclc.pdf

*4.5.2.b Non-small-cell lung cancer*

**Saad Khan**
**Enriqueta Felip**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of non-small-cell lung cancer (NSCLC), including secondary prevention |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of NSCLC that are used to individually personalise treatment<br>• Awareness of the availability of different diagnostic procedures<br>• Awareness of the existence of different prognostic factors<br>• Recognition of the importance of the multimodality approach to treat patients with NSCLC<br>• Appreciation of the principles of the multimodality approach in limited-stage disease<br>• Awareness of the established and emerging biomarkers guiding therapy for NSCLC |
| Knowledge | • Knowledge of the implications of the different biological and pathological subtypes of NSCLC for the selection of the appropriate treatment strategies<br>• Familiarity with the different presentations of NSCLC and the tests available for work-up and staging<br>• Familiarity with the indications for and limitations of the different diagnostic tools available for the identification of NSCLC (including fine needle aspiration (FNA), bronchoscopy)<br>• Knowledge of the available treatments and the usual sequence in which they are given<br>• Familiarity with the indications and value of surgery, radiation therapy, chemotherapy and immunotherapy in NSCLC, but also with their limitations (eg, criteria of operability)<br>• Understanding of the role of chemotherapy, immunotherapy, targeted therapy and radiation therapy in the management of patients with advanced disease<br>• Knowledge which complications arise from disease progression and which are treatment-associated<br>• Understanding of the strengths of treatment personalisation opportunities and the importance of offering individualised targeted therapies on the basis of molecular findings, such as epidermal growth factor receptor (EGFR) mutations, echinoderm microtubule-associated protein-like 4 (EML4)-anaplastic lymphoma kinase (ALK) and ROS translocation and programmed death-ligand 1 (PD-L1) expression<br>• Familiarity with supportive and palliative care strategies |
| Skills | • Ability to identify patients at high risk for developing lung cancer who should undergo screening studies<br>• Ability to perform a history and physical examination in NSCLC patients, including different subtypes, and to interpret imaging studies to appropriately stage the patients<br>• Ability to contribute to discussions on general management strategies in order to understand the rationale for selecting and sequencing treatments in a multidisciplinary setting<br>• Ability to prescribe various therapeutic agents considering their potential interactions with radiation therapy<br>• Ability to effectively discuss data with patients regarding the impact of various treatments, and what would be recommended for them specifically<br>• Ability to identify clinical scenarios where neoadjuvant and adjuvant therapy is appropriate<br>• Ability to identify situations where surgery, radiation or multimodality therapy is preferred over systemic therapy alone<br>• Ability to select therapy for advanced disease according to pathological subtype, molecular marker status and performance status<br>• Ability to minimise and manage side effects from surgery, radiation or systemic therapies<br>• Ability to guide a patient discussion about continuing anticancer therapy versus pursuing supportive care only |

## References

1. ESMO clinical practice guidelines: lung and chest tumours. http://www.esmo.org/Guidelines/Lung-and-Chest-Tumours
2. NCCN. http://www.nccn.org/professionals/physician_gls/pdf/nscl.pdf

### *4.5.2.c Mesothelioma*

**Saad Khan**
**Enriqueta Felip**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with mesothelioma |
| Awareness | • Awareness of the existence of different pathological subtypes of mesothelioma and the availability of different diagnostic procedures<br>• Appreciation that mesothelioma causes morbidity and mortality by local invasion<br>• Awareness of the importance of the multimodality approach to treat patients with mesothelioma<br>• Awareness of the principles of the multimodality approach with early-stage disease<br>• Appreciation of established scoring systems for predicting prognosis |
| Knowledge | • Knowledge of the implications of the extent of mesothelioma for the selection of appropriate treatments and the usual sequence in which they are given<br>• Familiarity with the different presentations of mesothelioma, as well as the tests available for work-up and staging<br>• Familiarity with the indications for and limitations of the different diagnostic tools available for the identification of mesothelioma (including fine needle aspiration (FNA), bronchoscopy)<br>• Familiarity with the indications and value of surgery, radiation therapy and chemotherapy in mesothelioma, but also with their limitations (eg, criteria of operability)<br>• Understanding of the role of chemotherapy, and radiation therapy in the management of patients with advanced disease<br>• Knowledge which complications arise from disease progression and which are treatment-associated<br>• Familiarity with various surgical techniques and when they are indicated<br>• Familiarity with supportive and palliative care strategies |
| Skills | • Ability to perform a history and physical examination and to interpret imaging studies to appropriately stage mesothelioma patients<br>• Ability to effectively identify and present relevant information about the patient at multidisciplinary settings<br>• Ability to contribute to discussions on general management strategies in order to understand the rationale for selecting and sequencing treatments in a multidisciplinary setting<br>• Ability to effectively discuss data with patients regarding the impact of various treatments, and what would be recommended for them specifically<br>• Ability to identify situations where surgery, radiation or multimodality therapy is preferred over systemic therapy alone<br>• Ability to select therapy according to pathological subtype, extent of disease and performance status<br>• Ability to minimise and manage side effects from surgery, radiation or systemic therapies<br>• Ability to guide a patient discussion about continuing anticancer therapy versus pursuing supportive care only |

**References**

1. ESMO clinical practice guidelines: lung and chest tumours. http://www.esmo.org/Guidelines/Lung-and-Chest-Tumours
2. NCCN. http://www.nccn.org/professionals/physician_gls/pdf/mpm.pdf

### *4.5.2.d Thymoma and thymic cancer*

**Nicolas Girard**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with thymoma and thymic cancer |
| Awareness | • Recognition of the rarity of thymoma and thymic cancer<br>• Appreciation of differences between thymoma and thymic cancer regarding pathology, biology and outcome, for the selection of appropriate treatment strategies<br>• Awareness of the association of thymoma with multiple endocrine neoplasia (MEN) type 1 |

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| | • Awareness of the association of thymoma with autoimmune disorders<br>• Awareness of the availability of different diagnostic procedures for thymoma and thymic cancer<br>• Awareness of the existence of different prognostic factors<br>• Appreciation of the criteria and their limitations to define resectable and non-resectable disease<br>• Recognition of the importance of the multimodality approach to treat patients with thymoma and thymic cancer |
| Knowledge | • Familiarity with the implications of the clinical, pathological and biological differences between thymoma and thymic cancer for the selection of appropriate treatment strategies<br>• Familiarity with the indications for, expectations from and limitations of the different diagnostic tools available for the identification of thymoma and thymic cancer (including computed tomography (CT), positron emission tomography (PET), magnetic resonance imaging (MRI)) and with differential diagnoses<br>• Understanding of the clinical situations where pretreatment biopsy is required or not<br>• Familiarity with the clinical and biological assessment of the most frequent thymoma-associated autoimmune disorders, especially myasthenia gravis<br>• Familiarity with the risk assessment work-up of prognostic factors, especially the staging systems (Masaoka–Koga and TNM), and the criteria that define resectability and non-resectability, including their limitations<br>• Familiarity with the principles and indications of surgery and postoperative radiotherapy for the treatment of resectable thymoma and thymic cancer<br>• Familiarity with the principles and indications of primary and exclusive chemotherapy and definitive radiotherapy for the treatment of advanced disease<br>• Understanding of the role of surgery, radiotherapy and chemotherapy in the management of patients with recurrent disease<br>• Familiarity with the principles of the follow-up of patients, including the long-term implications regarding autoimmune disorders |
| Skills | • Ability to contribute actively to a variety of thymoma and thymic cancer clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in patients with thymoma and thymic cancer<br>• Ability to contribute to multidisciplinary discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic agents considering their potential interactions with radiation therapy<br>• Ability to manage side effects of various chemotherapeutic agents<br>• Ability to recognise considerations in multimodal treatment sequences, including surgery, chemotherapy (primary, exclusive) and radiotherapy (postoperative, definitive), at the time of initial management and when recurrences occur<br>• Ability to discuss follow-up strategies with patients |

## Reference

1. Girard N, Ruffini E, Marx A, *et al*. ESMO Guidelines Committee. Thymic epithelial tumours: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2015;26(Suppl 5):v40–55.

### 4.5.3 Gastrointestinal cancers

#### *4.5.3.a Oesophageal cancer*

**Axel Grothey**
**Claus-Henning Köhne**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with oesophageal cancer |
| Awareness | • Appreciation of the existence of different biological and pathological subtypes of oesophageal cancer for the selection of appropriate treatment strategies<br>• Appreciation of the principles of endoscopic management for early-stage oesophageal cancer<br>• Awareness of the existence of different prognostic factors<br>• Awareness of the importance of the multimodality approach to treat patients with oesophageal cancer<br>• Awareness of the importance of adequate imaging techniques to allow for exact pretreatment staging<br>• Awareness of the established biomarkers guiding therapy for oesophageal cancer |

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| Knowledge | • Familiarity with the implications of the different biological and pathological subtypes of oesophageal cancer in order to select appropriate treatment strategies<br>• Familiarity that oesophageal cancer in early stages is treated differently<br>• Understanding of the pattern of metastasis of oesophageal cancer<br>• Familiarity with the indications and diagnostic tools available for oesophageal cancer (such as upper endoscopy with or without endoscopic ultrasound, computed tomography (CT) and positron emission tomography (PET)/CT imaging) and their implications for an appropriate therapeutic strategy<br>• Understanding of the importance of cancer precursor lesions and premalignant conditions for the development of oesophageal cancer<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for oesophageal cancer<br>• Familiarity with the indications and value of the multimodality approach of radiotherapy, chemotherapy and surgery in non-metastatic oesophageal cancer<br>• Understanding that certain localised oesophageal cancers can be treated with chemotherapy and irradiation with curative intent<br>• Understanding of the role of chemotherapy in the management of patients with advanced oesophageal cancer<br>• Familiarity with hereditary syndromes, the management of families with these and the implications for individual patients<br>• Understanding of the value of lines of treatment in case of disease progression and in the continuum of care<br>• Understanding of the symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings<br>• Understanding of the neoadjuvant and perioperative treatment setting |
| Skills | • Ability to contribute actively to a variety of oesophageal cancer scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early and metastatic disease)<br>• Ability to perform a history and physical examination in oesophageal patients with cancer, including different subtypes and different stages of disease<br>• Ability to follow individual patients with oesophageal cancer throughout their patient history from initial diagnosis to hospice care<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic agents considering their potential interactions with radiation therapy<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases prior adjuvant chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to manage side effects of various chemotherapeutic agents<br>• Ability to discuss prevention strategies with patients and, if applicable, potential implications for family members |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

### *4.5.3.b Gastric cancer*

**Axel Grothey**
**Claus-Henning Köhne**

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|---|---|
| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with gastric cancer |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of gastric cancer for the selection of appropriate treatment strategies<br>• Appreciation of worldwide regional differences in the incidence of gastric cancer<br>• Recognition of specific lifestyle risk factors and premalignant conditions for gastric cancer |

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| | • Awareness of the existence of different prognostic factors<br>• Appreciation of the importance of the multimodality approach to treat patients with gastric cancer<br>• Appreciation of the importance of adequate imaging techniques to allow for exact pretreatment staging<br>• Appreciation of human epidermal growth factor receptor 2 (HER-2) as the only established biomarker guiding therapy for gastric cancer |
| Knowledge | • Familiarity with the implications of the different biological and pathological subtypes of gastric cancer in order to select the appropriate treatment strategies<br>• Familiarity that gastric cancer in early stages is treated differently<br>• Understanding of the pattern of metastases of gastric cancer<br>• Familiarity with the indications and diagnostic tools available for gastric cancer (such as upper endoscopy with or without endoscopic ultrasound, computed tomography (CT) and positron emission tomography (PET)/CT imaging, diagnostic laparoscopy) and their implications for an appropriate therapeutic strategy<br>• Understanding of the importance of cancer precursor lesions and premalignant conditions for the development of gastric cancer<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for gastric cancer<br>• Familiarity with the indications and the value of multimodality approach of radiotherapy, chemotherapy and surgery in non-metastatic gastric cancer<br>• Understanding of the neoadjuvant, perioperative and adjuvant treatment setting<br>• Understanding of the role of chemotherapy and monoclonal antibodies in the management of patients with advanced gastric cancer<br>• Familiarity with hereditary syndromes, the management of families with these and the implications for individual patients<br>• Understanding of the value of lines of treatment in case of disease progression<br>• Understanding of the symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings |
| Skills | • Ability to contribute actively to a variety of gastric cancer scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early and metastatic disease)<br>• Ability to perform a history and physical examination in gastric patients with cancer, including different subtypes and different stages of disease<br>• Ability to follow individual patients with gastric cancer throughout their patient history from initial diagnosis to hospice care<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to adequately prescribe various chemotherapeutic agents and monoclonal antibodies considering their potential interactions with radiation therapy<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases prior adjuvant chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to manage side effects of various chemotherapeutic agents and monoclonal antibodies<br>• Ability to discuss prevention strategies with patients and, if applicable, potential implications for family members |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

*4.5.3.c Colon and rectal cancer*

**Claus-Henning Köhne**
**Axel Grothey**

| | |
|---|---|
| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with colon and rectal cancer, including secondary prevention |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of colon and rectal cancer for the selection of appropriate treatment strategies<br>• Awareness of the existence of different prognostic factors<br>• Recognition of the importance of the multimodality approach to treat patients with colon and rectal cancer<br>• Appreciation of the principles of the multimodality approach in patients with limited or oligometastatic disease<br>• Familiarity with established biomarkers guiding therapy for colon and rectal cancer<br>• Awareness of the hereditary syndromes associated with colon cancer |
| Knowledge | • Familiarity with the implications of the different biological and pathological subtypes of colon and rectal cancer in order to select the appropriate treatment strategies<br>• Familiarity that colon and rectal cancer in early stages are treated differently<br>• Familiarity with the indications and diagnostic tools available for colon and rectal cancer (such as colonoscopies, endosonography and magnetic resonance imaging (MRI)) and their implications for therapies<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for colon and rectal cancer<br>• Familiarity with the indications and value of surgery, radiotherapy and chemotherapy in the adjuvant and neoadjuvant setting of colon and rectal cancer<br>• Understanding of the role of surgery in resectable liver and lung metastases and the role of chemotherapy in borderline or unresectable situations in order to achieve resectability<br>• Understanding of the role of chemotherapy, monoclonal antibodies and targeted therapy in the management of patients with advanced disease<br>• Knowledge of the strengths of personalised medicine and the importance of offering individualised targeted therapies based on molecular findings such as K-Ras, N-Ras or B-Raf mutations<br>• Familiarity with hereditary syndromes, the management of families with these and implications for individual patients<br>• Understanding of the value of lines of treatment in case of disease progression and in the continuum of care<br>• Understanding of the symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings |
| Skills | • Ability to contribute actively to a variety of colon and rectal cancer scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early or metastatic disease)<br>• Ability to perform a history and physical examination in colorectal patients with cancer, including different subtypes and different stages of disease<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic agents, monoclonal antibodies and targeted therapy considering their potential interactions with radiation therapy where applicable<br>• Ability to understand the neoadjuvant and adjuvant setting, especially in rectal cancer as well as in patients with isolated liver or lung metastases<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases, prior adjuvant chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to determine therapy according to molecular marker status<br>• Ability to manage side effects of various therapeutic agents<br>• Ability to discuss prevention strategies with patients and, if applicable, potential implications for family members |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

*4.5.3.d Anal cancer*

**Axel Grothey**
**Claus-Henning Köhne**

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|---|---|
| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with anal cancer |
| Awareness | • Recognition of specific lifestyle and epidemiological risk factors, viral infections and premalignant conditions for anal cancer<br>• Awareness of different prognostic factors<br>• Appreciation of the importance of the multimodality approach, including radiotherapy to treat patients with anal cancer<br>• Appreciation of the importance of adequate imaging techniques to allow for exact pretreatment staging<br>• Appreciation of the use of surgery as salvage option for patients with treatment-refractory or relapsed anal cancers |
| Knowledge | • Familiarity with the implication of the different stages of anal cancer in order to select the appropriate treatment strategies<br>• Understanding of the protective value of human papilloma virus (HPV) vaccinations for the development of anal cancers<br>• Understanding of the pattern of metastases of anal cancer<br>• Familiarity with the complexity of anal cancer therapy in patients with active human immunodeficiency virus (HIV) infections<br>• Familiarity with the indications and diagnostic tools available for anal cancer (such as endoscopy with or without endoscopic ultrasound, computed tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography (PET)/CT imaging) and their implications for an appropriate therapeutic strategy<br>• Understanding of the importance of cancer precursor lesions and premalignant conditions for the development of anal cancer<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for anal cancer<br>• Familiarity with the indications and value of the multimodality approach of radiation therapy and chemotherapy in non-metastatic anal cancer<br>• Familiarity with the role of surveillance protocols and the appropriate interval from the completion of radio-chemotherapy as definitive treatment to first restaging evaluation<br>• Understanding of the role of chemotherapy in the management of patients with recurrent and metastatic cancer<br>• Familiarity with the value of salvage surgery after primary definitive radio-chemotherapy in localised anal cancer<br>• Understanding of symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings |
| Skills | • Ability to contribute actively to a variety of anal cancer scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early and metastatic disease)<br>• Ability to perform a history and physical examination in anal patients with cancer<br>• Ability to follow individual patients with anal cancer throughout their patient history from initial diagnosis to hospice care<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe chemotherapeutic agents considering their potential interactions with radiation therapy<br>• Ability to understand the long-term complications of definitive radio-chemotherapy in anal cancer<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases, prior radio-chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to manage side effects of various chemotherapeutic agents<br>• Ability to educate patients in the importance of lifestyle factors, viral infections and the preventative value of HPV vaccinations of anal cancer |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

*4.5.3.e Hepatobiliary cancers*

**Axel Grothey**
**Claus-Henning Köhne**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with hepatobiliary cancers |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of hepatobiliary cancers for the selection of the appropriate treatment strategies; specifically distinguish between hepatocellular and biliary cancers<br>• Awareness of the existence of specific lifestyle risk factors, viral infections and premalignant conditions for hepatobiliary cancer<br>• Awareness of substantial regional differences in the incidence and pathogenesis of hepatobiliary cancers worldwide<br>• Awareness of the existence of different prognostic factors<br>• Appreciation of the importance of the multimodality approach to treat patients with hepatobiliary cancer<br>• Appreciation of the importance of adequate imaging techniques to allow for exact pretreatment staging<br>• Awareness of specific surgical techniques and their respective complications in the management of hepatobiliary cancer<br>• Appreciation of the use of liver transplantation for selecting patients with early-stage hepatobiliary cancers |
| Knowledge | • Familiarity with the implication of the different biological and pathological subtypes of hepatobiliary cancer in order to select the appropriate treatment strategies<br>• Understanding of the pattern of metastases of hepatobiliary cancer<br>• Familiarity with the indications and diagnostic tools available for hepatobiliary cancer (such as diagnostic serum tumour markers like α-foetoprotein (AFP) and cancer antigen (CA)19-9, computed tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography (PET)/CT imaging) and their implications for an appropriate therapeutic strategy<br>• Understanding of the role of endoscopic techniques to address biliary tract stenosis<br>• Understanding of the importance of cancer precursor lesions and premalignant conditions for the development of hepatobiliary cancer<br>• Familiarity with predisposing medical conditions for the development of hepatocellular (eg, viral infections, cirrhosis, storage diseases) and biliary cancers (eg, inflammatory bowel disease with primary biliary sclerosis, cholecystolithiasis)<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for hepatobiliary cancer<br>• Familiarity with integrating clinical scoring systems like Child-Pugh, Model for End-Stage Liver Disease (MELD) and Milan criteria into treatment decisions<br>• Familiarity with indications and value of multimodality approach of surgery, loco-regional ablative techniques and medical therapy in non-metastatic hepatobiliary cancer<br>• Understanding of the difference between bland embolisation, chemo-embolisation and radio-embolisation as loco-regional interventional techniques<br>• Understanding of the role of chemotherapy and targeted therapy in the management of patients with advanced hepatobiliary cancer<br>• Familiarity with hereditary syndromes and the management of families with these implications for individual patients<br>• Understanding of the value of medical therapy in advanced hepatobiliary cancer<br>• Understanding of the symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings |
| Skills | • Ability to contribute actively to a variety of hepatobiliary cancer scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early and metastatic disease)<br>• Ability to perform a history and physical examination in patients with hepatobiliary cancer, including different subtypes and different stages of diseases<br>• Ability to follow individual patients with hepatobiliary cancer throughout their patient history from initial diagnosis to hospice care<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to consider loco-regional embolisation techniques, local ablative procedures like radiofrequency ablation and surgical management for different stages of hepatobiliary cancers<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases prior adjuvant chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to manage side effects of various chemotherapeutic agents and targeted therapy |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

*4.5.3.f Pancreatic adenocarcinoma*

**Axel Grothey**
**Claus-Henning Köhne**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with pancreatic adenocarcinoma |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of pancreatic adenocarcinoma for the selection of the appropriate treatment strategies; specifically distinguish between cancers of the exocrine and endocrine part of the pancreas; for neuroendocrine tumours, see subchapter 4.5.9.b<br>• Awareness of the existence of specific lifestyle risk factors and premalignant conditions for pancreatic adenocarcinoma<br>• Awareness of different prognostic factors<br>• Appreciation of the importance of the multimodality approach to treat patients with pancreatic adenocarcinoma<br>• Appreciation of the importance of adequate imaging techniques to allow for exact pretreatment staging<br>• Appreciation of the use of specific surgical techniques and their respective complications in the management of pancreatic adenocarcinoma |
| Knowledge | • Familiarity with the implications of the different biological and pathological subtypes of pancreatic adenocarcinoma in order to select the appropriate treatment strategies<br>• Understanding of the pattern of metastasis of pancreatic adenocarcinoma<br>• Familiarity with the indications and diagnostic tools available for pancreatic adenocarcinoma (such as upper endoscopy with or without endoscopic ultrasound, computed tomography (CT) and positron emission tomography (PET)/CT imaging, diagnostic laparoscopy) and their implications for an appropriate therapeutic strategy<br>• Understanding of the role of endoscopic techniques to address biliary tract stenosis<br>• Understanding of the importance of cancer precursor lesions and premalignant conditions for the development of pancreatic adenocarcinoma<br>• Familiarity with the risk assessment of prognostic factors, especially the TNM staging system for pancreatic adenocarcinoma<br>• Familiarity with the indications and value of the multimodality approach of surgery and chemotherapy in non-metastatic pancreatic adenocarcinoma<br>• Familiarity with the controversial role of radiotherapy in the postoperative setting and its established role in the palliative management of unresectable disease<br>• Familiarity with defining pancreatic adenocarcinoma as primarily resectable, borderline resectable, locally advanced and metastatic based on imaging staging<br>• Understanding of the role of chemotherapy and targeted therapy in the management of patients with advanced pancreatic adenocarcinoma<br>• Familiarity with hereditary syndromes, the management of families with these and the implications for individual patients<br>• Understanding of the value of first- and second-line therapy in advanced pancreatic adenocarcinoma<br>• Understanding of the symptoms and complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care settings |
| Skills | • Ability to contribute actively to a variety of pancreatic adenocarcinoma scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations for various phases of the disease (early and metastatic disease)<br>• Ability to perform a history and physical examination in pancreatic adenocarcinoma patients, including different subtypes and different stages of disease<br>• Ability to follow individual patients with pancreatic adenocarcinoma throughout their patient history from initial diagnosis to hospice care<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic agents and targeted therapy considering their potential interactions with radiation therapy<br>• Ability to contribute to the actual status of the pre- and perioperative treatment settings<br>• Ability to correctly allocate patients to the neoadjuvant, perioperative and adjuvant treatment setting<br>• Ability to recognise conditions or clinical prognostic factors such as performance status, tumour load, number of metastases, prior adjuvant chemotherapy, concomitant diseases and other previous therapies that are important for considering when to start and to stop a treatment or switch to another option<br>• Ability to manage side effects of various therapeutic agents |

## Reference

1. ESMO clinical practice guidelines: gastrointestinal cancers. http://www.esmo.org/Guidelines/Gastrointestinal-Cancers

4.5.4 Genitourinary cancers

*4.5.4.a Renal cell cancer*

**Cora N Sternberg**
**Maria De Santis**

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| Objectives | • To understand the diagnostic aspects of renal cell cancer (RCC), and the prognostic categories associated with good, intermediate and poor survival of metastatic patients<br>• To understand when nephrectomy is indicated; appreciate the curative role of surgery in localised disease and the role of nephron-sparing procedures in RCC as well as the increasing use of laparoscopy<br>• To understand that RCC is a metabolic disease and that is not just one cancer, but that there are many different histological categories of RCC often with different genetic associated abnormalities<br>• To be aware of the novel systemic therapies, including antiangiogenic therapies, inhibitors of the mammalian target of rapamycin (mTOR) pathway and novel immunotherapy; the expanded role of molecular targeted treatments has dramatically changed the treatment paradigm of RCC<br>• To be familiar with the changing landscape of therapies and be familiar with the clinical presentations of RCC as well as possible paraneoplastic aspects of the disease and palliation of advanced disease |
| Awareness | • Awareness of how to classify and stage localised disease and metastatic disease<br>• Awareness that improved laparoscopic techniques and local techniques are available<br>• Awareness that improved survival has been obtained with the approval of several novel targeted agents in the last decade, particularly directed against angiogenesis, the vascular endothelial growth factor (VEGF) and mTOR pathways<br>• Appreciation that new studies have shown improved survival with novel checkpoint inhibition immunotherapy and novel targeted agents, which are thus far in the second-line setting |
| Knowledge | • Knowledge of the different types of focal therapy in use, including enucleation, partial nephrectomy, cryotherapy and hyperthermia and that laparoscopic surgery plays a large role in the treatment of smaller tumours for localised disease<br>• Understanding that radical nephrectomy, as well, is often performed with laparoscopic or robotic techniques<br>• Knowledge about the newer staging systems for assessing risk in patients with metastatic disease<br>• Knowledge of the studies in first- and second-line therapy for patients with metastatic disease that have led to overall improved survival in patients with metastatic clear cell RCC<br>• Knowledge about the new studies with checkpoint inhibition, and ongoing studies with combination therapies and vaccines<br>• Knowledge about the studies that have been conducted in patients with non-clear cell RCC<br>• Understanding that, in contrast to many other cancers, metastasectomy for oligometastatic disease has an important role, in particular, for clear cell RCC management and should be discussed at the multidisciplinary team meetings<br>• Familiarity with results available from the adjuvant studies with targeted therapy<br>• Familiarity with the study results that are available and the ongoing studies in the adjuvant setting, and in the setting of targeted therapy in evaluating the role of nephrectomy |
| Skills | • Ability to recognise the indications for nephrectomy and partial nephrectomy in patients with localised disease and metastatic disease<br>• Ability to recognise the treatment guidelines for first and further lines of therapy for metastatic clear cell RCC<br>• Ability to manage the toxicities associated with targeted therapies and immunotherapy |

## References

1. Choueiri TK, Escudier B, Powles T, *et al*. METEOR Investigators. Cabozantinib versus everolimus in advanced renal-cell carcinoma. *N Engl J Med* 2015;373:1814–23.
2. ESMO clinical practice guidelines: genitourinary cancers. http://www.esmo.org/Guidelines/Genitourinary-Cancers
3. Motzer RJ, Hutson TE, Tomczak P, *et al*. Sunitinib versus interferon alfa in metastatic renal-cell carcinoma. *N Engl J Med* 2007;356:115–24.
4. Motzer RJ, Hutson TE, Cella D, *et al*. Pazopanib versus sunitinib in metastatic renal cell carcinoma. *N Engl J Med* 2013;369:722–31.
5. Motzer RJ, Escudier B, McDermott DF, *et al*. CheckMate 025 Investigators. Nivolumab versus everolimus in advanced renal-cell carcinoma. *N Engl J Med* 2015;373:1803–13.
6. Patard JJ, Pignot G, Escudier B, *et al*. ICUD-EAU International Consultation on Kidney Cancer 2010: treatment of metastatic disease. *Eur Urol* 2011;60:684–90.
7. Sternberg CN, Davis ID, Mardiak J, *et al*. Pazopanib in locally advanced and/or metastatic renal cell carcinoma: results of a randomized phase III trial. *J Clin Oncol* 2010;28:1061–8.

*4.5.4.b Urothelial cancer*

**Maria De Santis**
**Cora N Sternberg**

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| Objectives | • To understand the risk factors associated with urothelial cancers and the recommendations about cessation of smoking at any stage of disease<br>• To be able to distinguish between non-muscle invasive (NMIBC) and muscle invasive bladder cancer (MIBC) disease and to know the implications for progression, recurrence, spread, prognosis and treatment<br>• To be able to appreciate the role of urine cytology, and to know how to use diagnostic imaging and cystoscopy in the staging and follow-up of patients<br>• To know the role of intravesical therapy in the management of NMIBC, as well as the role of salvage instillation and surgery in recurrent, progressive non-muscle invasive and early-stage invasive cancers<br>• To understand the advantages and disadvantages and indications for radical cystectomy and lymph node dissection and definitive chemo-radiotherapy or trimodality treatment for MIBC<br>• To be able to distinguish the clinical prognostic groups and eligibility for standard chemotherapy with cisplatin<br>• To know about alternative treatment options for cisplatin-ineligible patients<br>• To understand that there are scarce treatment options for platinum-failing patients and that ongoing research is promising for antiangiogenic treatment, targeted therapies and immunotherapy |
| Awareness | • Awareness that the most common presenting symptom is painless haematuria<br>• Awareness that 80% of diagnosed cases of MIBC present as primary invasive bladder cancer and only 15% of patients have a history of mainly high-risk NMIBC<br>• Awareness that the pathological diagnosis according to the WHO classification is mostly made from a biopsy obtained during transurethral resection of the bladder tumour (TURBT) and that 90% are transitional cell carcinomas (TCC); new molecular classifications in addition to histological subgroups have been described<br>• Appreciation that, at TURBT, complete resection of all tumour tissue is aimed at whenever possible<br>• Recognition that carcinoma in situ (CIS) has been shown to be an adverse prognostic factor; bladder biopsies should be taken from suspicious areas<br>• Awareness that MIBC requires further imaging with computed tomography (CT) or magnetic resonance imaging (MRI)<br>• Awareness that cystectomy or chemo-radiotherapy following maximal TURBT are curative treatment options for MIBC<br>• Recognition that perioperative chemotherapy is a standard of care for cisplatin-eligible patients; the body of evidence is stronger for neoadjuvant than for adjuvant chemotherapy but both options are recommended. More patients are able to receive neoadjuvant, ie, preoperative than adjuvant chemotherapy<br>• Awareness that, for systemic treatment of MIBC, eligibility for cisplatin has been defined and separates patients for standard chemotherapy or alternative treatment options with mostly carboplatin-based chemotherapy<br>• Awareness that there are several standard combination chemotherapy options with cisplatin that have different safety profiles<br>• Awareness of other less common pathologies than TCC that may be found and that have different treatment options |
| Knowledge | • Knowledge that smoking is the major risk factor for bladder cancer and that smoking cessation improves outcomes<br>• Knowledge of the mandatory diagnostic procedures, the required full-body imaging for staging and the definitive treatment options for NMIBC and MIBC<br>• Knowledge of correct allocation of adjuvant instillation therapies with chemotherapy and Bacillus Calmette-Guérin (BCG) for different stages of NMIBC<br>• Knowledge of the options of early cystectomy or rechallenge instillation therapy in high-risk or recurrent, progressive NMIBC<br>• Knowledge of the results and the amount of benefit shown in the most important studies and meta-analyses about perioperative (neoadjuvant and adjuvant) chemotherapy for MIBC<br>• Knowledge that perioperative chemotherapy is a standard of care that should be discussed at the multidisciplinary tumour board before radical treatment and offered to patients eligible for cisplatin-based chemotherapy<br>• Familiarity with the most common urinary diversions and reconstruction by ileal conduit or bladder replacement, depending on tumour characteristics and patient choice<br>• Knowledge that age is no limiting factor for surgery although postoperative morbidity increases with age |

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| | • Knowledge of the clinical prognostic factors and prognostic groups for patients with metastatic disease at the start of platinum-based chemotherapy and at progression during or after platinum-based chemotherapy<br>• Knowledge that the standard of care is cisplatin-based combination chemotherapy<br>• Knowledge of the criteria for cisplatin ineligibility that were established by an international consensus and are widely used in daily practice and for clinical trials<br>• Knowledge of the alternative, carboplatin combination chemotherapy, in cisplatin-ineligible patients and the monotherapy options for those with more adverse prognostic factors<br>• Knowledge of the options for second-line chemotherapy<br>• Knowledge about the emerging literature on checkpoint inhibitors and their activity in bladder cancer<br>• Knowledge about the emerging data that urothelial cancer has a high number of mutations and that, in the future, it will be divided into different subclasses |
| Skills | • Ability to council patients concerning risk factors for bladder cancer progression and recurrence<br>• Ability to perform the work-up and diagnostic procedures in case of haematuria<br>• Ability to discuss interdisciplinary the treatment options for NMIBC, instillation therapy and early cystectomy<br>• Ability to adequately stage patients with MIBC<br>• Ability to discuss definitive treatment options for MIBC, cystectomy, urinary diversions and trimodality treatment with bladder preservation<br>• Ability to explain patients the optimal treatment strategies according to the criteria for cisplatin eligibility and clinical prognostic factors<br>• Ability to discuss perioperative chemotherapy, chemotherapy for advanced and metastatic disease and second-line therapies as well as chemotherapy side effects and council patients and their families |

## References


1. Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. Neoadjuvant chemotherapy in invasive bladder cancer: update of a systematic review and meta-analysis of individual patient data advanced bladder cancer (ABC) meta-analysis collaboration. *Eur Urol* 2005;48:202–5.
2. Advanced Bladder Cancer (ABC) Meta-analysis Collaboration. Adjuvant chemotherapy for invasive bladder cancer (individual patient data), 2006. *Cochrane Database Syst Rev* 2006;(2): CD006018.
3. Bajorin DF, Dodd PM, Mazumdar M, *et al*. Long-term survival in metastatic transitional-cell carcinoma and prognostic factors predicting outcome of therapy. *J Clin Oncol* 1999;17:3173–81.
4. Bellmunt J, Theodore C, Demkov T, *et al*. Phase III trial of vinflunine plus best supportive care compared with best supportive care alone after a platinum-containing regimen in patients with advanced transitional cell carcinoma of the urothelial tract. *J Clin Oncol* 2009;27:4454–61.
5. Bellmunt J, von der Maase H, Mead GM, *et al*. Randomized phase III study comparing paclitaxel/cisplatin/gemcitabine and gemcitabine/cisplatin in patients with locally advanced or metastatic urothelial cancer without prior systemic therapy: EORTC Intergroup Study 30987. *J Clin Oncol* 2012;30:1107–13.
6. Bellmunt J, Fougeray R, Rosenberg JE, *et al*. Long-term survival results of a randomized phase III trial of vinflunine plus best supportive care versus best supportive care alone in advanced urothelial carcinoma patients after failure of platinum-based chemotherapy. *Ann Oncol* 2013;24:1466–72.
7. Calabro F, Lorusso V, Rosati G, *et al*. Gemcitabine and paclitaxel every 2 weeks in patients with previously untreated urothelial carcinoma. *Cancer* 2009;115:2652–9.
8. Cancer Genome Atlas Research Network. Comprehensive molecular characterization of urothelial bladder carcinoma. *Nature* 2014;507:315–22.
9. De Santis M, Bellmunt J, Mead G, *et al*. Randomized phase II/III trial assessing gemcitabine/carboplatin and methotrexate/carboplatin/vinblastine in patients with advanced urothelial cancer "unfit" for cisplatin based chemotherapy: phase II–results of EORTC study 30986. *J Clin Oncol* 2009;27:5634–9.
10. De Santis M, Bellmunt J, Mead G, *et al*. Randomized phase II/III trial assessing gemcitabine/carboplatin and methotrexate/carboplatin/vinblastine in patients with advanced urothelial cancer who are unfit for cisplatin-based chemotherapy: EORTC study 30986. *J Clin Oncol* 2012;30:191–9.
11. Galsky MD, Hahn NM, Rosenberg T, *et al*. A consensus definition of patients with metastatic urothelial carcinoma who are unfit for cisplatin-based chemotherapy. *Lancet Oncol* 2011;12:211–14.
12. Galsky MD, Hahn NM, Rosenberg T, *et al*. Treatment of patients with metastatic urothelial cancer "unfit" for cisplatin-based chemotherapy. *J Clin Oncol* 2011;29:2432–8.
13. Galsky MD, Chen GJ, Oh WK, *et al*. Comparative effectiveness of cisplatin-based and carboplatin-based chemotherapy for treatment of advanced urothelial carcinoma. *Ann Oncol* 2012;23:406–10.
14. Griffiths G, Hall R, Sylvester R, *et al*. International phase III trial assessing neoadjuvant cisplatin, methotrexate, and vinblastine chemotherapy for muscle-invasive bladder cancer: long-term results of the BA06 30894 trial. *J Clin Oncol* 2011;29:2171–7.
15. Grossman HB, Natale RB, Tangen CM, *et al*. Neoadjuvant chemotherapy plus cystectomy compared with cystectomy alone for locally advanced bladder cancer. *N Engl J Med* 2003;349:859–66.
16. Hussain SA, Stocken DD, Riley P, *et al*. A phase I/II study of gemcitabine and fractionated cisplatin in an outpatient setting using a 21-day schedule in patients with advanced and metastatic bladder cancer. *Br J Cancer* 2004;91:844–9.
17. Morales-Barrera R, Bellmunt J, Suarez C, *et al*. Cisplatin and gemcitabine administered every two weeks in patients with locally advanced or metastatic urothelial carcinoma and impaired renal function. *Eur J Cancer* 2012;48:1816–21.
18. Powles T, Eder JP, Fine GD, *et al*. MPDL3280A (anti-PD-L1) treatment leads to clinical activity in metastatic bladder cancer. *Nature* 2014;515:558–62.
19. Sternberg CN, de Mulder PH, Schornagel JH, *et al*. Randomized phase III trial of high-dose-intensity methotrexate, vinblastine, doxorubicin, and cisplatin (MVAC) chemotherapy and recombinant human granulocyte colony-stimulating factor versus classic MVAC in advanced urothelial tract tumors: European Organization for Research and Treatment of Cancer Protocol no. 30924. *J Clin Oncol* 2001;19:2638–46.
20. Sternberg CN, Skoneczna I, Kerst JM, *et al*. for the European Organisation for Research and Treatment of Cancer Genito-Urinary Cancers Group; Groupe d'Etude des Tumeurs Urogénitales; National Cancer Research Institute Bladder Cancer Study Group; National Cancer Institute of Canada Clinical Trials Group; German Association of Urologic Oncology (AUO). Immediate versus deferred chemotherapy after radical cystectomy in patients with pT3-pT4 or N + M0 urothelial carcinoma of the bladder (EORTC 30994): an intergroup, open-label, randomised phase 3 trial. *Lancet Oncol* 2015;16:76–86.
21. von der Maase H, Hansen SW, Roberts JT, *et al*. Gemcitabine and cisplatin versus methotrexate, vinblastine, doxorubicin, and cisplatin in advanced or metastatic bladder cancer: results of a large, randomized, multinational, multicenter, phase III study. *J Clin Oncol* 2000;18:3068–77.
22. von der Maase H, Sengelov L, Roberts JT, *et al*. Long-term survival results of a randomized trial comparing gemcitabine plus cisplatin, with methotrexate, vinblastine, doxorubicin, plus cisplatin in patients with bladder cancer. *J Cin Oncol* 2005;23:4602–8.

*4.5.4.c Penile cancer*

**Cora N Sternberg**
**Maria De Santis**

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| Objectives | • To appreciate the role of human papilloma virus (HPV) and ethnic background as well as hygienic standards in the aetiology of penile cancers<br>• To understand the importance of staging and, in particular, of lymph node staging for prognosis and for treatment<br>• To understand the potentially curative role of surgery and radiation treatment<br>• To understand the role of combination chemotherapy for metastatic disease |
| Awareness | • Awareness that squamous cell carcinoma (SCC) accounts for more than 95% of cases of penile cancer and that currently no molecular biomarkers have shown to be useful in clinical practice<br>• Awareness that, at the time of diagnosis, almost half of palpable inguinal nodes are enlarged due to inflammatory changes<br>• Appreciation that accurate staging is important for prognosis and adequate local (more or less radical) or combined treatment<br>• Awareness of the multimodal treatment approaches that include different surgical tools and radiotherapy<br>• Awareness that, due to the rarity of the disease, level 1 evidence for systemic treatment approaches is lacking and that chemotherapy, mostly cisplatin-based, has a palliative therapeutic role for metastatic disease |
| Knowledge | • Knowledge about the different approaches for staging and in particular of lymph node staging<br>• Knowledge that early detection of lymph node metastases by dynamic sentinel node biopsy (DSNB) and subsequent resection in clinically node negative T2–3 penile cancer improves survival<br>• Knowledge that if no DSNB is available, ultrasound-guided fine needle aspiration (FNA) cytology (FNAC) biopsy of visualised nodes can be used for staging<br>• Knowledge about stage-dependent local treatments like penile-preserving techniques, including topical therapy for low-disease stages, possible wide local excision plus reconstructive surgery, new laser therapy approaches, radiotherapy delivered as external beam radiation therapy (EBRT) or brachytherapy with interstitial implants, and partial surgery approaches or penectomy for high-tumour stages<br>• Knowledge that, for non-palpable, enlarged and biopsy- or DSNB-positive lymph nodes, lymphadenectomy is recommended<br>• Knowledge that, for unilateral or bilateral palpable inguinal nodes, FNA of the lymph node is standard diagnostic procedure<br>• Knowledge that, when pelvic lymph nodes are enlarged, systemic chemotherapy or radiotherapy with concurrent chemotherapy are reasonable treatment options<br>• Understanding that patients with non-fixed nodes can be considered for inguinal node dissection with the option to use a skin flap to cover the defect<br>• Understanding that patients with fixed nodes should be considered for neoadjuvant chemo-radiotherapy and responders can receive consolidation surgery<br>• Understanding that patients with disease progression or unresectable lymph nodes should be considered for additional systemic chemotherapy or local-field radiotherapy<br>• Knowledge that, for metastatic penile cancer, treatment options include systemic chemotherapy or radiotherapy or radiotherapy with concurrent chemotherapy |
| Skills | • Ability to discuss the different approaches for staging and, in particular, lymph node staging for penile cancer<br>• Ability to council patients and discuss in multidisciplinary tumour boards the management of enlarged pelvic lymph nodes with systemic chemotherapy or radiotherapy with concurrent chemotherapy<br>• Ability to discuss side effects of surgery and, in particular, lymph node dissection and chemoradiation of pelvic and inguinal lymph nodes<br>• Ability to discuss the treatment of patients with fixed nodes with neoadjuvant chemoradiotherapy and potential consolidation surgery<br>• Ability to council patients with metastatic penile cancer about systemic chemotherapy or radiotherapy or radiotherapy with concurrent chemotherapy and explain side effects of chemotherapy |

## References

1. Bermejo C, Busby JE, Spiess PE, *et al*. Neoadjuvant chemotherapy followed by aggressive surgical consolidation for metastatic penile squamous cell carcinoma. *J Urol* 2007;177:1335–8.
2. Crook J, Jezioranski J, Cygler JE. Penile brachytherapy: technical aspects and post implant issues. *Brachytherapy* 2010;9:151–8.
3. Crook JM, Haie-Meder C, Demanes DJ, *et al*. American Brachytherapy Society-Groupe Europeén de Curiethérapie-European Society of Therapeutic Radiation Oncology (ABS-GEC-ESTRO) consensus statement for penile brachytherapy. *Brachytherapy* 2013;12:191–8.
4. de Crevoisier R, Slimane K, Sanfilippo N, *et al*. Long-term results of brachytherapy for carcinoma of the penis confined to the glans (N- or NX). *Int J Radiat Oncol Biol Phys* 2009;74:1150–6.

5. Di Lorenzo G, Federico P, Buonerba C, *et al*. Paclitaxel in pretreated metastatic penile cancer; final results of a phase 2 study. *Eur Urol* 2011;60:1280–4.
6. Di Lorenzo G, Buonerba C, Federico P, *et al*. Cisplatin and 5-fluorouracil in inoperable, stage IV squamous cell carcinoma of the penis. *BJU Int* 2012;110:E661–6.
7. Graafland NM, Lam W, Leijte JA, *et al*. Prognostic factors for occult inguinal lymph node involvement in penile carcinoma and assessment of the high-risk EAU subgroup: a two-institution analysis of 342 clinically node-negative patients. *Eur Urol* 2010;58:742–7.
8. Graafland NM, MoonenLM, van Boven HH, *et al*. Inguinal recurrence following therapeutic lymphadenectomy for node positive penile carcinoma: outcome and implications for management. *J Urol* 2011;185:888–93.
9. Graafland NM, Teertstra HJ, Besnard AP, *et al*. Identification of high risk pathologicalpathologic node positive penile carcinoma: value of preoperative computerized tomography imaging. *J Urol* 2011;185:881–7.
10. Horenblas S. Lymphadenectomy in penile cancer. *Urol Clin North Am* 2011;38:459–69, vi–vii.
11. Kiltie AE, Elwell C, Close HJ, *et al*. Iridium-192 implantation for node-negative carcinoma of the penis: the Cookridge Hospital experience. *Clin Oncol (R Coll Radiol)* 2000;12:25–31.
12. Leijte JA, Kerst JM, Bais E, *et al*. Neoadjuvant chemotherapy in advanced penile carcinoma. *Eur Urol* 2007;52:488–94.
13. Leijte JA, Kroon BK, Valdés Olmos RA, *et al*. Reliability and safety of current dynamic sentinel node biopsy for penile carcinoma. *Eur Urol* 2007;52:170–7.
14. Ozsahin M, Jichlinski P, Weber DC, *et al*. Treatment of penile carcinoma: to cut or not to cut? *Int J Radiat Oncol Biol Phys* 2006;66:674–9.
15. Pagliaro LC, Williams DL, Daliani D, *et al*. Neoadjuvant paclitaxel, ifosfamide, and cisplatin chemotherapy for metastatic penile cancer: a phase II study. *J Clin Oncol* 2010;28:3851–7.
16. Pettaway CA, Pagliaro L, Theodore C, *et al*. Treatment of visceral, unresectable, or bulky/unresectable regional metastases of penile cancer. *Urology* 2010;76(Suppl 1):S58–65.
17. Pizzocaro G, Nicolai N, Milani A. Taxanes in combination with cisplatin and fluorouracil for advanced penile cancer: preliminary results. *Eur Urol* 2009;55:546–51.
18. Rozan R, Albuisson E, Giraud B, *et al*. Interstitial brachytherapy for penile carcinoma: a multicentric survey (259 patients). *Radiother Oncol* 1995;36:83–93.
19. Sadeghi R, Gholami H, Zakavi SR, *et al*. Accuracy of sentinel lymph node biopsy for inguinal lymph node staging of penile squamous cell carcinoma: systematic review and meta-analysis of the literature. *J Urol* 2012;187:25–31.
20. Schlenker B, Tilki D, Seitz M, *et al*. Organ-preserving neodymium-yttrium aluminium-garnet laser therapy for penile carcinoma: a long-term follow-up. *BJU Int* 2010;106:786–90.
21. Sobin L, Gospodarowics M, Wittekind C. *TNM classification of malignant tumors. UICC International Union against cancer*. 7th edn. West Sussex, UK: Willy Blackwell, 2009:239–42.


### *4.5.4.d Prostate cancer*

**Cora N Sternberg**
**Maria De Santis**

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| Objectives | • To understand the epidemiology and the controversies surrounding the screening of prostate cancer, including the evidence for and against the use of prostate-specific antigen (PSA) screening and the practical indications of serum PSA measurement in different clinical settings<br>• To know about the increased use of robotic prostatectomy and newer techniques of radiation therapy in patients with localised disease<br>• To be able to evaluate the emerging literature surrounding chemotherapy in hormone-sensitive prostate cancer for patients with metastatic disease<br>• To understand the definition of castration-resistant prostate cancer (CRPC) and know about the novel therapies that have been developed and approved in the last decade |
| Awareness | • Recognition of the role of observation, surgery and radiation therapy in the management of early-stage disease<br>• Awareness of the importance of a multidisciplinary team approach in decision-making<br>• Appreciation of the importance of histological grading and of the changes that have recently been proposed to the traditional Gleason grading system<br>• Appreciation of the fundamentals of proper diagnosis in prostate cancer and the role of different staging techniques; there is increasing evidence for the use of magnetic resonance imaging (MRI) and novel types of positron emission tomography (PET) scanning (sodium fluoride (NaF), choline and prostate-specific membrane antigen (PSMA) scanning) that reveal more and often different disease than traditional technetium bone scans<br>• Awareness of the side effects (such as decreased libido) and metabolic side effects and toxicities associated with androgen deprivation therapy<br>• Awareness of the novel therapies that have been developed for CRPC and that CRPC remains driven by androgen receptor (AR) signalling and that AR alterations are likely selected during androgen deprivation therapy<br>• Awareness of the changing paradigm in the treatment of hormone-sensitive metastatic disease and the trend towards early use of chemotherapy in association with androgen deprivation therapy in patients who present with widely metastatic disease<br>• Awareness of the novel therapies that have been approved for patients with CRPC that have improved overall survival and of the bone-targeting agents which are approved in this setting<br>• Appreciation of the increasing literature on prostate cancer heterogeneity and that 90% of metastatic CRPC patients harbour clinically actionable molecular alterations<br>• Awareness of the emerging literature on active agents to treat patients with DNA repair defects |

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| Knowledge | • Knowledge of when and how to use the combination of hormonal therapy and radiation therapy in patients with locally advanced prostate cancer<br>• Understanding of the lack of evidence to support early treatment in most patients (eg, for rising PSA), and familiarity with the evaluation of the evidence for and against intermittent treatment for patients with metastatic hormone-sensitive disease<br>• Knowledge of the indications in hormone-sensitive metastatic disease for the use of chemotherapy in association with androgen deprivation therapy in fit patients who present with metastatic disease<br>• Knowledge of the indications for and recognition of how to use and knowledge of the side effects of chemotherapeutic, hormonal and targeted agents as well as radio-isotope; some knowledge surrounding the mechanisms of resistance to these agents<br>• Familiarity with potential histological evolution and clonal selection using new hormonal therapies, with the consequence of new histological features like neuroendocrine carcinoma and intermediate atypical carcinoma<br>• Knowledge of the implications of the multidisciplinary approach and of the oncogeriatric approach in this tumour of the elderly<br>• Understanding of how and when to use bone-targeted therapies and of the prevention and treatment of osteonecrosis of the jaw |
| Skills | • Ability to recognise the indications for prostatectomy and radiation therapy in patients with localised disease and those for salvage radiation therapy after radical prostatectomy<br>• Ability to determine the indication for imaging and new imaging techniques at biochemical relapse<br>• Ability to discuss options for oligometastatic disease<br>• Ability to follow the changing treatment guidelines for metastatic patients with hormone-sensitive disease, adding chemotherapy to androgen deprivation therapy<br>• Ability to manage the treatment of metastatic CRPC and its side effects<br>• Ability to manage the toxicities associated with novel AR-directed therapies<br>• Ability to select second-line chemotherapy and to manage its toxicity<br>• Ability to determine the indications for therapy with radioisotope for bone-only disease<br>• Ability to diagnose and manage spinal cord compression, one of the most devastating complications of metastatic prostate cancer<br>• Ability to contribute to a multidisciplinary team approach in the treatment of patients with prostate cancer |

## References


1. Beer TM, Armstrong AJ, Rathkopf DE, *et al*. PREVAIL Investigators. Enzalutamide in metastatic prostate cancer before chemotherapy. *N Engl J Med* 2014;371:424–33.
2. de Bono JS, Logothetis CJ, Molina A, *et al*. COU-AA-301 Investigators. Abiraterone and increased survival in metastatic prostate cancer. *N Engl J Med* 2011;364:1995–2005.
3. Gillessen S, Omlin A, Attard G, *et al*. Management of patients with advanced prostate cancer: recommendations of the St Gallen Advanced Prostate Cancer Consensus Conference (APCCC) 2015. *Ann Oncol* 2015;26:1589–604.
4. Mateo J, Carreira S, Sandhu S, *et al*. DNA-repair defects and olaparib in metastatic prostate cancer. *N Engl J Med* 2015;373:1697–708.
5. Parker C, Nilsson S, Heinrich D, *et al*. ALSYMPCA Investigators. Alpha emitter radium-223 and survival in metastatic prostate cancer. *N Engl J Med* 2013;369:213–23.
6. Robinson D, Van Allen EM, Wu YM, *et al*. Integrative clinical genomics of advanced prostate cancer. *Cell* 2015;161:1215–28.
7. Ryan CJ, Smith MR, Fizazi K, *et al*. COU-AA-302 Investigators. Abiraterone acetate plus prednisone versus placebo plus prednisone in chemotherapy-naive men with metastatic castration-resistant prostate cancer (COU-AA-302): final overall survival analysis of a randomised, double-blind, placebo-controlled phase 3 study. *Lancet Oncol* 2015;16:152–60.
8. Scher HI, Fizazi K, Saad F, *et al*. AFFIRM Investigators. Increased survival with enzalutamide in prostate cancer after chemotherapy. *N Engl J Med* 2012;367:1187–97.
9. Sternberg CN, Castellano D, Daugaard G, *et al*. Abiraterone Global EAP Investigators. Abiraterone acetate for patients with metastatic castration-resistant prostate cancer progressing after chemotherapy: final analysis of a multicentre, open-label, early-access protocol trial. *Lancet Oncol* 2014;15:1263–8.
10. Sternberg CN, Petrylak DP, Madan RA, *et al*. Progress in the treatment of advanced prostate cancer. *Am Soc Clin Oncol Educ Book* 2014:117–31.


### *4.5.4.e Germ cell tumours*

**Maria De Santis**
**Cora N Sternberg**

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| Objectives | • To understand the high incidence of germ cell tumours (GCT) at young age<br>• To understand the reason for the overall very good prognosis and the importance of chemotherapy<br>• To understand the importance of surgery for the primary tumour and for the residual tumours after chemotherapy, which is a standard of care and part of the long-term treatment success<br>• To appreciate the differences between seminoma (SGCT) and non-seminomatous NSGCT, and the rare occurrence of extragonadal GCT |

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| | • To understand the diagnostic tools for the detection of the primary tumour and for staging<br>• To understand the American Joint Committee on Cancer (AJCC) classification, the role of staging procedures with imaging and the unique role of tumour markers for diagnosis, staging and follow-up of GCT<br>• To understand the classification of metastatic patients by the International Germ Cell Cancer Collaborative Group (IGCCCG) and the respective allocation of treatment amount<br>• To understand the management options for GCT of stage I and metastatic disease and the importance of treatment according to guidelines for overall outcome<br>• To understand that a precancerous lesion (TIN) can be detected by biopsy of the testicle<br>• To understand the salvage treatment options for relapse, including high-dose chemotherapy<br>• To understand late toxicity of chemotherapy and radiation therapy |
| Awareness | • Awareness of the epidemiology and high incidence rate of GCT at young age<br>• Recognition that TIN is the precancerous lesion<br>• Awareness of the staging tools with imaging and tumour markers<br>• Appreciation that GCT are chemotherapy-sensitive and that the introduction of cisplatin is the reason for the high cure rate<br>• Awareness of the differences in the management of SGCT and NSGCT<br>• Awareness of the roles of chemotherapy, radiation therapy and surgery<br>• Recognition that there are also extragonadal GCT<br>• Awareness that overall outcome for GCT and, in particular, the high cure rates as well as reduction of late toxicity are linked to treatment according to guidelines and treatment in specialised centres<br>• Awareness of late relapse |
| Knowledge | • Knowledge of the histological differentiation of GCT, SGCT and NSGCT<br>• Understanding that surgery of the primary tumour is standard of care and curative in many stage I patients<br>• Knowledge of the indication for contralateral testis biopsy and treatment of TIN<br>• Knowledge of the treatment and management options for stage I NSGCT and SGCT and the roles of adjuvant chemotherapy and surveillance<br>• Knowledge that metastatic GCT are classified by IGCCCG based on staging with imaging and tumour markers<br>• Knowledge of the standard chemotherapy and the strict number of cycles allocated according to the risk classification, and knowledge that there are also other options to be used in special circumstances<br>• Knowledge about the correct scheduling in order to guarantee the necessary dose density of chemotherapy<br>• Knowledge of the indication for residual tumour surgery after chemotherapy and its curative role, in particular for long-term relapse-free survival<br>• Knowledge of the conventional-dose and high-dose (with peripheral stem cell support) chemotherapy regimens in the salvage setting<br>• Knowledge of how to handle late relapse<br>• Knowledge of the most common late toxicities |
| Skills | • Ability to discuss histology and staging with the multidisciplinary tumour board<br>• Ability to discuss all aspects of stage I management, surveillance and adjuvant treatment options with patients and their families<br>• Ability to interpret tumour marker changes and slopes before, during and after treatment<br>• Ability to classify patients with metastases according to the IGCCCG and allocate the correct amount of chemotherapy, thereby respecting the necessary dose density<br>• Ability to decide about the indication for postchemotherapy surgery<br>• Ability to discuss treatment with chemotherapy and surgery and to explain side effects and potential long-term sequelae<br>• Ability to set up an adequate follow-up scheme and to avoid unnecessary radiation risks by imaging |

## References


1. Beyer J, Albers P, Altena R, *et al*. Maintaining success, reducing treatment burden, focusing on survivorship: highlights from the third European consensus conference on diagnosis and treatment of germ-cell cancer. *Ann Oncol* 2013;24:878–88.
2. Ehrlich Y, Brames MJ, Beck SD, *et al*. Long-term follow-up of cisplatin combination chemotherapy in patients with disseminated non seminomatous germ cell tumors: is a postchemotherapy retroperitoneal lymph node dissection needed after complete remission? *J Clin Oncol* 2010;28:531–6.
3. Feldman DR, Bosl GJ, Sheinfeld J, *et al*. Medical treatment of advanced testicular cancer. *JAMA* 2008;299:672–84.
4. Fizazi K, Oldenburg J, Dunant A, *et al*. Assessing prognosis and optimizing treatment in patients with postchemotherapy viable non seminomatous germ-cell tumors (NSGCT): results of the sCR2 international study. *Ann Oncol* 2008;19:259–64.
5. Heidenreich A, Pfister D. Retroperitoneal lymphadenectomy and resection for testicular cancer: an update on best practice. *Ther Adv Urol* 2012;4:187–205.
6. International Germ Cell Cancer Collaborative Group. International germ cell consensus classification: a prognostic factor-based staging system for metastatic germ cell cancers. *J Clin Oncol* 1997;15:594–603.

7. Lorch A, Bascoul-Mollevi C, Kramar A, *et al*. Conventional-dose versus high-dose chemotherapy as first salvage treatment in male patients with metastatic germ cell tumors: evidence from a large international database. *J Clin Oncol* 2011;29:2178–84.
8. Oldenburg J, Alfsen GC, Waehre H, *et al*. Late recurrences of germ cell malignancies: a population-based experience over three decades. *Br J Cancer* 2006;94:820–7.
9. Oldenburg J, Martin JM, Fossa SD. Late relapses of germ cell malignancies: incidence, management, and prognosis. *J Clin Oncol* 2006;24:5503–11.
10. Oliver RT, Mason MD, Mead GM, *et al*. Radiotherapy versus single-dose carboplatin in adjuvant treatment of stage I seminoma: a randomized trial. *Lancet* 2005;366:293–300.
11. Tandstad T, Dahl O, Cohn-Cedermark G, *et al*. Risk-adapted treatment in clinical stage I non seminomatous germ cell testicular cancer: the SWENOTECA management program. *J Clin Oncol* 2009;27:2122–8.
12. Tandstad T, Smaaland R, Solberg A, *et al*. Management of seminomatous testicular cancer: a binational prospective population-based study from the Swedish Norwegian testicular cancer study group. *J Clin Oncol* 2011;29:719–25.


## 4.5.5 Gynaecological malignancies

### *4.5.5.a Ovarian cancer (including fallopian tube and primary peritoneal cancer)*

**Susana Banerjee**
**Linda R Duska**

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| Objectives | • To be able to describe the epidemiology, aetiology and risk factors of ovarian cancer<br>• To be able to perform specialist assessment and to develop a multidisciplinary management plan for newly diagnosed patients with ovarian cancer<br>• To be able to formulate treatment plans for patients with recurrent ovarian cancer, including palliation |
| Awareness | • Awareness of risk factors<br>• Awareness of symptoms and signs<br>• Appreciation of the evidence for screening and preventive measures<br>• Recognition of the genetic predisposition to ovarian cancer<br>• Awareness of imaging modalities and serum markers to diagnose and manage patients with ovarian cancer<br>• Appreciation of fertility preservation options<br>• Appreciation of issues surrounding management of ovarian cancer in pregnancy<br>• Awareness of survivorship-related issues |
| Knowledge | • Familiarity with the anatomy related to ovarian cancer<br>• Knowledge of the staging systems used in ovarian cancer<br>• Familiarity with the histological and molecular subtypes of ovarian cancer and the associated clinical behaviour<br>• Understanding of the relevance of BReast CAncer (BRCA) testing in ovarian cancer<br>• Understanding of the management of newly diagnosed (first-line) ovarian cancer:<br>◦ Evidence for and role of primary debulking surgery, primary chemotherapy and interval debulking surgery<br>◦ Evidence and indications for adjuvant systemic therapy (including antiangiogenic therapy, dose-dense and intraperitoneal chemotherapy)<br>◦ Surgical management: first-line, recurrent, palliative<br>• Understanding of the management of recurrent ovarian cancer:<br>◦ Familiarity with the relevance of treatment-free interval<br>◦ Platinum-sensitive, platinum-resistant and platinum-refractory (chemotherapy and targeted therapy options such as antiangiogenic therapy and poly ADP ribose polymerase (PARP) inhibitors)<br>◦ Role for surgery in relapsed disease, including palliative procedures, eg, in case of bowel obstruction<br>• Knowledge of an overview of the management of non-epithelial ovarian cancers and ovarian tumours, eg, sex-cord stromal ovarian tumours, borderline tumours |
| Skills | • Ability to contribute to the multidisciplinary management decisions of patients with newly diagnosed and recurrent ovarian cancer<br>• Ability to determine and prescribe systemic therapy plans for newly diagnosed and recurrent patients with ovarian cancer, taking into consideration performance status, comorbidities and prior toxicities<br>• Ability to evaluate patients for therapy (history and physical examination, including internal) and to discuss prognosis and treatment options<br>• Ability to counsel patients regarding the relevance of BRCA gene testing<br>• Ability to assess and manage disease-related events (eg, ascites, bowel obstruction), and complications of systemic therapies<br>• Ability to discuss cancer follow-up with patients |

## References

1. Banerjee S, Kaye SB. New strategies in the treatment of ovarian cancer: current clinical perspectives and future potential. *Clin Cancer Res* 2013;19:961–8.
2. Ledermann JA, Raja FA, Fotopoulou C, *et al*. Newly diagnosed and relapsed epithelial ovarian carcinoma: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2013;24 (Suppl 6):vi24–32.
3. Morice P, Denschlag D, Rodolakis A, *et al*. Recommendations of the Fertility Task Force of the European Society of Gynecologic Oncology about the conservative management of ovarian malignant tumors. *Int J Gynecol Cancer* 2011;21:951–63.
4. Ray-Coquard I, Brown J, Harter P, *et al*. Gynecologic Cancer InterGroup (GCIG) consensus review for ovarian sex cord stromal tumors. *Int J Gynecol Cancer* 2014;24(Suppl 3): S42–7.


### *4.5.5.b Endometrial cancer*

**Susana Banerjee**
**Linda R Duska**

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| Objectives | • To be able to describe the epidemiology, aetiology and risk factors of endometrial cancer<br>• To be able to perform specialist assessment and to develop a multidisciplinary management plan for newly diagnosed patients with endometrial cancer<br>• To be able to formulate treatment plans for patients with recurrent endometrial cancer, including palliation |
| Awareness | • Awareness of risk factors<br>• Awareness of symptoms and signs<br>• Appreciation of the evidence and indications for screening, prevention and surveillance measures<br>• Awareness of imaging modalities to diagnose and manage endometrial cancer<br>• Appreciation of fertility preservation options<br>• Awareness of survivorship-related issues<br>• Recognition of genetic predisposition to endometrial cancer, eg, Lynch syndrome<br>• Awareness of molecular alterations in endometrial cancer |
| Knowledge | • Knowledge of the staging systems used in endometrial cancer<br>• Familiarity with the histological subtypes of endometrial cancer (including carcinosarcoma) and the associated clinical behaviour<br>• Familiarity with defining the risk stratification of endometrial cancer (low, intermediate and high risk)<br>• Understanding of the management of newly diagnosed endometrial cancer in relation to stage and risk groups:<br>◦ Indications for surgery (including minimally invasive techniques, role of lymphadenectomy) and radiotherapy<br>◦ Indications for adjuvant systemic therapy<br>• Understanding of the management of recurrent endometrial cancer:<br>◦ Systemic treatment options (role for chemotherapy and hormonal therapy)<br>◦ Role for surgery in relapsed disease, including palliative procedures<br>◦ Role for palliative radiotherapy |
| Skills | • Ability to contribute to the multidisciplinary management decisions of patients with newly diagnosed and recurrent endometrial cancer<br>• Ability to evaluate patients for therapy (history and physical examination, including internal) and to discuss prognosis and treatment options<br>• Ability to determine management plans for newly diagnosed patients with endometrial cancer according to stage and risk stratification, taking into consideration comorbidities and performance status<br>• Ability to determine and prescribe systemic therapy plans for patients with recurrent endometrial cancer, taking into consideration performance status, comorbidities and prior toxicities<br>• Ability to assess and manage disease-related events (eg, vaginal bleeding), complications of radiotherapy and systemic therapy<br>• Ability to discuss cancer follow-up with patients |


## References

1. Colombo N, Preti E, Landoni F, *et al*. Endometrial cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2013;24(Suppl 6):vi33–8.
2. Colombo N, Creutzberg C, Amant F, *et al*. ESMO-ESGO-ESTRO consensus conference on endometrial cancer: diagnosis, treatment and follow-up. *Ann Oncol* 2016;27:16–41.
3. Meyer LA, Bohlke K, Powell MA, *et al*. Postoperative radiation therapy for endometrial cancer: American Society of Clinical Oncology clinical practice guideline endorsement of the American Society for Radiation Oncology evidence-based guideline. *J Clin Oncol* 2015;33:2908–13.
4. Morice P, Leary A, Creutzberg C, *et al*. Endometrial cancer. *Lancet* 2015. pii: S0140-6736(15)00130-0.
5. Rodolakis A, Biliatis I, Morice P, *et al*. European Society of Gynecological Oncology Task Force for fertility preservation: clinical recommendations for fertility-sparing management in young endometrial cancer patients. *Int J Gynecol Cancer* 2015;25:1258–65.

*4.5.5.c Cervical cancer*

**Linda R Duska**
**Susana Banerjee**

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| Objectives | • To be able to describe the epidemiology, aetiology and methods of prevention of cervical cancer<br>• To be able to perform specialist assessment, treatment and counselling of patients with primary cervical cancer<br>• To be able to counsel and treat patients with recurrent cervical cancer |
| Awareness | • Appreciation of the staging system for cervical cancer<br>• Awareness of the importance of the multimodality approach to treatment, including the role of surgery and radiation oncology<br>• Appreciation of the role of surgery versus chemo-radiation in early-stage disease<br>• Awareness of options for fertility preservation in early-stage disease<br>• Recognition of the role of chemo-radiation in locally advanced cervical cancer<br>• Awareness of treatment options for primary advanced (stage IVB) and recurrent or persistent disease, including the indications for pelvic exenteration<br>• Appreciation of the role of systemic therapies, including antiangiogenic therapy in cervical cancer treatment |
| Knowledge | • Knowledge of staging procedures, including diagnostic and radiological procedures for staging cervical cancer<br>• Familiarity with the role, indications and limitations of staging studies, including magnetic resonance imaging (MRI), positron emission tomography (PET)/computed tomography (CT), and staging lymphadenectomy with respect to treatment planning<br>• Understanding of the role of primary surgery in early-stage disease and the risks and benefits of surgery versus chemo-radiation in early-stage disease with respect to post-treatment side effects and cancer cure rates<br>• Understanding of options for fertility preservation, including radical trachelectomy, neoadjuvant chemotherapy and ovarian transposition<br>• Understanding of the indications for adjuvant therapy following radical surgery for early-stage disease<br>• Familiarity with the indications and value of surgery, radiation therapy, chemotherapy and antiangiogenic drug therapy in cervical cancer, but also with their limitations<br>• Understanding of the role of chemotherapy in combination with irradiation in locally advanced cervical cancer<br>• Understanding of the role of chemotherapy and antiangiogenic therapy in the management of patients with advanced, persistent or recurrent disease<br>• Understanding of treatment options for advanced or recurrent disease, including tumour vaccines<br>• Understanding of the complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care strategies |
| Skills | • Ability to contribute actively to a variety of cervical cancer clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in patients with cervix cancer, including different stages of disease as well as pelvic and rectal examinations<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use<br>• Ability to prescribe chemotherapy with pelvic irradiation, including managing acute toxicity during treatment<br>• Ability to manage side effects of radical surgery, radiation and chemo-radiation therapy<br>• Ability to discuss prevention strategies with patients |

## References

1. Brotherton JM, Ogilvie GS. Current status of human papillomavirus vaccination. *Curr Opin Oncol* 2015;27:399–404.
2. Columbo N, Carinelli S, Colombo A, *et al.* ESMO Guidelines Working Group. Cervical cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2012;23(Suppl 7): vii27–32.
3. Petignat P, Roy M. Diagnosis and management of cervical cancer. *BMJ* 2007;335:765–8.
4. Pfaendler KS, Tewari KS. Changing paradigms in the systemic treatment of advanced cervical cancer. *Am J Obstet Gynecol* 2016;214:22–30.
5. Sonoda Y. Fertility preservation in patients with cervical cancer. *Oncology (Williston Park)* 2015;29:525–6.

*4.5.5.d Vulvar and vaginal cancers*

**Linda R Duska**
**Susana Banerjee**

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| Objectives | • To be able to describe the epidemiology, aetiology and risk factors (including human papilloma virus (HPV)) for vulvar and vaginal cancers<br>• To understand the presentation of melanoma primary to the vulva and vagina<br>• To understand the methods of prevention of vulvar and vaginal cancers, including diagnosis and management of pre-invasive disease<br>• To be able to perform specialist assessment, staging, treatment and counselling of patients with primary vaginal and vulvar cancers<br>• To be able to counsel and treat patients with recurrent disease<br>• To recognise metastatic cancers to the vulva and vagina |
| Awareness | • Awareness of staging procedures, including diagnostic and radiological procedures for staging<br>• Recognition of the importance of the multimodality approach to treatment, including the roles of surgery and radiation oncology<br>• Awareness of diagnosis, staging and treatment of melanoma primary to the vulva and vagina<br>• Appreciation of the role of biological treatments and immunotherapy agents in the treatment of melanoma |
| Knowledge | • Familiarity with the role, indications and limitations of staging studies, including magnetic resonance imaging (MRI), positron emission tomography-computed tomography (PET-CT), and staging lymphadenectomy with respect to treatment planning<br>• Understanding of the role of primary surgery in the treatment of vulvar cancer and early stage vaginal cancer<br>• Understanding of the indications for chemo-radiation therapy for advanced (unresectable) vulvar cancer and for most vaginal cancers<br>• Understanding of the indications for adjuvant therapy following radical surgery<br>• Understanding of the role of chemotherapy in the management of patients with advanced, persistent or recurrent disease<br>• Understanding of the complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care strategies |
| Skills | • Ability to contribute actively to a variety of vulvar and vaginal cancer clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination, including pelvic and rectal examinations<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use<br>• Ability to prescribe chemotherapy with radiation therapy, including managing acute toxicity during treatment<br>• Ability to manage side effects of radical surgery, irradiation and chemo-radiation therapy<br>• Ability to discuss the options for patients with persistent or recurrent disease following primary therapy<br>• Ability to discuss prevention strategies with patients |

## References

1. Janco JM, Markovic SN, Weaver AL, *et al*. Vulvar and vaginal melanoma: case series and review of current management options including neoadjuvant chemotherapy. *Gynecol Oncol* 2013;129:533–7.
2. Lilic V, Lilic G, Filipovic S, *et al*. Primary carcinoma of the vagina. *J BUON* 2010;15:241–7.
3. Woelber L, Trillsch F, Kock L, *et al*. Management of patients with vulvar cancer: a perspective review according to tumour stage. *Ther Adv Med Oncol* 2013;5:183–92.

### *4.5.5.e Gestational trophoblastic neoplasia*

**Linda R Duska**
**Susana Banerjee**

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| Objectives | • To be able to describe the different types of gestational trophoblastic neoplasia (GTN) (including complete and partial molar pregnancy, invasive mole, choriocarcinoma and placental site trophoblastic tumours), including molecular pathogenesis<br>• To be able to perform specialist assessment, staging, treatment and counselling of patients with GTN<br>• To be able to counsel and treat patients with recurrent or persistent disease |
| Awareness | • Awareness of staging systems, including International Federation of Gynecology and Obstetrics (FIGO) anatomical staging for GTN and modified WHO prognostic scoring system<br>• Awareness of chemotherapy options for early- and late-stage disease as well as persistent/recurrent disease<br>• Recognition of the role of surgery in disease management<br>• Awareness of surveillance following treatment (including prevention of pregnancy during surveillance period)<br>• Appreciation of the management of subsequent pregnancies |
| Knowledge | • Familiarity with staging according to FIGO and with providing prognostic information (WHO) for GTN<br>• Familiarity with the different histological types of GTN and their prognosis<br>• Familiarity with the diagnostic evaluation of GTN, including the role and limitations of computed tomography (CT), magnetic resonance imaging (MRI) and pelvic ultrasound<br>• Understanding of the role of primary surgery in the management of complete and partial molar pregnancies<br>• Understanding of the management of GTN by FIGO stage, including the indications for single-agent versus multiple-agent chemotherapy, and the role of chemotherapy in the treatment of persistent or recurrent disease<br>• Understanding of the surveillance of GTN following treatment, including the importance of (and methods for) preventing subsequent pregnancy |
| Skills | • Ability to contribute to discussions on general management strategies for the management of suspected molar pregnancy<br>• Ability to contribute to discussions on treatment of GTN (all stages), including management of placental site trophoblastic tumour<br>• Ability to prescribe single-agent versus combination chemotherapy and to discuss the benefits and limitations of different chemotherapy options<br>• Ability to discuss with patients the surveillance strategy, including the prevention of subsequent pregnancy during the surveillance period and the risk of recurrent disease in a subsequent pregnancy |

**References**

1. Lurain JR. Gestational trophoblastic disease I: epidemiology, pathology, clinical presentation and diagnosis of gestational trophoblastic disease, and management of hydatidiform mole. *Am J Obstet Gynecol* 2010;203:531–9.
2. Lurain JR. Gestational trophoblastic disease II: classification and management of gestational trophoblastic neoplasia. *Am J Obstet Gynecol* 2011;204:11–18.
3. Seck MJ, Sebire NJ, Fisher RA, *et al*, on behalf of the ESMO Guidelines Working Group. Gestational trophoblastic disease: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2013;24(Suppl 6):vi39–v150.

### 4.5.6 Breast cancer

**Fatima Cardoso**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with breast cancer, including genetics, as well as prevention, early detection and screening |
| Awareness | • Awareness of the existence of different molecular subtypes of breast cancer defined by genomic testing and immunohistochemistry (IHC) surrogates, and their implications in terms of prognosis and selection of appropriate therapies<br>• Awareness of the existence of different pathological subtypes of breast cancer, namely rare histological subtypes and implications for prognosis and treatment<br>• Awareness of the existence of BReast CAncer (BRCA)-related breast cancer and implications for surveillance of carriers, diagnosis and treatment |

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| | • Awareness of the existence of indications for screening as well as best imaging tools<br>• Recognition of the availability of different diagnostic and staging procedures, including imaging and pathology<br>• Appreciation of the existence of different prognostic and predictive factors<br>• Appreciation of the importance of the multidisciplinary approach to manage patients with breast cancer, in the early and the metastatic settings<br>• Awareness of the existence of different therapeutic modalities namely surgery, radiotherapy, systemic therapies (chemotherapy, hormonal therapy and targeted therapy), as well as specialties such as physical therapy to manage lymphoedema<br>• Awareness of the existence of indications for adequate follow-up of patients, including tackling issues of survivorship<br>• Recognition of the existence of breast cancer in male patients<br>• Awareness of international guidelines for the management of patients with breast cancer |
| Knowledge | • Familiarity with the implications of the different molecular subtypes of breast cancer in terms of prognosis and selection of appropriate therapies<br>• Familiarity with the implications of the different pathological subtypes of breast cancer, namely rare histological subtypes, in terms of prognosis and selection of appropriate therapies<br>• Familiarity with the indications for screening as well as best imaging tools<br>• Understanding of the principles of chemoprevention, its indications and side effects<br>• Understanding of the indications for referring patients and their relatives for genetic counselling and testing and the implications of BRCA positivity in the management of carriers and patients<br>• Familiarity with the indications and limitations of the different diagnostic tools available for breast cancer, including different imaging techniques (mammography, ultrasound, magnetic resonance imaging (MRI)) and pathology (fine needle aspiration (FNA) and core biopsy), as well as best staging procedures<br>• Familiarity with the risk assessment work-up of prognostic factors, including staging and biological markers (hormone and human epidermal growth factor (HER-2) receptors)<br>• Familiarity with the indications, value, modalities and limitations of surgery and radiotherapy for breast cancer, in all stages, as well as with the different possible sequences<br>• Knowledge regarding types of systemic therapy (hormonal therapy, chemotherapy and targeted therapy), different regimens, their indications and main side effects for early and advanced disease<br>• Knowledge about indications, objectives and limitations of neoadjuvant, ie, preoperative systemic therapy<br>• Understanding of the criteria, clinical and biological, for decisions about adjuvant chemotherapy, including genomic tests and their indications and limitations<br>• Understanding of the different goals of treatment and their implications for early and advanced disease<br>• Understanding of the most common long-term side effects and other survivorship issues, including psychological, that affect patients who had a diagnosis of breast cancer, as well as those living with metastatic disease<br>• Understanding of the complications that derive from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care strategies<br>• Understanding of the characteristics of breast cancer in male patients and main management procedures<br>• Understanding of the indications and limitations of follow-up procedures for patients with breast cancer<br>• Understanding how to evaluate response in the neoadjuvant and the advanced setting |
| Skills | • Ability to contribute actively to a variety of breast cancer clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in patients with breast cancer, including different subtypes<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic and targeted agents as well as monoclonal antibodies<br>• Ability to recognise conditions (such as performance status and patients' clinical condition, concomitant disease(s), previous treatments etc) that are important for considering when to start and to stop treatment or to switch to another option<br>• Ability to determine therapy according to molecular marker status<br>• Ability to manage side effects of various chemotherapeutic, targeted agents and monoclonal antibodies<br>• Ability to discuss chemoprevention strategies with patients<br>• Ability to discuss genetic counselling/testing with patients and their relatives<br>• Ability to discuss survivorship and compliance issues (particularly regarding adjuvant endocrine therapy) with patients<br>• Ability to discuss and advise fertility preservation |

## References

1. Amant F, Deckers S, Van Calsteren K, *et al*. Breast cancer in pregnancy: recommendations of an international consensus meeting. *Eur J Cancer* 2010;46:3158–68.
2. Anderson BO, Cazap E, El Saghir NS, *et al*. Optimisation of breast cancer management in low-resource and middle-resource countries: executive summary of the Breast Health Global Initiative consensus. *Lancet Oncol* 2011;12:387–98.
3. Cardoso F, Bedard PL, Winer EP, *et al*. ESO-MBC Task Force. International guidelines for management of metastatic breast cancer: combination vs sequential single-agent chemotherapy. *J Natl Cancer Inst* 2009;101:1174–81.
4. Cardoso F, Costa A, Norton L, *et al*. 1st International consensus guidelines for advanced breast cancer (ABC 1). *Breast* 2012;21:242–52.
5. Cardoso F, Costa A, Norton L, *et al*. ESO-ESMO 2nd international consensus guidelines for advanced breast cancer (ABC2). *Ann Oncol* 2014;25:1871–88.
6. Coates AS, Winer EP, Goldhirsch A, *et al*. Tailoring therapies—improving the management of early breast cancer: St Gallen International Expert Consensus on the Primary Therapy of Early Breast Cancer 2015. *Ann Oncol* 2015;26:1533–46.
7. Distelhorst SR, Cleary JF, Ganz PA, *et al*. Breast Health Global Initiative Global Summit on Supportive Care and Quality of Life Consensus Panel Members. Optimisation of the continuum of supportive and palliative care for patients with breast cancer in low-income and middle-income countries: executive summary of the Breast Health Global Initiative, 2014. *Lancet Oncol* 2015;16:e137–47.
8. Giordano SH, Temin S, Kirshner JJ, *et al*. Systemic therapy for patients with advanced human epidermal growth factor receptor 2-positive breast cancer: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol* 2014;32:2078–99.
9. Khatcheressian JL, Wolff AC, Smith TJ, *et al*. American Society of Clinical Oncology 2006 Update of the breast cancer follow-up and management guidelines in the adjuvant setting. *J Clin Oncol* 2006;24:5091–7.
10. Khatcheressian JL, Hurley P, Bantug E, *et al*. Breast cancer follow-up and management after primary treatment: American Society of Clinical Oncology clinical practice guideline update. *J Clin Oncol* 2013;31:961–5.
11. Korde LA, Zujewski JA, Kamin L, *et al*. Multidisciplinary meeting on male breast cancer: summary and research recommendations. *J Clin Oncol* 2010;28:2114–22.
12. Lin NU, Thomssen C, Cardoso F, *et al*. European School of Oncology-Metastatic Breast Cancer Task Force. International guidelines for management of metastatic breast cancer (MBC) from the European School of Oncology (ESO)-MBC Task Force: surveillance, staging, and evaluation of patients with early-stage and metastatic breast cancer. *Breast* 2013;22:203–10.
13. Lyman GH, Temin S, Edge SB, *et al*. Sentinel lymph node biopsy for patients with early-stage breast cancer: American Society of Clinical Oncology clinical practice guideline update. *J Clin Oncol* 2014;32:1365–83.
14. Pagani O, Senkus E, Wood W, *et al*. ESO-MBC Task Force. International guidelines for management of metastatic breast cancer: can metastatic breast cancer be cured? *J Natl Cancer Inst* 2010;102:456–63.
15. Partridge AH, Pagani O, Abulkhair O, *et al*. First international consensus guidelines for breast cancer in young women (BCY1). *Breast* 2014;23:209–20.
16. Partridge AH, Rumble RB, Carey LA, *et al*. Chemotherapy and targeted therapy for women with human epidermal growth factor receptor 2-negative (or unknown) advanced breast cancer: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol* 2014;32:3307–29.
17. Ramakrishna N, Temin S, Chandarlapaty S, *et al*. Recommendations on disease management for patients with advanced human epidermal growth factor receptor 2-positive breast cancer and brain metastases: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol* 2014;32:2100–8.
18. Senkus E, Kyriakides S, Ohno S, *et al*. ESMO Guidelines Committee. Primary breast cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2015;26(Suppl 5):v8–30.
19. Tryfonidis K, Senkus E, Cardoso MJ, *et al*. Management of locally advanced breast cancer-perspectives and future directions. *Nat Rev Clin Oncol* 2015;12:147–62.
20. Van Poznak C, Somerfield MR, Bast RC, *et al*. Use of biomarkers to guide decisions on systemic therapy for women with metastatic breast cancer: American Society of Clinical Oncology clinical practice guideline. *J Clin Oncol* 2015;33:2695–704.
21. Wolff AC, Hammond MEH, Hicks DG, *et al*. Recommendations for human epidermal growth factor receptor 2 testing in breast cancer: American Society of Clinical Oncology/College of American Pathologists clinical practice guideline update. *J Clin Oncol* 2013;31:3997–4013; *Arch Pathol Lab Med* 2014;138:241–56.


## 4.5.7 Sarcomas

### *4.5.7.a Bone sarcomas*

**Paolo Casali**

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| Objectives | • To be able to handle the first diagnosis of a bone sarcoma patient and to proactively refer patients to sarcoma reference centres for specialised multidisciplinary treatment planning<br>• To be able to collaborate with a sarcoma reference centre on the medical management of patients with bone sarcomas, as needed, through proactive clinical networking |
| Awareness | • Awareness that all bone sarcomas are rare cancers, worth being referred, following biopsy, to centres specialised in their treatment<br>• Appreciation that the main entities include osteosarcoma, Ewing sarcoma, chondrosarcoma, chordoma and others, with different characteristics in terms of epidemiology, natural history and treatment strategy<br>• Recognition that bone sarcomas can occur throughout the skeleton depending on the subtype, with remarkable discrepancy rates in pathological diagnosis between reference institutions and the community<br>• Appreciation that proper treatment should be always selected on a multidisciplinary basis<br>• Appreciation that chemotherapy is especially effective in osteosarcoma and Ewing sarcoma within intensive multidisciplinary treatment protocols<br>• Awareness that molecular targeted therapies are available for giant cell tumours of bone and chordomas |
| Knowledge | • Knowledge of the main concepts regarding the following aspects of bone sarcomas:<br>◦ Essentials of epidemiology and gross natural history of disease for osteosarcoma, Ewing sarcoma, chondrosarcoma and chordoma<br>◦ Importance of pathological diagnosis |

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| | ◦ Principles of surgery of bone sarcomas<br>◦ Efficacy of systemic therapy, especially in osteosarcoma and Ewing sarcoma (with the potential of chemo-radiation treatment in the latter)<br>◦ Main survivorship issues for children and young patients cured of their bone sarcoma |
| Skills | • Ability to advise surgeons facing a clinical/pathological diagnosis of bone sarcoma, or suspected bone sarcoma<br>• Ability to refer bone sarcoma patients to centres of reference by conveying essential, meaningful clinical information<br>• Ability to actively discuss patient cases with reference centres in regard to strategic clinical decisions and medical treatment conduct, if needed |

**Reference**

1. ESMO clinical practice guidelines: sarcoma and GIST. http://www.esmo.org/Guidelines/Sarcoma-and-GIST

### *4.5.7.b Soft tissue sarcomas*

**Paolo Casali**

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| Objectives | • To be able to clinically suspect the diagnosis of soft tissue sarcomas (STS), when appropriate, and to properly refer these patients to sarcoma reference centres for biopsy and specialised multidisciplinary treatment planning<br>• To be able to collaborate with a sarcoma reference centre on the medical management of STS patients, as needed, through active clinical networking |
| Awareness | • Awareness that STS are rare cancers, worth being referred to centres specialised in their treatment<br>• Appreciation that STS can occur everywhere in the body and are an exceedingly variegated group of malignancies pathologically, with remarkable discrepancy rates in pathological diagnosis between reference institutions and the community<br>• Recognition that first surgery is often crucial for the patient's outcome and that proper treatment should be selected on a multidisciplinary basis as from the time of diagnostic suspicion<br>• Awareness that, in the localised and advanced disease settings, the indication for systemic therapies and the selection of drugs significantly depends on the pathological subtype |
| Knowledge | • Knowledge of the main concepts regarding the following aspects of STS:<br>◦ Essentials of natural history of STS in general<br>◦ Clinical importance of histopathological partitioning (with significant subgroups, such as desmoid tumours, small round cell sarcomas, uterine sarcomas, including endometrial stromal sarcomas)<br>◦ Gross prognostic factors<br>◦ Objectives of surgery and radiation therapy for localised disease<br>◦ Potential and uncertainties of adjuvant and neoadjuvant systemic therapy<br>◦ Potential of surgery of lung metastases<br>◦ Principles of systemic treatment of advanced disease with main active drugs |
| Skills | • Ability to advise surgeons facing a clinical/pathological diagnosis of STS or suspected STS<br>• Ability to refer STS patients to centres of reference by collecting and conveying essential, meaningful clinical information<br>• Ability to actively discuss patient cases with reference centres in regard to strategic clinical decisions and medical treatment conduct, as needed |

**Reference**

1. ESMO clinical practice guidelines: sarcoma and GIST. http://www.esmo.org/Guidelines/Sarcoma-and-GIST

*4.5.7.c Gastrointestinal stromal tumour*

**Paolo Casali**

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| Objectives | • To be able to handle the first diagnosis of a patient with gastrointestinal stromal tumour (GIST) and to proactively refer patients with GIST to sarcoma reference centres for specialised multidisciplinary treatment<br>• To be able to collaborate with a sarcoma reference centre in medical management of patients with GIST, if needed, through active clinical networking |
| Awareness | • Awareness that GIST are rare cancers, worth being referred to centres specialised in their treatment<br>• Recognition that GIST can be first diagnosed on an emergency basis<br>• Recognition that GIST should be considered during the differential diagnosis of abdominal masses and may be diagnosed as incidental endoscopic findings<br>• Appreciation that proper treatment should be selected on a multidisciplinary basis<br>• Appreciation that molecular targeted agents are especially effective and used in the adjuvant and in the advanced disease settings, with specific issues pertaining to side effects and tumour response assessment |
| Knowledge | • Knowledge of the main concepts regarding the following aspects of GIST:<br>◦ Essentials of natural history of disease, including the existence of so-called wild-type GIST, in addition to the typical cKIT/platelet-derived growth factor receptor A (PDGFRA)-mutated GIST<br>◦ Importance of genotyping and existence of prognostic classifications<br>◦ Objectives of surgery for localised disease<br>◦ Potential of adjuvant molecular targeted therapy<br>◦ Gross biological rationale of molecular targeted therapies<br>◦ Principles of systemic treatment with molecular targeted agents approved for use in GIST<br>◦ Patterns of non-dimensional tumour response to molecular targeted agents |
| Skills | • Ability to advise surgeons and gastroenterologists facing a clinical/pathological diagnosis of GIST or suspected GIST<br>• Ability to refer patients with GIST to centres of reference by collecting and conveying essential, meaningful clinical information<br>• Ability to actively discuss patient cases with reference centres in regard to strategic clinical decisions and medical treatment conduct, as needed |

**Reference**

1. ESMO clinical practice guidelines: sarcoma and GIST. http://www.esmo.org/Guidelines/Sarcoma-and-GIST

## 4.5.8 Skin cancers

*4.5.8.a Melanoma*

**Marc Ernstoff**
**Olivier Michielin**

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| Objectives | • To be able to work within a multidisciplinary team to perform diagnostics, treatment and counselling of patients with melanoma<br>• To be able to identify patients at high risk for melanoma and melanoma familial syndromes as well as to perform specialist assessment, diagnostics, treatment and counselling of these patients and families<br>• To understand and be able to counsel patients regarding the modifiable risk factors for melanoma<br>• To understand the molecular, cellular and immunological pathology of melanoma, and its relevance for the clinical management of patients |
| Awareness | • Awareness of the importance of the multimodality approach to treat patients with melanoma, including medical, surgical and radiation oncology as well as specialties such as physical therapy to manage lymphoedema, and dietetic treatment, and social work<br>• Appreciation of different anatomic sites and associated behaviours (cutaneous, non-cutaneous: uveal, mucosal, unknown primary) influencing treatment strategies<br>• Recognition of atypical pigmented lesions and their implications for care<br>• Appreciation of different molecular profiles of melanoma and how these influence selection of treatment |

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| | • Appreciation of stage-based treatment approaches and the existence of other prognostic factors<br>• Awareness of diagnostic procedures such as sentinel lymph node biopsy, computed tomography (CT) scan, positron emission tomography (PET) scans and ultrasonography |
| Knowledge | • Familiarity with the indications and different techniques for the diagnosis and characterisation of pigmented lesions (biopsy procedures, sentinel nodal evaluation, pathological evaluation, molecular profiling)<br>• Familiarity with the risk of recurrence by stage and the role of adjuvant therapies<br>• Familiarity with the role of surveillance examination (physical and radiological approaches and new technologies allowing for in situ evaluation of pigmented lesions)<br>• Familiarity with the indications for therapy for non-operable and metastatic disease, including targeted therapy, immunotherapy, chemotherapy, surgery and radiation therapy<br>• Familiarity with the indication for adjuvant therapy in high-risk melanoma<br>• Familiarity with the complications and toxicity of each type of therapy and their management<br>• Knowledge of the risk–benefit ratio for treatments<br>• Familiarity with melanoma-associated paraneoplastic syndromes<br>• Familiarity with familial and high-risk syndromes from primary melanoma and multiple primary melanomas<br>• Knowledge of prevention techniques using modifiable risk factors |
| Skills | • Ability to perform patient history, physical examination with lymph node and skin examination<br>• Ability to perform lumbar puncture in cases of suspected carcinomatous meningitis and to either refer to the appropriate specialist or perform skin biopsies<br>• Ability to actively contribute to multidisciplinary discussions establishing the diagnosis, stage and treatment plans<br>• Ability to present a concise and coherent summary of the patient's condition and history of care<br>• Ability to identify and manage conditions (stage, performance status, comorbid conditions, prior therapies, family history) that will influence therapeutic and care strategies<br>• Ability to identify emergent/urgent conditions such as brain metastases, carcinomatous meningitis and bowel obstruction and to develop treatment approaches<br>• Ability to discuss options for therapy by stage and to discuss with patients and their family the complications of targeted therapy, immunotherapy, radiation therapy and surgery as well as the role of investigational agents<br>• Ability to rapidly identify specific immuno-oncology toxicities and to apply appropriate management guidelines<br>• Ability to use molecular and immunohistochemical markers in helping with therapy strategies<br>• Ability to address risk and benefits with the patient<br>• Ability to evaluate treatment outcomes, toxicity and the management of these complications, including decision to change or end therapy<br>• Ability to address family issues and prevention strategies<br>• Ability to use request consultation services and co-ordination of care pathways relevant to the practice environment |

## References


1. Balch CM, Gershenwald JE, Soong SJ, *et al*. Final version of 2009 AJCC melanoma staging and classification. *J Clin Oncol* 2009;27:6199–206.
2. Barnhill RL, Piepkorn MW, Busam KJ. *Pathology of melanocytic Nevi and melanoma*. 3rd edn. Heidelberg: Springer, 2014.
3. Ernstoff MS. Molecular basis for treating cutaneous melanoma. In: Mendelson J, Gray JW, Howley PM, *et al*. eds. *The molecular basis of cancer*. Philadelphia: Elsevier Saunders, 2015.
4. Gyorki DE, Callahan M, Wolchok JD, *et al*. The delicate balance of melanoma immunotherapy. *Clin Trans Immunol* 2013;2:e5. doi:10.1038/cti.2013.5
5. NCCN guidelines for treatment of cancer by site (melanoma). http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#melanoma
6. Sondak VK, Wong SL, Gershenwald JE, *et al*. Evidence-based clinical practice guidelines on the use of sentinel lymph node biopsy in melanoma. *Am Soc Clin Oncol Educ Book* 2013. doi: 10.1200/EdBook_AM.2013.33.e320

*4.5.8.b Basal cell and squamous cell cancers of the skin*

**Rainer Kunstfeld**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with basal cell cancer (BCC) and squamous cell cancer (SCC) of the skin, including secondary prevention |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of skin cancer, ie, non-melanoma skin cancers versus melanoma, hereditary versus spontaneous forms, for the selection of the appropriate treatment strategies<br>• Awareness of the existence of SCC at non-skin sites, eg, lung, prostate, thyroid etc<br>• Awareness of the existence of different prognostic factors<br>• Awareness of the diagnostic work-up using microscopy and biopsy as well as that the pathological appearance of SCC varies with the depth of the biopsy<br>• Appreciation of the importance of the differences in treatment approaches in localised versus metastatic disease and in hereditary versus spontaneous disease |
| Knowledge | • Understanding of the causes of BCC, actinic keratosis (AK) and SCC, ie, primarily sun exposure, but also long-term complications of cancer therapy or human papilloma virus (HPV) infection (SCC only)<br>• Understanding of the long latency period of up to 30 years between sun exposure and occurrence of skin cancer lesions<br>• Familiarity with the implications of the different biological and pathological subtypes of skin cancer for the selection of appropriate treatment strategies<br>• Familiarity with the risk assessment work-up of prognostic factors, especially the TNM staging system for BCC and SCC and their implications for treatment choice<br>• Familiarity with the indications and value of surgery, cryotherapy, chemotherapy, photodynamic therapy, radiotherapy, laser therapy, creams and lotions, targeted agents, but also with their limitations (eg, criteria of inoperability, aspects pertaining to metastatic disease, side effect profiles)<br>• Understanding of the role of targeted agents in the management of patients with advanced disease, including genetic variants determining mechanisms of resistance towards targeted therapies<br>• Understanding of disease dynamics and associated treatment strategies in hereditary disease (Gorlin–Goltz syndrome)<br>• Familiarity with the conditions in which the various surgical and non-surgical treatments are performed |
| Skills | • Ability to contribute actively to a variety of BCC, SCC and AK clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in patients with non-melanoma skin cancer<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use<br>• Ability to manage side effects of various chemotherapeutic and targeted agents<br>• Ability to discuss with patients the special considerations in the management of hereditary disease (Gorlin–Goltz syndrome), especially with regard to speed of recurrence, the large number of lesions and cosmetic sequelae<br>• Ability to discuss prevention strategies with patients, especially sun protection |

## References


1. Behavioral counseling to prevent skin cancer—systematic evidence review to update the 2003 U.S. Preventive Services Task Force Recommendation. http://www.ncbi.nlm.nih.gov/books/NBK53508/
2. Genetics of Skin Cancer (PDQ®)—Health Professional Version. http://www.ncbi.nlm.nih.gov/books/NBK65895/
3. Guidelines of the British Association of Dermatologists (BAD). http://www.bad.org.uk/healthcare-professionals/clinical-standards/clinical-guidelines?sitesectionid=678&group=00016001000200020001&range=BAD%20guidelines&l=0
4. Guidelines of the European Dermatology Forum (EDF). http://www.euroderm.org/edf/index.php/edf-guidelines/category/5-guidelines-miscellaneous
5. Guidelines of the US National Comprehensive Cancer Network (NCCN). http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#site
6. Skin Cancer Screening (PDQ®)—Health Professional Version. http://www.ncbi.nlm.nih.gov/books/NBK65861/
7. Skin Cancer Treatment (PDQ®)—Health Professional Version. http://www.ncbi.nlm.nih.gov/books/NBK65928/

## 4.5.9 Endocrine tumours

### *4.5.9.a Thyroid cancer*

**Martin Schlumberger**

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| Objectives | • To understand the cellular origin, natural history, diagnosis and treatment modalities and outcome of patients with thyroid cancer<br>• To be able to perform specialist assessment, treatment and counselling of patients with thyroid cancer |
| Awareness | • Awareness of the existence of different biological and pathological subtypes of thyroid cancer<br>• Awareness of the existence of different prognostic classifications for the risk of thyroid cancer death and recurrence that are used for the selection of appropriate treatment strategies<br>• Recognition of the availability of different diagnostic procedures, including fine needle aspiration (FNA) and neck ultrasonography<br>• Appreciation of the importance of the multimodality approach to treat patients with thyroid cancer<br>• Recognition of the use of surgery and radioiodine in patients with localised disease<br>• Recognition of the use of radioiodine and kinase inhibitors in patients with advanced disease |
| Knowledge | • Understanding of the tissue of origin and pathological classification of thyroid cancers<br>• Knowledge of the epidemiology of thyroid cancers, and its relation to screening procedures, environmental factors and genetic factors<br>• Familiarity with most important prognosticators for cancer-related death and for recurrence (TNM stage, histological diagnosis and grade)<br>• Knowledge of the diagnostic management and biochemical thyroid function profile of patients with thyroid cancer<br>• Knowledge of the indications for the use of imaging modalities for staging<br>• Familiarity with the indications for surgery and for its extent, for radioactive iodine ablation (indications, modalities and radioprotection), and external beam radiotherapy in the management of localised disease<br>• Knowledge of the indications for focal treatment modalities, radioiodine treatment, and chemotherapy and novel targeted agents for locally advanced and metastatic thyroid cancers |
| Skills | • Ability to contribute actively to a variety of thyroid cancer clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in patients with thyroid cancer, including different subtypes<br>• Ability to contribute to discussions on general management strategies in patients with thyroid cancer, including different subtypes in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe kinase inhibitors and to prevent/manage side effects of kinase inhibitors |

#### References


1. Haugen BR, Alexander EK, Bible KC, *et al.* 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer. *Thyroid* 2016;26:1–133.
2. Wells SA Jr, Asa SL, Dralle H, *et al.* American Thyroid Association Guidelines Task Force on medullary thyroid carcinoma. Revised American Thyroid Association guidelines for the management of medullary thyroid carcinoma. *Thyroid* 2015;25:567–610.


### *4.5.9.b Neuroendocrine neoplasms*

**Kjell Öberg**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with various types of neuroendocrine neoplasms (NENs) |
| Awareness | • Awareness of the existence of different biological and pathological subtypes, NENs with various clinical presentations and prognoses<br>• Recognition of the availability of different diagnostic procedures, including histopathology, biomarkers, molecular imaging, radiology and endoscopies<br>• Awareness of the WHO 2010 Classification System and the European Neuroendocrine Tumour Society (ENETS) TNM Staging System for NENs<br>• Awareness of the existence of different prognostic factors<br>• Appreciation of the importance of the multimodality approach to the treatment of NENs |

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| Knowledge | • Familiarity with the indications for different diagnostic tools such as histopathology, biomarkers, molecular imaging, radiology and endoscopies<br>• Knowledge of the implications of the different pathological and biological subtypes of NENs (functioning vs non-functioning tumours) with regard to primary tumour localisation for the selection of appropriate treatment strategies<br>• Familiarity with inherited forms of NENs (multiple neuroendocrine neoplasia MEN-1, MEN-2, Von Hippel-Lindau, tuberous sclerosis)<br>• Familiarity with the risk assessment work-up of prognostic factors, especially the grading and staging system for NENs<br>• Familiarity with the indications and value of surgery, radiation therapy, chemotherapy, hormonal agents, biological agents and targeted agents<br>• Familiarity with the role of somatostatin analogues for antitumour control and symptom control<br>• Understanding of the role of chemotherapy versus targeted therapy in the treatment of pancreatic NENs<br>• Understanding of the role of peptide receptor radiotherapy (PRRT) in relation to other treatment modalities for NENs<br>• Understanding of the side effects developing during the different therapies for NENs<br>• Familiarity with hormone-related emergencies during treatment of NENs |
| Skills | • Ability to contribute actively to the management of various subtypes of NENs<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in NEN patients, including different subtypes<br>• Ability to contribute to discussions on general management strategies in the multidisciplinary team and tumour board<br>• Ability to prescribe various therapies, including cytotoxic agents as well as targeted agents<br>• Ability to correctly allocate patients with NENs to PRRT<br>• Ability to determine therapy according to the WHO Grading System as well as ENETS TNM Staging System and primary tumour localisation<br>• Ability to manage side effects of various chemotherapeutic, hormonal agents, biological agents and targeted agents as well as PRRT<br>• Ability to determine the indications for local–regional treatment of liver metastases with embolisation/radioembolisation |

## References


1. Bosman FT, Carneiro F, Hruban RH, *et al*. eds. *WHO classification of tumours of the digestive system*. 4th edn. Lyon CEDEX 08: IARC Press, 2010.
2. Caplin ME, Pavel M, Cwikla JB, *et al*. Lanreotide in metastatic enteropancreatic neuroendocrine tumors. *N Engl J Med* 2014;371:224–33.
3. Kwekkeboom DJ, de Herder WW, Krenning EP. Somatostatin receptor-targeted radionuclide therapy in patients with gastroenteropancreatic neuroendocrine tumors. *Endocrinol Metab Clin North Am* 2011;40:173–85, ix.
4. Oberg K, Knigge U, Kwekkeboom D, *et al*. Neuroendocrine gastro-entero-pancreatic tumors: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2012;23(Suppl 7): vii124–30.
5. Raymond E, Dahan L, Raoul JL, *et al*. Sunitinib malate for the treatment of pancreatic neuroendocrine tumors. *N Engl J Med* 2011;364:501–13.
6. Rindi G, Kloppel G, Alhman H, *et al*. TNM staging of foregut (neuro) endocrine tumors: a consensus proposal including a grading system. *Virchows Arch* 2006;449:395–401.
7. Rindi G, Kloppel G, Couvelard A, *et al*. TNM staging of midgut and hindgut (neuro) endocrine tumors: a consensus proposal including a grading system. *Virchows Arch* 2007;451:757–62.
8. Salazar R, Wiedenmann B, Rindi G, *et al*. ENETS 2011 consensus guidelines for the management of patients with digestive neuroendocrine tumors: an update. *Neuroendocrinology* 2012;95:71–3.
9. Yao JC, Shah MH, Ito T, *et al*. Everolimus for advanced pancreatic neuroendocrine tumors. *N Engl J Med* 2011;364:514–23.


### 4.5.10 Central nervous system malignancies

**Jan Buckner**
**Roger Stupp**

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| Objectives | • To be able to perform specialist assessment, initial management of symptoms, diagnostic workup, treatment and counselling of patients with the most common primary malignant brain tumours and brain metastases |
| Awareness | • Awareness of the WHO classification of brain tumours, including key molecular diagnostic definitions<br>• Awareness of the appropriate usage of diagnostic modalities<br>• Awareness of key prognostic factors for most common tumours<br>• Appreciation of the role of surgery, radiation therapy, other local modalities and systemic therapies for the treatment of primary brain tumours |

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| | • Awareness of the appropriate symptomatic and supportive care interventions, including the engagement of additional staff as appropriate, including physiatrists, social workers, home health nurses, palliative care and hospice staff |
| Knowledge | • Familiarity with the capabilities and limitations of computed tomography (CT) and magnetic resonance imaging (MRI) in the diagnosis of primary and metastatic brain tumours, especially the phenomena of pseudoprogression and pseudoregression<br>• Familiarity with the prognostic implications of tumour grade and molecular markers, especially 1p/19q codeletion, isocitrate dehydrogenase (IDH) mutations and 06-methylguanine-DNA methyltransferase (MGMT) promotor methylation, and their potential impact on the management of patients with primary brain tumours<br>• Familiarity with the implications of the different pathological and molecular subtypes of gliomas for the selection of appropriate treatment strategies<br>• Knowledge of the appropriate use of surgery, radiation therapy, chemotherapy, antiangiogenic therapy and tumour-treating fields for patients with newly diagnosed and recurrent gliomas, and tumours metastatic to brain<br>• Knowledge of the management of tumours metastatic to brain and central nervous system<br>• Knowledge of potential complications of all therapeutic modalities in the treatment of primary and metastatic brain tumours and the management of those complications<br>• Familiarity with the management of increased intracranial pressure, seizures, fatigue and cognitive impairment |
| Skills | • Ability to obtain a relevant clinical history and general and neurological examination for patients with primary and metastatic brain tumours<br>• Ability to interpret fundamental elements on CT and MR images<br>• Ability to draw pertinent conclusions from pathology reports<br>• Ability to present relevant components of history, physical examination, imaging and pathology results—indications for additional molecular characterisation, as appropriate<br>• Ability to contribute to ongoing assessments of patients with primary and metastatic brain tumours<br>• Ability to develop and oversee treatment plans for chemotherapy, antiangiogenic therapy and other systemic therapies for patients with primary and metastatic brain tumours<br>• Ability to work effectively with a multidisciplinary and multimodality treatment team, including neurosurgeons, neurologists, radiation oncologists, neuropsychologists and physiatrists to develop multimodality treatment plans<br>• Ability to request appropriate referrals to neurosurgeons, radiation oncologists and other specialists as appropriate<br>• Ability to manage toxicities emerging from all treatment modalities<br>• Ability to manage symptoms related to the primary and metastatic brain tumours, including increased intracranial pressure, seizures, deep venous thromboses and pulmonary emboli |

## References


1. Armstrong TS, Grant R, Gilbert MR, *et al*. Epilepsy in glioma patients: mechanisms, management, and impact of anticonvulsant therapy. *Neuro Oncol* 2016;18:779–89.
2. Brastianos PK, Batchelor TT. Primary central nervous system lymphoma: overview of current treatment strategies. *Hematol Oncol Clin N Am* 2012;26:897–916.
3. Brat DJ, Verhaak RG, Aldape KD, *et al*. Cancer Genome Atlas Research Network. Comprehensive, integrative genomic analysis of diffuse lower-grade gliomas. *N Engl J Med* 2015;372:2481–98.
4. Buckner JC, Pugh SL, Shaw EG, *et al*. Phase III study of radiation therapy (RT) with or without procarbazine, CCNU, and vincristine (PCV) in low-grade glioma: RTOG 9802 with Alliance, ECOG, and SWOG. *J Clin Oncol* 2014;32:5s (suppl; abstr 2000).
5. Cairncross JG, Wang M, Jenkins RB, *et al*. Benefit from procarbazine, lomustine, and vincristine in oligodendroglial tumors is associated with mutation of IDH. *J Clin Oncol* 2014;32:783–90.
6. Eckel-Passow JE, Lachance DH, Molinaro AM, *et al*. Glioma groups based on 1p/19q, IDH, and TERT promoter mutations in tumors. *N Engl J Med* 2015;372:2499–508.
7. Hegi ME, Diserens AC, Gorlia T, *et al*. MGMT gene silencing and benefit from temozolomide in glioblastoma. *N Engl J Med* 2005;352:997–1003.
8. Killela PJ, Reitman ZJ, Jiao Y, *et al*. TERT promoter mutations occur frequently in gliomas and a subset of tumors derived from cells with low rates of self-renewal. *Proc Natl Acad Sci USA* 2013;110:6021–6.
9. Korfel A, Schlegel U. Diagnosis and treatment of primary CNS lymphoma. *Nat Revi Neurol* 2013;9:317–27.
10. Preusser M, de Ribaupierre S, Wöhrer A, *et al*. Current concepts and management of glioblastoma. *Ann Neurol* 2011;70:9–21.
11. Rossetti AO, Stupp R. Epilepsy in brain tumor patients. *Curr Opin Neurol* 2010;23:603–9.
12. Sanai N, Chang S, Berger MS. Low-grade gliomas in adults. *J Neurosurg* 2011;115:948–65.
13. Stummer W, Pichlmeier U, Meinel T, *et al*. Fluorescence-guided surgery with 5-aminolevulinic acid for resection of malignant glioma: a randomised controlled multicentre phase III trial. *Lancet Oncol* 2006;7:392–401.
14. Stupp R, Mason WP, van den Bent MJ, *et al*. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. *N Engl J Med* 2005;352:987–96.
15. van Breemen MS, Wilms EB, Vecht CJ. Epilepsy in patients with brain tumours: epidemiology, mechanisms, and management. *Lancet Neurol* 2007;6:421–30.
16. van den Bent MJ, Brandes AA, Taphoorn MJ, *et al*. Adjuvant procarbazine, lomustine, and vincristine chemotherapy in newly diagnosed anaplastic oligodendroglioma: long-term follow-up of EORTC Brain Tumor Group Study 26951. *J Clin Oncol* 2013;31:344–50.
17. Weller M, Stupp R, Reifenberger G, *et al*. MGMT promoter methylation in malignant gliomas: ready for personalized medicine? *Nat Rev Neurol* 2010;6:39–51.
18. Weller M, Pfister SM, Wick W, *et al*. Molecular neuro-oncology in clinical practice: a new horizon. *Lancet Oncol* 2013;14:e370–9.
19. Weller M, Wick W, Aldape K, *et al*. Glioma. *Nat Rev Disease Primers* 2015. Published Online First:16 July 2015. doi:10.1038/nrdp.2015.17. http://www.nature.com/articles/nrdp201517
20. Wen PY, Kesari S. Malignant gliomas in adults. *N Engl J Med* 2008;359:492–507.
21. Yan H, Parsons DW, Jin G, *et al*. IDH1 and IDH2 mutations in gliomas. *N Engl J Med* 2009;360:765–73.

## 4.5.11 Carcinoma of unknown primary site

**Nicholas Pavlidis**

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| Objectives | • To be able to recognise carcinoma of unknown primary site (CUP) subsets (favourable vs unfavourable) and to treat them accordingly |
| Awareness | • Awareness that CUP is not a rare malignant disorder; it accounts for 3–5% of all human cancers and is the fourth most common cause of cancer death<br>• Awareness that CUP incidence is declining due to improved diagnostic approaches<br>• Awareness of the diagnostic methods to identify the primary sites, including pathology/molecular pathology, imaging and endoscopies<br>• Awareness that CUP is not a single disease<br>• Awareness that CUP is divided to favourable (20%) and unfavourable subsets (80%)<br>• Appreciation that the most common histological type is well to poorly differentiated adenocarcinoma, followed by squamous cell and undifferentiated neoplasms<br>• Awareness that gene profiling technology identifies 90% of primary tumours |
| Knowledge | • Knowledge of how to interpret immunohistochemistry (IHC)<br>• Knowledge that the routine use of serum epithelial tumour markers has no diagnostic, prognostic or predictive value<br>• Knowledge that positron emission tomography (PET) scan technology has higher sensitivity to detect mainly hidden primary head and neck or lung cancers<br>• Understanding that endoscopies should be ordered only in patients with relevant symptoms or signs<br>• Knowledge that favourable CUP subsets should be treated with curative intent, and unfavourable subsets with palliative intent<br>• Knowledge that data from phase III prospective randomised studies, justifying the use of gene profiling technology for treating CUP patients with specifically directed treatment, are not available yet<br>• Knowledge that data on the use of targeted treatments in CUP patients are still anecdotal |
| Skills | • Ability to suspect, diagnose and classify CUP patients<br>• Ability to recognise and treat favourable subsets similarly to the relevant primary tumours, ie, the subset of axillary lymphadenopathy as breast cancer, the subset of serous peritoneal adenocarcinoma as ovarian cancer or the subset of squamous cell carcinoma of the cervical nodes as head and neck cancer<br>• Ability to request gene profiling testing for the right patient, ie, young patients, patients with poorly differentiated or undifferentiated carcinomas, potentially chemo-sensitive tumours, etc<br>• Ability to recognise that unfavourable CUP patients carry, in general, an aggressive course with poor prognosis<br>• Ability to contribute in multidisciplinary teams where medical oncologists, radiation oncologists, surgeons, pathologists, radiologists, special nurses and psychologists are participating |

## References


1. Economopoulou P, Mountzios G, Pavlidis N, *et al*. Cancer of unknown primary origin in the genomic era: elucidating the dark box of cancer. *Cancer Treat Rev* 2015;41:598–604.
2. Fizazi K, Greco FA, Pavlidis N, *et al*. ESMO Guidelines Committee. Cancer of unknown primary site: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2015;(Suppl 5):v133–8.
3. Kamposioras K, Pentheroudakis G, *et al*. Exploring the biology of cancer of unknown primary: breakthroughs and drawbacks. *Eur J Clin Invest* 2013;43:491–500.
4. Pavlidis N, Pentheroudakis G. Cancer of unknown primary site. *Lancet* 2012;379:1428–35.
5. Pavlidis N, Petrakis D, Golfinopoulos V, *et al*. Long-term survivors among patients with cancer of unknown primary. *Crit Rev Oncol Hematol* 2012;84:85–92.
6. Petrakis D, Pentheroudakis G, Voulgaris E, *et al*. Prognostication in cancer of unknown primary (CUP): development of a prognostic algorithm in 311 cases and review of the literature. *Cancer Treat Rev* 2013;39:701–8.

4.5.12 Haematological malignancies

*4.5.12.a Leukaemias (including acute and chronic leukaemias of lymphoid and myeloid lineage)*

**Martin F Fey**

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| Objectives | • To be able to perform specialist assessment, diagnostics, treatment and counselling of patients with leukaemia<br>• To understand the molecular and cellular pathology of leukaemia and its relevance for the clinical management of patients |
| Awareness | • Recognition of the importance of a multimodality approach to treat patients with leukaemia, including haematology, medical oncology, transfusion medicine and infectious disease specialists, transplant centres, and specialised nursing care<br>• Awareness of the different morphological, cytogenetic and molecular entities or subtypes of leukaemia as defined by the WHO classification for the assessment of prognosis and the selection of appropriate treatment<br>• Appreciation of the relevant diagnostic procedures, including quality control measures<br>• Awareness of risk factors for specific types of leukaemia<br>• Recognition of the psychosocial implications of a diagnosis of leukaemia and its treatment<br>• Awareness of specific issues on the care of patients that underwent allogeneic stem cell transplantation, including identification and management of graft-versus-host disease and infections in immunosuppressed hosts |
| Knowledge | • Familiarity with the indications and the techniques of different diagnostic tools available for the identification of leukaemias (including examination of peripheral blood film morphology, bone marrow aspirates and biopsies, immunophenotyping, cytogenetics, and karyotyping as well as molecular diagnostic techniques—the latter comprising polymerase chain reaction (PCR) or reverse transcriptase (RT)-PCR, fluorescence in situ hybridisation (FISH) and next-generation sequencing (NGS) for the molecular detection of specific chromosomal abnormalities as well as somatic mutations)<br>• Familiarity with the techniques to identify potential human leucocyte antigen (HLA)-compatible stem cell or bone marrow donors (siblings and unrelated donors)<br>• Familiarity with the identification and the treatment of comorbidities in patients with leukaemia, notably infectious disease complications<br>• Knowledge about the indications for chemotherapy, targeted therapy (notably with tyrosine kinase inhibitors and monoclonal antibodies) and stem cell transplantation (allogeneic and autologous), the side effects of these treatments and their therapeutic results<br>• Familiarity with the principles of transfusion medicine, adequate red cell and platelet support, and leukapheresis (specifically to treat hyperleukocytosis syndrome, and to collect haematopoietic stem cells from patients in remission or from selected stem cell donors)<br>• Familiarity with the diagnosis and the treatment of infections, notably during periods of severe treatment-induced bone marrow failure<br>• Knowledge of disease-associated syndromes such as autoimmune cytopenias (eg, autoimmune haemolytic anaemia in chronic lymphocytic leukaemia (CLL))<br>• Familiarity with the complications that derive from leukaemia progression and those that are treatment-associated in the context of being familiar with supportive and palliative care strategies |
| Skills | • Ability to perform patient history and physical examination<br>• Ability to perform bone marrow aspirates and biopsies as well as lumbar punctures to sample cerebrospinal fluid for cytology and other diagnostic techniques<br>• Ability to contribute actively to establish a diagnosis of leukaemia with morphological, immunological, cytogenetic and molecular diagnostic techniques, as well as imaging where needed<br>• Ability to identify and manage conditions (such as performance status and the patient's clinical condition, concomitant disease, previous treatments) that are important for considering when to start and when to stop treatment or to switch to another therapeutic option<br>• Ability to contribute actively in presenting patient cases<br>• Ability to identify typical emergencies in leukaemic patients (including hyperleukocytosis syndromes, bleeding due to coagulopathy and/or thrombocytopenia notably in acute promyelocytic leukaemia, septicaemia in patients with neutropenia), and to organise appropriate treatment rapidly |

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- Ability to discuss critically the treatment options/recommendations at various stages of disease, ie, at presentation, in patients with disease remission after induction, in leukaemia relapse and in end-of-life care decisions
- Ability to determine therapy according to molecular marker status where appropriate
- Ability to prescribe various chemotherapeutic or targeted/immunotherapeutic agents (tyrosine kinase inhibitors and monoclonal antibodies) as well as intrathecal therapy where needed
- Ability to manage side effects of various chemotherapeutic, immunotherapeutic or targeted agents
- Ability to provide appropriate supportive care, including red cell and platelet transfusions, antibiotic and antifungal prophylaxis or treatment, and immunoglobulin substitution for hypogammaglobinaemia-associated infections where needed

## References


1. Coombs CC, Tallman MS, Levine RL. Molecular therapy for acute myeloid leukaemia. *Nat Rev Clin Oncol* 2016;13:305–18.
2. Cramer P, Langerbeins P, Eichhorst B, *et al*. Advances in first-line treatment of chronic lymphocytic leukemia: current recommendations on management and first-line treatment by the German CLL Study Group (GCLLSG). *Eur J Haematol* 2016;96:9–18.
3. DeVita VT Jr, Lawrence TS, Rosenberg SA, eds. *Section 13 "Leukemias and plasma cell tumours," DeVita, Hellman, and Rosenberg's cancer: principles & practice of oncology*. 9th edn. Philadelphia: Lippincott Williams & Wilkins, 2011.
4. Dombret H, Gardin C. An update of current treatments for adult acute myeloid leukemia. *Blood* 2016;127:53–61.
5. Grimwade D, Ivey A, Huntly BJ. Molecular landscape of acute myeloid leukemia in younger adults and its clinical relevance. *Blood* 2016;127:29–41.
6. Hallek M. Chronic lymphocytic leukemia: 2015 update on diagnosis, risk stratification, and treatment. *Am J Hematol* 2015;90:446–60.
7. Jabbour E, O'Brien S, Konopleva M, *et al*. New insights into the pathophysiology and therapy of adult acute lymphoblastic leukemia. *Cancer* 2015;121:2517–228.
8. Larson RA. Is there a best TKI for chronic phase CML? *Blood* 2015;126:2370–5.
9. Wiestner A. The role of B-cell receptor inhibitors in the treatment of patients with chronic lymphocytic leukemia. *Haematologica* 2015;100:1495–507.


*4.5.12.b Lymphomas*

## 4.5.12.b.1 Hodgkin's lymphoma

**Merry Jennifer Markham**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with Hodgkin's lymphoma (HL) |
| Awareness | • Awareness of the existence of different pathological subtypes of HL<br>• Appreciation of the availability of different diagnostic approaches<br>• Awareness of the existence of different prognostic factors in HL<br>• Appreciation of the importance of the multimodality approach to treat patients with HL depending on stage<br>• Appreciation of the principles of the multimodality approach with early-stage or bulky disease<br>• Appreciation of the importance of late effects that may affect patients with HL depending on treatment type |
| Knowledge | • Familiarity with the characteristics of the different pathological subtypes of HL, including classical HL and nodular lymphocyte-predominant HL<br>• Familiarity with the indications for, expectations from and limitations of the different diagnostic approaches available for the identification of HL, including excisional biopsy versus core needle biopsy and immunophenotypic profile<br>• Familiarity with the staging system for HL<br>• Understanding of the role of the prognostic factors which guide treatment selection in HL<br>• Understanding of the role of positron emission tomography (PET) imaging in the staging and restaging of HL and its limitations<br>• Familiarity with the indications for and the value of radiation therapy, chemotherapy, supportive and palliative care, and survivorship care in HL<br>• Understanding of the role of high-dose chemotherapy and/or bone marrow/stem cell transplantation in relapsed and refractory HL<br>• Understanding of the role of monoclonal antibody therapy in the relapsed/refractory setting<br>• Familiarity with the treatment approach of HL during pregnancy, in older or frail patients, and in patients with human immunodeficiency virus (HIV)<br>• Understanding of the early-stage and advanced stage setting as well as the bulky disease particularities |

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| Skills | • Ability to contribute actively to a variety of HL clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in HL patients<br>• Ability to use effectively the prognostic factors in order to guide treatment selection in HL<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and when to incorporate radiation therapy<br>• Ability to prescribe various chemotherapeutic regimens<br>• Ability to manage side effects of various chemotherapeutic agents<br>• Ability to discuss survivorship care and the risk for late treatment effects with patients |

## References


1. Armitage JO. Early-stage Hodgkin's lymphoma. *N Engl J Med* 2010;363:653–62.
2. Johnson P, McKenzie H. How I treat advanced classical Hodgkin lymphoma. *Blood* 2015;125:1717–23.
3. NCCN clinical practice guidelines in oncology (NCCN guidelines). Hodgkin lymphoma (Version 2.2015). http://www.nccn.org/professionals/physician_gls/pdf/hodgkins.pdf


### 4.5.12.b.2 Non-Hodgkin's lymphoma

**Merry Jennifer Markham**
**Bertrand Coiffier**

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| Objectives | • To be able to perform specialist assessment, treatment, and counselling of patients with the various subtypes of non-Hodgkin's lymphoma (NHL) |
| Awareness | • Awareness of the existence of the enormous heterogeneity of NHL subtypes, including the clinical classification into indolent, aggressive or highly aggressive lymphomas<br>• Awareness of the existence of the enormous heterogeneity of clinical presentation, with at least 40% of cases without peripheral lymph nodes and 20% of cases with only extranodal location<br>• Awareness of the existence of the WHO pathological classification of the various NHL subtypes and the European Organisation for Research and Treatment of Cancer (EORTC)/WHO classification of cutaneous T-cell lymphoma (CTCL) and its subtypes<br>• Awareness of the existence of different prognostic factors<br>• Familiarity with prognostic scoring systems in the various subtypes of NHL<br>• Recognition of when treatment is indicated and when observation is appropriate<br>• Recognition that the goal of treatment may range from cure for more aggressive histologies to palliation or control of disease for more indolent histologies<br>• Awareness of the association of NHL with human immunodeficiency virus (HIV), immunosuppression and hepatitis C virus (HCV) |
| Knowledge | • Familiarity with the characteristics of the different pathological subtypes of NHL as classified by the WHO classification<br>• Knowledge of the diagnostic criteria of the EORTC/WHO classification in diagnosing CTCL and its subtypes<br>• Familiarity with the indications for, expectations from and limitations of the different diagnostic approaches available for the identification and staging of NHL<br>• Understanding that fine needle aspiration (FNA) is not sufficient for making a diagnosis of NHL; biopsy is mandatory<br>• Familiarity with immunohistochemistry (IHC), fluorescence in situ hybridisation (FISH) analysis and genetic abnormalities<br>• Familiarity with the Ann Arbor Staging system for NHL, the International Prognostic Index (IPI) or other indexes, and with the staging system for mycosis fungoides (MF), Sézary syndrome (SS) and non-MF/non-SS CTCL<br>• Understanding of the role of the prognostic scoring systems in NHL<br>• Familiarity with important prognostic parameters such as MYC or BCL-2 rearrangements<br>• Understanding of the role and the limitations of positron emission tomography (PET) imaging in the staging and restaging of various types of NHL<br>• Familiarity with the indications for and the value of chemotherapy, chemo-immunotherapy, monoclonal antibodies, targeted therapy, radiation therapy, supportive and palliative care, and survivorship care in NHL<br>• Understanding that cure may be reached only with the first-line therapy |

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| | • Understanding of the role of high-dose chemotherapy and/or bone marrow/stem cell transplantation in relapsed and refractory NHL<br>• Understanding that indolent lymphomas may relapse as aggressive lymphoma (transformation)<br>• Familiarity with the treatment approach of NHL during pregnancy, in older or frail patients, and in patients with HIV, hepatitis B virus (HBV) or HCV infection<br>• Understanding of the challenges and unique clinical properties of follicular lymphoma, marginal zone lymphomas, mantle cell lymphoma, diffuse large B-cell lymphoma, lymphoblastic lymphoma, Burkitt lymphoma and T-cell lymphomas, and the role for intensive treatment of the most aggressive forms<br>• Understanding that skin-directed therapies are the primary treatment for localised or early-stage CTCL, that systemic therapies are used in advanced stage disease and that chemotherapy has a role in only a minority of cases of more aggressive, advanced disease<br>• Understanding of the early-stage and advanced stage setting as well as the bulky disease particularities of the various subtypes of NHL |
| Skills | • Ability to contribute actively to a variety of NHL clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in NHL patients<br>• Ability to use effectively the prognostic scoring systems in NHL<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on when to initiate treatment versus when to observe, which treatment to use, and when to incorporate radiation therapy<br>• Ability to prescribe various chemotherapeutic regimens, monoclonal antibodies and targeted agents<br>• Ability to manage side effects of various chemo-immunotherapeutic agents<br>• Ability to discuss survivorship care and the risk for late treatment effects with patients |

## References


1. Campo E, Rule S. Mantle cell lymphoma: evolving management strategies. *Blood* 2015;125:48–55.
2. Casulo C, Burack WR, Friedberg JW. Transformed follicular non-Hodgkin's lymphoma. *Blood* 2015;125:40–47.
3. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines). Non-Hodgkin's Lymphoma (Version 1.2016). http://www.nccn.org/professionals/physician_gls/pdf/nhl.pdf
4. Roschewski M, Staudt LM, Wilson WH. Diffuse large B-cell lymphoma-treatment approaches in the molecular era. *Nat Rev Clin Oncol* 2014;11:12–23.
5. Sehn LH, Gascoyne RD. Diffuse large B-cell lymphoma: optimizing outcome in the context of clinical and biologic heterogeneity. *Blood* 2015;125:22–32.
6. Swerdlow SH, Campo E, Harris NL, *et al*. eds. *World Health Organization classification of tumours of haematopoietic and lymphoid tissues*. Lyon: IARC Press, 2008.
7. Wilcox RA. Cutaneous T-cell lymphoma: 2014 Update on diagnosis, risk-stratification, and management. *Am J Hematol* 2014;89:837–51.


### *4.5.12.c Plasma cell dyscrasias*

**Antonio Palumbo**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with plasma cell dyscrasias |
| Awareness | • Awareness of the existence of different biological and pathological types of plasma cell dyscrasias: monoclonal gammopathy of unknown significance, Waldenström's, macroglobulinaemia, plasmacytoma, multiple myeloma, POEMS (polyneuropathy, organomegaly, endocrinopathy, monoclonal protein, skin changes) and plasma cell leukaemia<br>• Recognition of diagnostic procedures<br>• Awareness of the existence of different prognostic factors<br>• Appreciation of the availability of different drugs and treatments<br>• Awareness of the indications for treatment in each instance<br>• Appreciation of the management of treatment-related side effects |
| Knowledge | • Familiarity with the different types of plasma cell dyscrasias and with the selection of the most appropriate treatment<br>• Familiarity with the diagnostic tools available<br>• Familiarity with the risk assessment work-up of prognostic factors<br>• Familiarity with the indications and the value of radiation therapy, chemotherapy, autologous and allogeneic transplantation, monoclonal antibodies, targeted drugs and supportive and palliative care, but also with their limitations |

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| | • Understanding of the strengths of treatment personalisation opportunities and the importance of offering individualised targeted therapies based on risk stratification, thus considering fluorescence in situ hybridisation (FISH) abnormalities, International Staging System (ISS), age, geriatric assessment etc<br>• Understanding of the complications that derived from disease progression and those that are treatment-associated in the context of being familiar with supportive and palliative care strategies |
| Skills | • Ability to contribute actively to a variety of clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options and recommendations<br>• Ability to perform a history and physical examination in patients with plasma cell dyscrasias, including different subtypes<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use and which sequence to select for the multidisciplinary strategy<br>• Ability to prescribe various chemotherapeutic agents, immunotherapeutic and targeted agents and their potential interactions with radiation therapy where appropriate<br>• Ability to understand conditions (such as performance status, patient clinical condition, concomitant disease(s), previous treatments, geriatric score etc) that are important for considering when to start and to stop treatment or to switch to another option<br>• Ability to determine therapy according to the patient's characteristics, prognosis and medical history<br>• Ability to manage side effects of various agents<br>• Ability to discuss strategies with patients |

## References


1. Brioli A, Melchor L, Walker BA, *et al*. Biology and treatment of myeloma. *Clin Lymphoma Myeloma Leuk* 2014;14(Suppl): S65–70.
2. Dhodapkar MV, Jacobson JL, Gertz MA, *et al*. Prognostic factors and response to fludarabine therapy in patients with Waldenström macroglobulinemia: results of United States intergroup trial (Southwest Oncology Group S9003). *Blood* 2001;98:41–8.
3. Dimopoulos MA, Zomas A, Viniou NA, *et al*. Treatment of Waldenstrom's macroglobulinemia with thalidomide. *J Clin Oncol* 2001;19:3596–601.
4. Ludwig H, Sonneveld P, Davies F, *et al*. European perspective on multiple myeloma treatment strategies in 2014. *Oncologist* 2014;19:829–44.
5. Palumbo A, Anderson K. Multpple myeloma. *N Engl J Med* 2011;364:1046–60.
6. Palumbo A, Bringhen S, Mateos MV, *et al*. Geriatric assessment predicts survival and toxicities in elderly myeloma patients: an International Myeloma Working Group report. *Blood* 2015;125:2068–74.
7. Palumbo A, Avet-Loiseau H, Oliva S, *et al*. Revised international staging system for multiple myeloma: a report from International Myeloma Working Group. *J Clin Oncol* 2015;33:2863–9.
8. Rajkumar SV, Dimopoulos MA, Palumbo A, *et al*. International Myeloma Working Group updated criteria for the diagnosis of multiple myeloma. *Lancet Oncol* 2014;15:e538–48.
9. Rajkumar SV. Myeloma today: disease definitions and treatment advances. *Am J Hematol* 2015. doi: 10.1002/ajh.24236
10. Sanchorawala V, Wright DG, Seldin DC, *et al*. An overview of the use of high-dose melphalan with autologous stem cell transplantation for the treatment of AL amyloidosis. *Bone Marrow Transplant* 2001;28:637–42.
11. Weber D, Treon SP, Emmanouilides C, *et al*. Uniform response criteria in Waldenstrom's macroglobulinemia: consensus panel recommendations from the Second International Workshop on Waldenstrom's Macroglobulinemia. *Semin Oncol* 2003;30:127–31.


### *4.5.12.d Myeloproliferative neoplasms*

**Michael Pfeilstöcker**

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| Objectives | • To be able to diagnose myeloproliferative neoplasms (MPNs), to discriminate them from reactive blood disorders and to perform specialist assessment which includes interpretation of molecular diagnostic data, treatment according to patient and disease-related risk groups and counselling of patients |
| Awareness | • Awareness of MPNs as a differential diagnosis in patients with altered blood counts and/or splenomegaly; frequent subtypes: polycythaemia vera (PV), essential thrombocythaemia (ET), primary myelofibrosis (PMF)<br>• Awareness of rare MPN varieties such as mastocytosis, chronic eosinophilic leukaemia, diseases with abnormalities of platelet-derived growth factor receptor A/B (PDGFRA/B), fibroblast growth factor receptor 1 (FGFR1)<br>• Awareness of the availability of different diagnostic procedures<br>• Recognition of the existence of different prognostic factors<br>• Awareness of the variety of different treatment options |

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| Knowledge | • Understanding of the implications of the different subtypes<br>• Familiarity with diagnostic criteria for main subtypes PV, ET, PMF and diagnostic algorithms<br>• Familiarity with the risk assessment work-up of prognostic factors, specifically risks of thrombosis and bleeding, considering pre-existing conditions (comorbidities, previous risk factors), risk-reduction options<br>• Familiarity with possible progression scenarios—leukaemic transformation/secondary fibrosis<br>• Familiarity with treatment options, supportive care, symptomatic treatment, role of antithrombotic agents, indications, risks and value for cytoreductive therapies, interferon, splenic irradiation, splenectomy, new targeted treatment approaches, role of allogeneic transplant, palliation<br>• Understanding of treatment personalisation opportunities from molecular findings<br>• Understanding how to discriminate complications derived from disease progression from those treatment-related |
| Skills | • Ability to contribute actively to the work-up of patients with suspected MPNs, that includes performing bone marrow aspiration and biopsies and ordering the necessary work-up of the material collected and interpretation of data<br>• Ability to contribute actively in case presentations and to discuss critically treatment options<br>• Ability to perform history and physical examination in MPN patients of different subtypes<br>• Ability to correctly assess the significance of Janus kinase 2 (JAK2) mutations, of smoking cessation and of phlebotomy for PV as an example<br>• Ability to contribute to discussions on general management strategies<br>• Ability to recognise disease-specific conditions that are important for considering when to start and to stop treatment, which treatment option to choose and when to switch<br>• Ability to recognise patient-specific conditions/comorbidities that are important to choose between treatment options<br>• Ability to determine therapy according to pathology findings and molecular marker status<br>• Ability to consider MPNs as chronic disorders with implications for long-term follow-up<br>• Ability to manage side effects of treatment |

## References


1. Barbui T, Barosi G, Birgegard G, *et al*. European LeukemiaNet. Philadelphia-negative classical myeloproliferative neoplasms: critical concepts and management recommendations from European LeukemiaNet. *J Clin Oncol* 2011;29:761–70.
2. Vannucchi AM, Barbui T, Cervantes F, *et al*. Philadelphia chromosome-negative chronic myeloproliferative neoplasms: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2015;26(Suppl 5):v85–99.
3. Vardiman JW, Thiele J, Arber DA, *et al*. The 2008 revision of the World Health Organization (WHO) classification of myeloid neoplasms and acute leukemia: rationale and important changes. *Blood* 2009;114:937–51.


### 4.6 Rare cancers

**Paolo Casali**

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| Objectives | • To understand the collective size and significance of rare cancer cases in the practice of medical oncology and to be aware of which main groups of cancers are rare<br>• To understand the main specific issues posed by rare cancers and the gross organisational and methodological solutions to cope with them |
| Awareness | • Awareness that rare cancers amount to a significant proportion of new cancer cases<br>• Recognition of the reasons why healthcare and clinical research deserve measures to cope with the specific problems posed by rare cancers |
| Knowledge | • Familiarity with the conceptual implications of the main definitions of rare cancers and the collective size of their frequency resulting thereof<br>• Knowledge of which are the big groupings of rare cancers<br>• Knowledge of the healthcare organisational solutions which can be put in place in order to optimise outcomes of patients with rare cancer<br>• Knowledge of the main methodological issues in clinical research underlying the excess of uncertainty which is typical of rare cancers |
| Skills | • Ability to refer patients with rare cancer to centres of reference and how to proactively collaborate with these centres<br>• Ability to share clinical uncertainty with patients and how to rationally deal with it in the clinical decision-making process |

## References

1. Casali PG, Bruzzi P, Bogaerts J, *et al*. Rare Cancers Europe (RCE) methodological recommendations for clinical studies in rare cancers: a European consensus position paper. *Ann Oncol* 2015;26:300–6.
2. Gatta G, van der Zwan JM, Casali PG, *et al*. Rare cancers are not so rare: the rare cancer burden in Europe. *Eur J Cancer* 2011;47:2493–511.
3. *The Lancet Oncology* Series on Rare Cancers. Published Online First: 3 February 2016. http://www.thelancet.com/series/rare-cancers


## 4.7 AIDS-associated malignancies

**Scot C Remick**
**Patrick J Loehrer**

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| Objectives | • To define the natural history and spectrum of acquired immunodeficiency syndrome (AIDS)-defining neoplasms in the setting of underlying human immunodeficiency virus (HIV) infection and associated risk behaviours<br>• To define the natural history and spectrum of non-AIDS-defining neoplasms and associated risk behaviours in patients with HIV/AIDS<br>• To understand the various underlying tumourigenic viral pathogens, disease associations and pathogenesis<br>• To extrapolate treatment approaches with appropriate knowledge of tumour stage and clinical and immune status of the patient<br>• To become conversant in anticancer systemic and palliative therapeutics and underlying combination antiretroviral therapy (cART) and prophylaxis of opportunistic infections (OIs) |
| Awareness | • Familiarity with the different tumour types (AIDS- and non-AIDS-defining) commonly seen in the backdrop of HIV infection<br>• Awareness of the importance of reliance on clinical skills of thorough history taking, physical examination and identification of signs and symptoms unique to patients with underlying immune deficiency<br>• Awareness of strengths and weaknesses of available diagnostic and staging capabilities<br>• Awareness of strengths and weaknesses of available pathological capacity—fine needle aspiration (FNA) versus core needle biopsy, histology, immunohistochemistry (IHC), molecular diagnostic profiling and tumour tissue interrogation<br>• Awareness of strengths and weaknesses of available laboratory capabilities to fully define stage of HIV infection, viral replication, resistance patterns and immune status<br>• Awareness of strengths and weaknesses of available therapeutic modalities (ie, surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy, and cART and OI prophylaxis)<br>• Awareness of strengths and weaknesses of available palliative care interventions, pain management, symptom management, and supportive and hospice referral capabilities<br>• Awareness and resourcefulness of many complementary medical assessments such as tumour mapping, physical examination diagrams and measurements, simple photography of skin lesions and characterisation of other physical findings |
| Knowledge | • Knowledge sets composed of basic understanding of epidemiology, pertinent disease pathogenesis, natural history, clinical manifestations and general orientation to therapeutic and/or preventive approach of the different AIDS-defining tumour types—Kaposi's sarcoma (KS); non-Hodgkin's lymphoma (NHL), including primary central nervous system lymphoma (PCNSL) and Burkitt lymphoma (BL); cervical cancer; squamous cell carcinoma of oral cavity (OSCC)<br>• Knowledge sets of the different non-AIDS-defining tumour types, especially Hodgkin's lymphoma (HL), anal cancer, lung cancer in certain settings and hepatocellular cancer<br>• Understanding and knowledge of disease pathogenesis by virtue of coinfection with other tumourigenic viruses (eg, Kaposi's sarcoma-associated herpes virus (KSHV), Epstein-Barr virus (EBV), human papilloma virus (HPV) and hepatitis-B virus (HBV)) in the backdrop of HIV infection<br>• Familiarity with differences in clinicopathological and molecular characterisation, disease patterns and natural history of KS (eg, classical vs endemic vs epidemic vs transplant less important) and NHL (eg, HIV-associated and non-HIV associated)<br>• Knowledge of the thoughtful clinical assessment of tumour stage and immune status in selecting and optimising therapeutic approaches to the HIV-infected patient with cancer<br>• Knowledge base in cART, monitoring of viral replication and immune status<br>• Familiarity with suitable therapeutic approaches employing all modalities of cancer therapy for all tumour types<br>• Knowledge of supportive and palliative care interventions, including pain management and hospice referral and usage<br>• Familiarity with suitable prevention strategies, including modifying risk behaviours<br>• Familiarity with systems-based knowledge and with multidisciplinary team approaches in the management of patients with AIDS-associated malignancies<br>• Understanding of cART treatment, drugs, monitoring and OI prophylaxis strategies<br>• Knowledge of systemic chemotherapy agents |

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| | • Understanding of the safety profiles of cART and systemic chemotherapy and the management thereof<br>• Familiarity with the identification of the access to new strategies of care for HIV infection and cancer through access to clinical trials and other appropriate supportive interventions that may be available |
| Skills | • Ability to contribute actively to a variety of settings (outpatient clinics, inpatient wards, multidisciplinary tumour boards, women's health clinics and HIV clinics) to gain access to the spectrum of cases of malignant disease encountered in the backdrop of HIV infection<br>• Ability to perform a thorough history and physical examination, including nuanced history and sentinel physical examination findings indicative of HIV risk behaviours and/or stigmata of HIV disease<br>• Ability to contribute actively in the presentation and discussion of cases<br>• Ability to contribute actively in the clinical decision-making of cases along the continuum of care from prevention and counselling to diagnostic, therapeutic (HIV therapy and anticancer therapy across all modalities), and palliative care and end-of-life decision-making<br>• Ability to guide clinical recommendations across the continuum of care based on understanding of performance status, tumour stage, clinical status and comorbid conditions, and immune status<br>• Ability to participate in multidisciplinary team approaches to the management of patients with AIDS-associated malignancies |

## References


1. Mwamba P, Mwanda WO, Busakhala N, *et al*. AIDS-related non-Hodgkin's lymphoma in sub-Saharan Africa: current status and realities of therapeutic approach. *Lymphoma* 2012;2012. doi: 10.1155/2012/904367
2. Oyiro PO, Roidad N, Monga M, *et al*. Transmissible agents, HIV and cancer. In: Miller KD, Simon M, eds. *Global perspectives on cancer: incidence, care and experience*. Vol. 1 of 2 volume text. Santa Barbara, CA: ABC-CLIO, LLC Praeger, 2015:55–144.
3. Rogena EA, Simbiri KO, De Falco G, *et al*. A review of the pattern of AIDS defining, HIV associated neoplasms and premalignant lesions diagnosed from 2000–2011 at Kenyatta National Hospital, Kenya. *Infect Agent Cancer* 2015;10:28. doi: 10.1186/s13027-015-0021-1
4. Sasco AJ, Jaquet A, Boidin E, *et al*. The challenge of AIDS-related malignancies in sub-Saharan Africa. *PLoS ONE* 2010;5:e8621.


## 4.8 Special issues in the diagnosis and treatment of cancers in adolescents

**Smita Bhatia**
**Giannis Mountzios**

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| Objectives | • To be familiar with the incidence and special characteristics of malignancies observed in adolescence (15–18 years) |
| Awareness | • Recognition that adolescence is a short period of somatic, social and spiritual evolution<br>• Appreciation that most cancers in this age group have a worse prognosis compared to the same cancers in children<br>• Awareness that, in this special age group, support from other disciplines is crucial<br>• Appreciation that lack of compliance is a great issue and long-term follow-up is necessary<br>• Awareness of the need for screening for long-term treatment-related toxicity<br>• Awareness of the need to immunise patients/healthy adolescents for human papilloma virus (HPV) vaccine<br>• Awareness of the need to counsel patients/healthy adolescents regarding risky lifestyle behaviours |
| Knowledge | • Knowledge that tumours in this age group may be:<br>◦ Paediatric with late onset (sarcoma, medulloblastoma)<br>◦ Adult type with early onset (thyroid cancer, melanoma)<br>◦ Adolescent tumours (bone tumours, testicular tumours)<br>◦ Tumours occurring at any age (leukaemia, lymphoma)<br>• Familiarity with late toxicity after treating cancer in adolescents |
| Skills | • Ability to communicate the diagnosis, to treat and to psychosocially support and care for adolescents<br>• Ability to contribute actively to a variety of clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in adolescent patients with cancer, including differential diagnoses in this age group<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use<br>• Ability to select the most appropriate therapeutic strategies<br>• Ability to manage side effects of various therapeutic agents<br>• Ability to discuss prevention strategies with patients<br>• Ability to discuss specific long-term toxicities with the patients, including fertility preservation options |

## References

1. Epelman S. The adolescent and young adult with cancer: state of the art—brain tumor. *Curr Oncol Rep* 2013;15:308–16.
2. Epelman CL. The adolescent and young adult with cancer: state of the art—psychosocial aspects. *Curr Oncol Rep* 2013;15:325–31.
3. Ferreira CG, de Melo AC, Nogueira-Rodrigues A. The adolescent and young adult with cancer: state of the art—epithelial cancer. *Curr Oncol Rep* 2013;15:287–95.
4. Gramatges MM, Rabin KR. The adolescent and young adult with cancer: state of the art—acute leukemias. *Curr Oncol Rep* 2013;15:317–24.
5. Rainusso N, Wang LL, Yustein JT. The adolescent and young adult with cancer: state of the art—bone tumors. *Curr Oncol Rep* 2013;15:296–307.


### 4.9 Special issues in the diagnosis and treatment of cancers in young adults

**Smita Bhatia**
**Giannis Mountzios**

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|---|---|
| Objectives | • To be familiar with the incidence and special characteristics of malignancies observed in young adults (18–39 years) |
| Awareness | • Recognition that, in this age group, support from other disciplines is crucial<br>• Appreciation that lack of compliance continues to be an issue and long-term follow-up is necessary<br>• Awareness of the need for screening for long-term treatment-related toxicity<br>• Awareness of the need to immunise patients/young healthy adults for human papilloma virus (HPV) vaccine until age 26 years<br>• Awareness of the need to counsel patients/young healthy adults regarding risky lifestyle behaviours |
| Knowledge | • Knowledge regarding the incidence and epidemiology of the various types of cancer in young adults<br>• Understanding of the risk factors and known causes of tumours in young adult patients<br>• Understanding of the magnitude of risk of treatment-related late toxicity after treating cancer |
| Skills | • Ability to communicate the diagnosis, to treat and to psychosocially support and care for young adults<br>• Ability to contribute actively to a variety of clinical scenarios and patient presentations<br>• Ability to discuss critically the treatment options/recommendations<br>• Ability to perform a history and physical examination in young adult patients with cancer, including differential diagnoses in this age group<br>• Ability to contribute to discussions on general management strategies in order to understand all the considerations on which treatment to use<br>• Ability to select the most appropriate therapeutic strategies<br>• Ability to manage side effects of various therapeutic agents<br>• Ability to discuss prevention strategies with patients<br>• Ability to discuss specific long-term toxicities with the patients, including fertility preservation options |


## References

1. Epelman S. The adolescent and young adult with cancer: state of the art—brain tumor. *Curr Oncol Rep* 2013;15:308–16.
2. Epelman CL. The adolescent and young adult with cancer: state of the art—psychosocial aspects. *Curr Oncol Rep* 2013;15:325–31.
3. Ferreira CG, de Melo AC, Nogueira-Rodrigues A. The adolescent and young adult with cancer: state of the art—epithelial cancer. *Curr Oncol Rep* 2013;15:287–95.
4. Gramatges MM, Rabin KR. The adolescent and young adult with cancer: state of the art—acute leukemias. *Curr Oncol Rep* 2013;15:317–24.
5. Rainusso N, Wang LL, Yustein JT. The adolescent and young adult with cancer: state of the art—bone tumors. *Curr Oncol Rep* 2013;15:296–307.

## 4.10 Cancer and pregnancy

**Fedro Alessandro Peccatori**
**Nicholas Pavlidis**

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| Objectives | • To be able to diagnose, stage, treat and counsel pregnant patients with cancer and to assess and counsel patients with pregnancies occurring after cancer |
| Awareness | • Awareness of the epidemiology of main cancer types occurring during pregnancy<br>• Awareness of the existence of diagnostic pitfalls of cancer during pregnancy due to the pregnant status<br>• Awareness of the availability of diagnostic and staging procedures which are safe for the pregnant mother and her fetus<br>• Awareness of the existence of specific treatment strategies for each tumour type<br>• Appreciation of the importance of multidisciplinarity in treating cancer during pregnancy<br>• Appreciation of the principles of surgery, radiation therapy and systemic treatment during pregnancy<br>• Recognition of the importance of referral to specialised centres<br>• Awareness of the existence of the special psychological and social support needs of the pregnant mother with cancer and her family<br>• Appreciation of the safety and feasibility of pregnancy following cancer treatment |
| Knowledge | • Familiarity with the implications of the different types of cancer diagnosed during pregnancy and their impact on maternal and fetal prognosis<br>• Familiarity with the peculiarities and implications associated with cancer diagnosed at different gestational ages<br>• Understanding of the situations where abortion might be considered and prioritise shared decision-making with the mother and her partner<br>• Familiarity with the available diagnostic means, including needle biopsy and surgery, and with the fetal effects of local and general anaesthesia with the mother<br>• Familiarity with the importance of correct staging also during pregnancy and of the available diagnostic means<br>• Familiarity with the indications and the value of surgery, radiation therapy, chemotherapy, immunotherapy, targeted therapy and supportive and palliative care for cancer diagnosed during pregnancy and their effects on the pregnant mother and her embryo or fetus<br>• Understanding of the importance of sensitive and empathic counselling<br>• Familiarity with the impact of previous treatments on pregnancy after cancer, including maternal effects (eg, drug-induced infertility, cardiomyopathy, radiation-induced breast fibrosis) and fetal effects (eg, genotoxicity of recent chemotherapy or endocrine treatment)<br>• Familiarity with the importance and the feasibility of contraception during and after cancer treatment<br>• Familiarity with the feasibility of fertility preservation during cancer treatment<br>• Understanding of the pharmacokinetics of drugs administered during pregnancy and of the importance of correct dosing according to actual weight and height<br>• Familiarity with conditions (such as rapidly deteriorating maternal performance status due to cancer spread) that are important for considering early delivery<br>• Familiarity with the potential adverse effects and neonatal risks of very early delivery<br>• Understanding of the long-term safety of children exposed to maternal chemotherapy during gestation |
| Skills | • Ability to contribute actively to the multidisciplinary management of the pregnant mother with cancer, sharing the appropriate oncological treatment with the surgeon, the radiation therapist, the obstetrician and the perinatologist<br>• Ability to perform a history and physical examination acknowledging the pregnant status of the patient<br>• Ability to explore the availability of social support and the patient's attitude regarding the ongoing pregnancy<br>• Ability to discuss critically the treatment options/recommendations of each tumour type diagnosed during pregnancy including prognostic considerations<br>• Ability to discuss with the mother the effects of local and general anaesthesia on the fetus<br>• Ability to recognise the effects of various therapeutic agents and their potential fetal toxicity according to the gestational age and mechanism of action<br>• Ability to counsel young patients with cancer about contraception during oncological treatments and about the feasibility and safety of subsequent pregnancies, when appropriate<br>• Ability to refer the patient to a centre with experience in treating cancer during pregnancy and to include the data into international registries after permission<br>• Ability to be compassionate, empathic, non-judgemental and to learn the art of listening and shared decision-making |

## References

1. Amant F, Deckers S, Van Calsteren K, *et al*. Breast cancer in pregnancy: recommendations of an international consensus meeting. *Eur J Cancer* 2010;46:3158–68.
2. Amant F, von Minckwitz G, Han SN, *et al*. Prognosis of women with primary breast cancer diagnosed during pregnancy: results from an international collaborative study. *J Clin Oncol* 2013;31:2532–9.
3. Amant F, Halaska MJ, Fumagalli M, *et al*. Gynecologic cancers in pregnancy. *Int J Gynecol Cancer* 2014;24:394–403.
4. Andersson TM-L, Johansson ALV, Fredriksson I, *et al*. Cancer during pregnancy and the postpartum period: A population-based study. *Cancer* 2015;121:2072–7.
5. Azim HA, Peccatori FA, Pavlidis N. Lung cancer in the pregnant woman: to treat or not to treat, that is the question. *Lung Cancer* 2010;67:251–6.
6. Cardonick EH, Usmani A, Ghaffar S. Perinatal outcomes of a pregnancy complicated by cancer, including neonatal follow-up after in utero exposure to chemotherapy. *Am J Cljn Oncol* 2010;33:221–8.
7. Cardonick EH, Gringlas MB, Hunter K, *et al*. Development of children born to mothers with cancer during pregnancy: comparing in utero chemotherapy-exposed children with nonexposed controls. *Am J Obstet Gynecol* 2015;212:658.e1–8.
8. Goncalves V, Sehovic I, Quinn G. Childbearing attitudes and decisions of young breast cancer survivors: a systematic review. *Hum Reprod Update* 2014;20:279–92.
9. Hahn KME, Johnson PH, Gordon N, *et al*. Treatment of pregnant breast cancer patients and outcomes of children exposed to chemotherapy in utero. *Cancer* 2006;107:1219–26.
10. Koren G, Carey N, Gagnon R, *et al*. Cancer chemotherapy and pregnancy. *J Obstet Gynaecol Canada* 2013;35:263–78.
11. Lambertini M, Anserini P, Levaggi A, *et al*. Fertility counseling of young breast cancer patients. *J Thorac Dis* 2013;5(Suppl 1):S68–80.
12. Loibl, S, Han SN, Amant F. Being pregnant and diagnosed with breast cancer. *Breast Care* 2012;7:204–9.
13. Moran BJ, Yano H, Al Zahir N, *et al*. Conflicting priorities in surgical intervention for cancer in pregnancy. *Lancet Oncol* 2007;8:536–44.
14. Morice P, Uzan C, Uzan S. Cancer in pregnancy: a challenging conflict of interest. *Lancet* 2012;379:495–6.
15. Pagani O, Partridge A, Korde L, *et al*. Pregnancy after breast cancer: If you wish, ma'am. *Breast Cancer Res Treat* 2011;129:309–17.
16. Peccatori FA, Azim HA, Orecchia R, *et al*. Cancer, pregnancy and fertility: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol* 2013;24(Suppl 6):vi160–70.
17. Peccatori FA, Corrado G, Fumagalli M. Risk factors: after gestational chemotherapy, the kids are all right. *Nat Rev Clin Oncol* 2015;12:254–5.
18. Pereg D, Koren G, Lishner M. Cancer in pregnancy: gaps, challenges and solutions. *Cancer Treat Rev* 2008;34:302–12.
19. Rizack T, Mega A, Legare R, *et al*. Management of hematological malignancies during pregnancy. *Am J Hematol* 2009;84:830–41.
20. Schedin P. Pregnancy-associated breast cancer and metastasis. *Nat Rev Cancer* 2006;6:281–91.
21. Schover LR. Motivation for parenthood after cancer: a review. *J Natl Cancer Inst Monogr* 2005:2–5.


## 4.11 Geriatric oncology

**Hans Wildiers**
**Stuart Lichtman**

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| Objectives | • To be able to perform/interpret geriatric screening and/or assessment of older patients with cancer<br>• To be able to counsel on an optimal treatment strategy for each individual |
| Awareness | • Appreciation of the importance of the evaluation of the general health status by geriatric assessment in older patients with cancer: detection of unidentified non-cancer health problems, prediction of adverse outcome and better estimation of residual life expectancy in relation to lethality of the malignancy<br>• Appreciation of the different domains of geriatric assessment: social status/support, functional status, fatigue, comorbidity, cognition, mental health status, nutrition and geriatric syndromes such as falls, incontinence and delirium<br>• Appreciation of the need of polypharmacy evaluation and drug compliance in this population<br>• Recognition that older patients may die from their cancer but also from other causes as well as from adverse effects of cancer treatment<br>• Appreciation that tumour biology can be different in older versus younger patients with cancer<br>• Appreciation that pharmacology of anticancer agents can be different in senior adults<br>• Awareness that the toxicity of anticancer agents can be different in senior adults and can be affected by comorbidities, eg, susceptibility to cardiotoxic agents |
| Knowledge | • Understanding that geriatric evaluation can have an impact on treatment decisions<br>• Understanding that, if geriatric assessment reveals problems, it needs to be followed by targeted geriatric interventions<br>• Familiarity with international guidelines, for example, from the International Society of Geriatric Oncology (SIOG) concerning specific treatment approaches for different tumour types<br>• Familiarity with the epidemiology of cancer in relation to age<br>• Familiarity with SIOG guidelines on other ageing-related issues such as geriatric evaluation and pharmacology<br>• Familiarity with (geriatric assessment-based) predictors of survival<br>• Knowledge that geriatric assessment-related factors correlate with chemotherapy-induced toxicity, and that predictive models exist<br>• Knowledge of how to evaluate possible drug–drug interactions in older patients with cancer<br>• Knowledge that chemotherapy pharmacology can differ for some chemotherapeutic agents in older patients, and where to find information for each specific chemotherapeutic agent |

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| Skills | • Ability to perform a geriatric assessment or geriatric screening<br>• Ability to interpret the results of a geriatric assessment or geriatric screening<br>• Ability to collaborate with geriatricians or specialised healthcare workers to improve care for each older patient with cancer<br>• Ability to integrate a geriatric assessment into oncology decision-making<br>• Ability to address issues related to social situation, access to care and the needs of the caregiver<br>• Ability to take treatment decisions in the palliative versus curative setting regarding appropriate drug dosing and supportive care modalities like growth factors or antiemetics<br>• Ability to assess therapy-induced toxicity, ie, standard toxicity criteria, and to deal with these toxicities; functional assessment and detection of functional impairment |

## References


1. Balducci L, Extermann M. Management of cancer in the older person: a practical approach. *Oncologist* 2000;5:224–37.
2. Decoster L, Van Puyvelde K, Mohile S, *et al*. Screening tools for multidimensional health problems warranting a geriatric assessment in older cancer patients: an update on SIOG recommendations. *Ann Oncology* 2015;26:288–300.
3. Hurria A, Levit LA, Dale W, *et al*. Improving the evidence base for treating older adults with Cancer: American Society of Clinical Oncology Statement. *J Clin Oncol* 2015;33:3826–33.
4. Lichtman S, Wildiers H, Chatelut E, *et al*. International Society of Geriatric Oncology Chemotherapy Taskforce. Evaluation of chemotherapy in older patients—an analysis of the medical literature; *J Clin Oncol* 2007;14:1832–43.
5. Wildiers H, Mauer M, Pallis A, *et al*. End points and trial design in geriatric oncology research: a joint European Organisation for Research and Treatment of Cancer–Alliance for Clinical Trials in Oncology–International Society of Geriatric Oncology position article. *J Clin Oncol* 2013;31:3711–18.
6. Wildiers H, Heeren P, Puts M, *et al*. International Society of Geriatric Oncology consensus on geriatric assessment in older patients with cancer. *J Clin Oncol* 2014;32:2595–603.


## 4.12 Cancer treatment in patients with comorbidities

**Diana Hanna**
**Heinz-Josef Lenz**

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| Objectives | • To be able to perform specialist assessment, treatment and counselling of patients with cancer and comorbidities |
| Awareness | • Recognition of the importance of interdisciplinary management of patients with cancer with comorbidities<br>• Appreciation of the principles of integrating comorbidities into diagnostic and treatment decisions for patients with cancer<br>• Awareness of the importance of comorbidity assessment in determining clinical trial eligibility<br>• Awareness of the existence of prognostic comorbidity indices<br>• Recognition of the psychosocial impact of cancer treatment in patients with comorbidities |
| Knowledge | • Understanding of how comorbid medical conditions can affect the efficacy and toxicity of cancer treatment<br>• Understanding that comorbidities may influence but are not equivalent to functional status<br>• Understanding of how to individualise the management of different cancers in patients with comorbidities<br>• Understanding of how cancer-directed treatment can lead to the exacerbation of comorbidities during or after the completion of therapy<br>• Understanding of the distinction between disease progression, treatment-related toxicities and complications related to comorbidities<br>• Familiarity with specific comorbidities which may be contraindications to surgery, radiation therapy, chemotherapeutics, immunotherapy or targeted therapy in different cancers<br>• Familiarity with the utility and limitations of tools such as the Charlson Index in assessing the impact of comorbid medical conditions on outcomes in patients with cancer |
| Skills | • Ability to perform a through and accurate assessment of a cancer patient's comorbid medical conditions<br>• Ability to consider how cardiovascular, pulmonary, haematological, gastrointestinal, autoimmune, rheumatological, neurological, infectious, endocrine, dermatological and psychiatric comorbid conditions and their treatment affect a patient's ability to receive a particular cancer-directed therapy<br>• Ability to discuss critically and coordinate the management of comorbidities of patients with cancer with other specialists<br>• Ability to include understanding of comorbidities in referrals for radiological and interventional diagnostic and therapeutic procedures in patients with cancer |

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- Ability to apply understanding of drug pharmacology to adapt and modify therapeutic plans in patients with cancer with comorbidities, including varying degrees of hepatic and renal dysfunction
- Ability to consider comorbidities to identify frail/unfit patients with cancer and to determine clinical trial eligibility
- Ability to incorporate comorbidities in determining the risk/benefit ratio for pursuing cancer-directed therapy and for specific anticancer agents
- Ability to anticipate potential acute and chronic treatment-related complications (eg, neuropathy) in patients with cancer with comorbidities
- Ability to contribute actively in the management of patients with cancer with comorbidities at the time of diagnosis, and during the initiation, transition and cessation of treatment
- Ability to integrate the presence of comorbidities, along with age, cognitive and performance status into developing multidisciplinary treatment plans for patients with cancer
- Ability to manage toxicities of chemotherapeutic, targeted and immunotherapeutic agents in the setting of comorbidities, including drug-dosing adjustments and administering supportive measures
- Ability to consider drug–drug interactions when prescribing different therapeutic agents in patients with cancer with comorbidities
- Ability to determine alternate drug regimens and schedules for patients with cancer with different comorbidities
- Ability to discuss the role of comorbidities in treatment decision-making with patients with cancer

## References


1. Carey EC, Walter LC, Lindquist K, *et al*. Development and validation of a functional morbidity index to predict mortality in community-dwelling elders. *J Gen Intern Med* 2004;19:1027–33.
2. Charlson ME, Pompei P, Ales KL, *et al*. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;40:373–83.
3. Edwards BK, Noone AM, Mariotto AB, *et al*. Annual Report to the Nation on the status of cancer, 1975–2010, featuring prevalence of comorbidity and impact on survival among persons with lung, colorectal, breast, or prostate cancer. *Cancer* 2014;120:1290–314.
4. Extermann M, Overcash J, Lyman GH, *et al*. Comorbidity and functional status are independent in older cancer patients. *J Clin Oncol* 1998;16:1582–7.
5. Extermann M. Interaction between comorbidity and cancer. *Cancer Control* 2007;14:13–22.
6. Karampeazis A Extermann M. Assessment and impact of comorbidity in older adult patients with cancer. In: Hurria A, Balducci L, eds. *Geriatric oncology: treatment, assessment and management*. Berlin: Springer, 2009.
7. National Comprehensive Cancer Network. Older Adult Oncology (Version 2.2015). http://www.nccn.org/professionals/physician_gls/pdf/senior.pdf
8. Pal SK, Hurria A. Impact of age, sex, and comorbidity on cancer therapy and disease progression. *J Clin Oncol* 2010;28:4086–93.
9. Piccirillo JF, Tierney RM, Costas I, *et al*. Prognostic importance of comorbidity in a hospital-based cancer registry. *JAMA* 2004;291:2441–7.
10. Søgaard M, Thomsen RW, Bossen KS, *et al*. The impact of comorbidity on cancer survival: a review. *Clin Epidemiol*. 2013;5 (Suppl 1):3–29.


## 5 PSYCHOSOCIAL ASPECTS OF CANCER

**Lidia Schapira**
**Luzia Travado**

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| Objectives | • To be able to perform an adequate assessment of a patient's psychosocial needs and to identify coping resources<br>• To be able to provide appropriate referrals to members of the multidisciplinary team with training in psycho-oncology or mental health |
| Awareness | • Awareness of the need to screen for emotional distress at regular intervals during the continuum of the cancer trajectory and to refer to the appropriate clinician or team following established guidelines<br>• Awareness of the epidemiology of psychological morbidity in patients with cancer, including syndromes such as depression, anxiety and adjustment disorders<br>• Appreciation of the consequences of psychological morbidity, including its impact on clinical outcomes (survival, quality of life)<br>• Appreciation of risk factors for psychological morbidity, including individual susceptibility based on prior history and sociodemographic factors or of those pertaining to the disease or its treatment<br>• Appreciation of the range of normal coping mechanisms and protective factors (family and social support, spirituality)<br>• Appreciation of the role of sociocultural determinants of health in shaping a person's meaning and experience of illness |

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| | • Awareness of the availability of community resources and professional services to assist patients and families in overcoming emotional and social consequences of living with a life-threatening illness<br>• Recognition of the importance of emotional self-awareness and self-regulation for oncology clinicians |
| Knowledge | • Familiarity with a conceptual biopsychosocial comprehensive patient-centred framework for assessing a patient's psychosocial needs (including psychological suffering and morbidity), and with a timely and efficient referral to psycho-oncology specialists, mental health professionals, social workers or chaplains depending on individual needs and available resources<br>• Knowledge of simple instruments to screen for distress such as the National Comprehensive Cancer Network (NCCN) Distress Thermometer, quality of life assessment tools, and survivorship assessment tools<br>• Understanding of the importance of communication skills and strategies to elicit patients' concerns, goals and values and to establish preferences for involvement in decision-making along the disease trajectory<br>• Knowledge of the different roles and areas of expertise of members of the multidisciplinary (medical professionals with different specialties) and interdisciplinary (non-medical healthcare professionals , including nurses, psychologists, therapists, social workers and chaplains) teams |
| Skills | • Ability to demonstrate proficiency in cross-cultural care based on a patient-centred approach to communication that avoids stereotyping and bias<br>• Ability to demonstrate competence in interviewing skills to identify psychological suffering and morbidity<br>• Ability to use and interpret simple instruments to screen for distress such as the NCCN Distress Thermometer, quality of life and survivorship assessment tools<br>• Ability to perform adequate referrals to psycho-oncology or mental health professionals<br>• Ability to conduct a family meeting<br>• Ability to exhibit excellence in communication skills for delivering patient-centred care, communicating serious news, using empathic responses that address the patient's emotions, perspectives and goals, eliciting a patient's concerns about his or her quality of life (including sexual function, mood and sleep), exploring the patient's beliefs and concerns, involving patients and caregivers in decision-making according to their expressed preference, as well as discussing goals of care and wishes for end-of-life care<br>• Ability to prescribe and monitor use of psychotropic drugs to reduce anxiety, depression, insomnia, delirium, and other common and distressing symptoms<br>• Ability to perform an adequate non-stigmatising referral to psycho-oncology or mental health professionals<br>• Ability to work effectively with nurses, psychologists, and psychiatrists, palliative care clinicians, therapists, social workers and chaplains, who are members of the oncology team, and to communicate effectively with referring physicians to ensure a seamless plan of care for the patient<br>• Ability to show maturity in handling the emotional impact of caring for patients who are seriously ill and dying |

## References


1. Adler NE, Page AEK, eds. *Cancer care for the whole patient: meeting psychosocial needs*. Washington DC: The National Academies Press, 2008.
2. Bultz BD, Travado L, Jacobsen PB, *et al*. 2014 President's plenary international psycho-oncology society: moving toward cancer care for the whole patient. *Psychooncology* 2015;24:1587–93. doi: 10.1002/pon.3844
3. Holland JC, Breitbart WS, Jacobsen PB, *et al*. eds. *Psycho-oncology*. 3rd edn. Oxford: Oxford University Press, 2015.
4. Multilingual Core Curriculum in Psycho-Oncology. http://www.ipos-society.org/multilingual-core-curriculum-in-psycho-oncology/
5. National Breast Cancer Centre and National Cancer Control Initiative. *Clinical practice guidelines for the psychosocial care of adults with cancer*. Camperdown, NSW, Australia: National Breast Cancer Centre, 2003. http://canceraustralia.gov.au/sites/default/files/publications/pca-1-clinical-practice-guidelines-for-psychosocial-care-of-adults-with-cancer_504af02682bdf.pdf
6. National Cancer Action Team. National Cancer Peer Review Programme: Manual for Cancer Services: Psychological Support Measures Version 1.0. National Health Service, UK, 2011. http://www.bad.org.uk/shared/get-file.ashx?itemtype=document&id=1624
7. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) Distress management. Version 1.2015, 2015. http://www.nccn.org/professionals/physician_gls/default.asp
8. Surbone A, Zwitter M, Rajer M, *et al*. eds. *New challenges in communication with cancer patients*. Berlin: Springer, 2013.
9. Travado L, Dalmas M. Psychosocial Oncology Care. In: Albreht T, Martin-Moreno JM, Jelenc MJ, *et al*. eds. *European guide for quality National Cancer Control Programmes*. Ljubljana, Slovenia: National Institute of Public Health, 2015:35–9. http://www.cancercontrol.eu/uploads/images/European_Guide_for_Quality_National_Cancer_Control_Programmes_web.pdf

## 6 COMMUNICATION

**Friedrich Stiefel**
**Alexander Kiss**
**Don S Dizon**

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| Objectives | • To better appreciate that communication about cancer, treatment and prognosis are highly sensitive topics<br>• To heighten recognition of emotional cues during discussions that impact on conversations between doctors, patients and their loved ones<br>• To communicate with patients and their relatives in such a way that they feel understood and treated as a whole person<br>• To provide balanced discussions with attention to benefits and risks of any oncological intervention, and the evidence (or, in some instances, the lack of evidence) that informs options<br>• To communicate with patients with cancer, cognizant of the diverse cultural backgrounds that they come from<br>• To increase provider skills in communication around difficult topics, such as end-of-life<br>• To establish a relationship which promotes trust and therapeutic alliance |
| Awareness | • Recognition that communication is a basic competency for oncologists<br>• Appreciation that our patients respond as individuals to clinical conversations; recognising emotional or cognitive cues enhances discussions, particularly around sensitive topics<br>• Awareness that the oncologist has his or her own personality, contextual factors and his/her lived experience, which are factors that can facilitate or hamper communication with patients and relatives<br>• Awareness that communication about difficult topics is a source of emotional stress for clinicians; enhancing abilities to perform these tasks can help to reduce burn out from the oncology work force |
| Knowledge | • Knowledge that communication training in oncology has been shown to be effective if the training is learner-centred, uses role-play and structured feedback and is conducted in small groups by trained facilitators<br>• Understanding that follow-up supervisions and booster sessions are recommended, but are not evidence-based so far<br>• Understanding that skills training around communication should be a mandatory part of all fellowships and training opportunities in oncology |
| Skills | • Ability to communicate cancer, from explaining a diagnosis, reviewing treatment options, to discussing prognosis<br>• Ability to demonstrate enhanced communication tasks such as breaking bad news, dealing with strong emotion, giving complex information, enabling shared decision-making, running a family meeting and transitioning to palliative care and care at the end of life<br>• Ability to communicate special issues such as genetic risk<br>• Ability to explain the role of active surveillance (eg, watchful waiting in men with an elevated prostate-specific antigen (PSA))<br>• Ability to discuss medical information from non-traditional sources (eg, web-based, social media) and participation in clinical trials |

### References

1. Bourquin C, Stiefel F, Bernhard J, *et al*. Mandatory communication skills training for oncologists: enforcement does not substantially impact satisfaction. *Support Care Cancer* 2014;22:2611–14.
2. Bousquet G, Orri M, Winterman S, *et al*. Breaking bad news in oncology: a metasynthesis. *J Clin Oncol* 2015;33:2437–43.
3. Dizon DS, Politi MC, Back AL. The power of words: discussing decision making and prognosis. *Am Soc Clin Oncol Educ Book* 2013:442–446.
4. Kissane DW, Bylund CL, Banerjee SC, *et al*. Communication skills training for oncology professionals. *J Clin Oncol* 2012;30:1242–7.
5. Moore PM, Rivera Mercado S, Grez Artigues M, *et al*. Communication skills training for healthcare professionals working with people who have cancer. *Cochrane Database Syst Rev* 2013;3:CD003751.
6. Salmon P, Young B. Creativity in clinical communication: from communication skills to skilled communication. *Med Educ* 2011;45:217–26.
7. Stiefel F, Barth J, Bensing J, *et al*. Communication skills training in oncology: a position paper based on a consensus meeting among European experts in 2009. *Ann Oncol* 2010;21:204–7.

## 7 GENETIC COUNSELLING

Lidia Schapira

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| Objectives | • To be able to perform an assessment of genetic susceptibility to cancer and to recommend appropriate testing<br>• To be able to provide counselling for the patient and family regarding risk and risk reduction |
| Awareness | • Awareness of the existence of different syndromes that confer increased risk of certain cancers<br>• Awareness of the availability of screening tests and procedures for those identified as having higher lifetime risk<br>• Recognition of the importance of multidisciplinary work and the role of genetic counsellors as well as mental health professionals to assist patients as they process difficult information |
| Knowledge | • Understanding of the hereditary predisposition to cancer, including the polygenic and multifactorial nature of cancer risk<br>• Understanding of distinguishing hereditary cancer syndromes from sporadic cancers<br>• Understanding how to obtain a comprehensive family history and how to provide guidance for testing of various family members<br>• Understanding of the impact of this information on the patient and his or her family<br>• Understanding how to offer advice and support, including the benefits and limitations of various management strategies<br>• Knowledge of the major hereditary cancer syndromes |
| Skills | • Ability to contribute to multidisciplinary case presentations and to discuss risk assessment and diagnosis of common familial cancer syndromes<br>• Ability to recognise individuals with increased risk of harbouring genetic mutations associated with susceptibility to cancer and to provide recommendations for testing and screening and management of cancer risk<br>• Ability to describe elements of consent for testing<br>• Ability to work with genetic counsellors to identify individuals and families with genetic mutations that increase cancer risk and to offer advice and guidance for the early detection or reduction of risk through surveillance or various management strategies, including the use of prophylactic surgery or medical therapies |

### Reference

1. Robson ME, Bradbury AR, Arun B, *et al*. American Society of Clinical Oncology Policy statement update: genetic and genomic testing for cancer susceptibility. *J Clin Oncol* 2015;33:3660–7.

## 8 PATIENT EDUCATION

Lidia Schapira
Lorenz Jost

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| Objectives | • To be able to provide clear information regarding cancer treatments, including side effects and trade-offs, dosing and schedules, and interactions with other active medications for comorbid conditions<br>• To increase clinician's skills in assessing patient's understanding of oral anticancer medications and to improve adherence through effective communication strategies (eg, telephone reminders, provision of educational materials, recommendation of expert-vetted websites)<br>• To be able to perform an accurate and up-to-date assessment of health maintenance after treatment for cancer and to provide counselling regarding risk reduction for recurrence or second malignancies as well as anticipated late effects of cancer treatment |
| Awareness | • Awareness of the importance of patient-centred communication that is clear and appropriate for the patient's educational level, culture and language preference<br>• Awareness of the existence of long-term sequelae of cancer treatments, including systemic therapy (chemotherapy, immunotherapy, targeted therapy), radiation therapy and surgery<br>• Appreciation of the impact of cancer treatment on psychological well-being<br>• Awareness of the importance of screening for early detection of second malignancies<br>• Appreciation of the need for genetic testing or counselling for the patient and family members if considered at higher than average risk |

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| Knowledge | • Familiarity with genetic syndromes associated with susceptibility to cancer<br>• Understanding of the emotional and psychological impact of cancer treatment<br>• Familiarity with techniques for eliciting patients' concerns at follow-up visits<br>• Knowledge of the long-term complications of cancer therapies such as the incidence of systemic therapy-induced secondary leukaemia or solid malignant tumours, radiation-induced sarcomas and endocrine dysfunction, respectively<br>• Knowledge of appropriate testing indicated for surveillance and monitoring after completion of active cancer-directed therapies<br>• Understanding of the role and importance of referral to the patient support groups |
| Skills | • Competence in basic interviewing and communication skills, including translation of complex data to understandable clear information regarding diagnosis, treatment and follow-up care<br>• Ability to communicate effectively with the patient, family caregivers and colleagues from other disciplines involved in the patient's care<br>• Ability to check the patient's understanding (eg, teach-back technique)<br>• Ability to provide guidance and emotional support during and after completion of active cancer therapy and to refer patients exhibiting emotional distress to appropriate mental health professionals<br>• Ability to discuss approaches to risk reduction, including chemoprevention when indicated<br>• Ability to recognise long-term complications of cancer therapies and their management<br>• Ability to offer recommendations about lifestyle modifications, including smoking cessation, healthy eating, exercise and reduction in alcohol consumption and sun exposure |

## References


1. ASCO. Resources for patients. http://www.cancer.net/
2. ESMO. Cancer guides for patients. http://www.esmo.org/Patients/Patient-Guides
3. ESMO. Guide for patients with advanced cancer: getting the most out of your oncologist. http://www.esmo.org/Patients/Getting-the-Most-out-of-Your-Oncologist
4. ESMO. Personalised cancer medicine explained. http://www.esmo.org/Patients/Personalised-Medicine-Explained
5. National Cancer Institute. Resources for patients, caregivers, and health professionals. http://www.cancer.gov/
6. UpToDate® Resources for patients. http://www.uptodate.com/contents/table-of-contents/patient-information/beyond-the-basics


## 9 SURVIVORSHIP

**Elizabeth Charlotte Moser**
**Charles L Shapiro**
**Lifang Liu**

In cancer, survivorship—as defined by the National Cancer Institute (NCI) of the USA—begins at the time of initial diagnosis and continues until the end of life. Family members, friends and caregivers are also affected by the survivorship experience and are included in this definition. However, not all individuals who are treated for cancer wish to be called survivors and in some countries other than USA, the term may not carry the same positive cultural associations.

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| Objectives | • To be able to perform outpatient follow-up assessments based on best practice or guideline recommendations for the detection of cancer recurrence, new primary cancers and to evaluate the signs and symptoms of long-term and late side effects of either the cancer or its treatment<br>• To be able to educate patients, families, caregivers and primary care providers about:<br>◦ the familial, socioeconomic and lifestyles that may increase the risks of cancer recurrence or new primary cancers<br>◦ the importance of developing and/or maintaining physically active lifestyles, weight management and avoidance of obesity, reducing alcohol consumption, tobacco cessation, making healthy dietary choices, managing depression/anxiety<br>◦ financial/back to work issues, and to successfully reintegrate into a productive social and professional life |

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| Awareness | • Awareness of the existence of different roles of follow-up:<br>◦ Screening for cancer recurrence and second primary cancers<br>◦ Management of long-term and late side effects: mental/physical/socioeconomic<br>◦ Family and lifestyle risk evaluation, including adverse health behaviours and interventions dedicated to promote healthier lifestyles<br>◦ Empowerment among patients and patients' advocates<br>• Awareness of the existence and risks of treatment-related problems including:<br>◦ Chronic fatigue<br>◦ Pain, disabling neuropathy<br>◦ Skin, mucosal and dental problems<br>◦ Second primary cancers (treatment-related, genetics-related or developing as the population ages)<br>◦ Cardiovascular risk and early symptoms such as hypertension and shortness of breath<br>◦ Cognitive dysfunction<br>◦ Urological problems<br>◦ Gastrointestinal problems<br>◦ Changes due to cancer treatment, including premature menopause, bone loss with the possibility of subsequent osteoporosis, infertility, impotence and sexual dysfunction<br>◦ Anxiety, depression and loss of self-esteem and confidence<br>◦ Relational, social and financial impact (eg, retention to, resume work, inaccessibility to insurance and mortgages)<br>• Awareness of the signs or symptoms of cancer recurrence or treatment-related side effects and the use of diagnostic imaging modalities as indicated by best practice or guideline recommendations including:<br>◦ Thorough investigation of new or persistent symptoms as clinically indicated<br>◦ Indications for screening including imaging modalities and blood tests based on the primary cancer<br>◦ The screening, detection and treatment of anxiety, depression, suicidal tendency and socioeconomic problems<br>◦ The recognition that some new cancers and medical problems will occur in the course of normal ageing and that cancer survivors should receive routine standard preventative health maintenance (eg, immunisations, preventive screening for diabetes, hypertension etc); for this reason, a shared-care model between the oncologist and the general practitioner delivers the most comprehensive care to promote wellness among cancer survivors |
| Knowledge | • Familiarity with the risks of long-term and late effects of different cancer treatments and the interaction with comorbidities, medications, lifestyle, age and family risk<br>• Familiarity with the indications for and the limitations of the different diagnostic imaging modalities for screening for cancer recurrence and second cancers, as well as their psychological and financial impact<br>• Understanding of the importance of offering individualised treatment based on age, comorbidities, lifestyle, family history and cancer recurrence risk<br>• Understanding of the importance of educating patients, family, caregivers and primary care providers about the risks of cancer recurrence, familial/genetic risks, long-term and late side effects and maintaining healthy lifestyles |
| Skills | • Ability to contribute actively to multidisciplinary discussions and patient presentations taking into account age, sex, cancer recurrence risk, lifestyle, comorbidities and consequences of cancer treatments<br>• Ability to discuss critically the treatment options/recommendations of screening for cancer recurrences and second cancers, long-term and late effects, promoting empowerment and wellness among survivors and their families/caregivers by teaching or referring them to programmes/primary care providers that emphasise the importance of adopting healthier lifestyles and the importance of obtaining routine preventative healthcare<br>• Ability to perform a thorough history, physical examination, laboratory studies and diagnostic imaging as indicated for new or persistent symptoms in cancer survivors<br>• Ability to discuss secondary prevention strategies with patients, family and related specialists<br>• Ability to discuss potential social challenges patients may face, such as job interruption during treatment |

## References


1. ASCO survivorship compendium clinical resources, 2015. https://www.asco.org/practice-guidelines/cancer-care-initiatives/prevention-survivorship/survivorship/survivorship-compendium
2. Oncoline. Cancer rehabilitation, 2011. http://www.oncoline.nl/cancer-rehabilitation
3. Oncoline. Cancer survivorship care, 2011. http://www.oncoline.nl/cancer-survivorship-care
4. van Halteren H, ed. *ESMO handbook on rehabilitation issues during cancer treatment and follow-up*. Viganello–Lugano: ESMO Press, 2014. http://oncologypro.esmo.org/Publications/Handbooks/Rehabilitation-Issues-During-Cancer-Treatment-and-Follow-Up

## 10 BIOETHICAL, LEGAL AND ECONOMIC ISSUES

### 10.1 Bioethical and legal issues

**Johannes G Meran**
**Mark Robson**

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| Objectives | • To be able to integrate ethical and legal rules into the care of patients with cancer |
| Awareness | • Appreciation of the importance of the legal requirements for obtaining informed consent and the ethical duty of guiding patients to make appropriately informed decisions through shared decision-making<br>• Awareness of the existence of situations raising conflicting ethical principles in the care of cancer patients<br>• Awareness of the existence of different ethical approaches that guide the care at the end of life<br>• Recognition of the availability of ethical counselling in problematic or conflicting situations<br>• Appreciation of conflict of interest within the delivery of patient care and within the field of research<br>• Recognition of legal and ethical issues associated with conduct of clinical trials<br>• Appreciation of the importance of genetic counselling for assessment of genetic susceptibility and treatment decisions<br>• Appreciation of the importance of technology assessment for new treatment options<br>• Awareness of the ethical issues of big data and privacy |
| Knowledge | • Knowledge of the Good Clinical Practice (GCP) guidelines<br>• Familiarity with the ethical principles of respect for autonomy, beneficence, non-maleficence, justice and truthfulness<br>• Familiarity with key ethical principles and local legal statutes that guide limits of treatment at the end of life<br>• Familiarity with the necessity of setting shared treatment goals at the end of life, including decisions regarding life-sustaining treatments<br>• Familiarity with guidelines that define conflict of interest (and declaration thereof)<br>• Familiarity with guidelines and local statutes that regulate data protection and privacy rights with regard to genetic information and tissue-banking<br>• Familiarity with principles informing the ethical conduct of clinical trials |
| Skills | • Ability to communicate basic ethical and legal principles with patients and relatives<br>• Ability to guide patients through the process of obtaining (or withdrawing) informed consent for clinical and research procedures<br>• Ability to guide and discuss critically advance directives and surrogate decision-making options with capable patients, including advance care planning issues<br>• Ability to discuss treatment and goals of care at the end of life with capable patients, including advance care planning<br>• Ability to work with surrogate decision makers according to the legal rules<br>• Ability to discuss the ethical and local legal issues relevant to euthanasia, assisted suicide and allowing natural death<br>• Ability to provide palliative care for the dying, including palliative sedation within the local legal scope<br>• Ability to discuss patient rights guiding the appropriate conduct of clinical studies<br>• Ability to discuss ethical dimensions of randomisation, stopping rules and confidentiality in clinical trials<br>• Ability to contribute actively and to prepare arguments in clinical–ethical rounds<br>• Ability to apply the rules of GCP while performing clinical studies |

## Reference

1. Beauchamp TL, Childress JF. *Principles of biomedical ethics*, 7th edn. Oxford: Oxford University Press, 2013.

## 10.2 Economic issues of new cancer drugs

**Lowell Schnipper**
**Richard Sullivan**

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| Objectives | • To be able to determine the highest-value agents or regimens — the optimal combination of clinical benefit, toxicity and cost—for a specific clinical indication |
| Awareness | • Appreciation that there is broad array of single agents or combination therapies that have proven efficacy for the same disease scenarios<br>• Awareness that there is variability in the quality of the evidence describing the clinical utility of cancer drugs<br>• Awareness that there is variability in the relative effectiveness of these agents in the same adjuvant or advanced disease settings<br>• Awareness that there are varying breadths and levels of toxicity associated with antineoplastic agents and combination therapies<br>• Appreciation that these agents and their combinations vary widely in cost<br>• Appreciation that the costs of medicines have very different impacts on healthcare budgets depending on country |
| Knowledge | • Understanding of the multiplicity of factors underlying the rapidly rising costs of cancer care in one's own national environment and worldwide<br>• Understanding of the specific role that new antineoplastic agents have in contributing to this rise<br>• Familiarity with the approaches that health economists employ to quantify value, eg, determination of quality-adjusted life years (QALYs), cost-effectiveness ratios etc<br>• Understanding of the mechanisms for financing healthcare in one's nation of residence<br>• Familiarity with the approach that various nations use to perform health technology assessments<br>• Familiarity with the formal value assessment tools that have been developed by ESMO, ASCO and the National Comprehensive Cancer Network (NCCN)<br>• Familiarity with the pathways that have been and are under development to guide high-quality, cost-effective cancer care<br>• Familiarity with the macroeconomics of cancer care<br>• Familiarity with the tools designed to enable use of the value frameworks in shared decision-making with patients |
| Skills | • Ability to apply one or several of the value assessment tools generated by ESMO, ASCO or NCCN to new cancer drugs or regimens that have been approved for use<br>• Ability to use communication skills that facilitate conversations with patients and families about the cost of cancer care, and particularly as it relates to the expense that they are personally responsible for<br>• Ability to use clinical and communication skills that enable communication at the end of life that emphasise when costly anticancer drugs are likely to be helpful, and when their use is likely to be counterproductive to the patients' well-being |

### References

1. Ades F, Senterre C, de Azambuja E, *et al*. Discrepancies in cancer incidence and mortality and its relationship to health expenditure in the 27 European Union member states. *Ann Oncol* 2013;24:2897–902.
2. Chalkidou K, Marquez P, Dhillon PK, *et al*. Evidence-informed frameworks for cost-effective cancer care and prevention in low, middle, and high-income countries. *Lancet Oncol* 2014;15:e119–31.
3. Cherny NI, Sullivan R, Dafni U, *et al*. A standardised, generic, validated approach to stratify the magnitude of clinical benefit that can be anticipated from anti-cancer therapies: the European Society for Medical Oncology Magnitude of Clinical Benefit Scale (ESMO-MCBS). *Ann Oncol* 2015;26:1547–73.
4. Collingridge D, Sullivan R. Affordable cancer care: pipedream or achievable reality? *Lancet Oncol* 2014;15:257–8.
5. Davis C. Drugs, cancer and end-of-life care: a case study of pharmaceuticalization? *Soc Sci Med* 2015;131:207–14.
6. Fojo T, Lo AW. Price, value, and the cost of cancer drugs. *Lancet Oncol* 2016;17:3–5.
7. Jönsson B. Ten arguments for a societal perspective in the economic evaluation of medical innovations. *Eur J Health Econ* 2009;10:357–9.
8. Jönsson B. Technology assessment for new oncology drugs. *Clin Cancer Res* 2013;19:6.
9. Porter ME. What is value in healthcare? *N Engl J Med* 2010;363:2477–81.
10. Smith S, Brick A, O'Hara S, *et al*. Evidence on the cost and cost-effectiveness of palliative care: a literature review. *Palliat Med* 2014;28:130–50.

## 11 CANCER CARE DELIVERY IN LOW-RESOURCE ENVIRONMENTS

**Alexandru Eniu**

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| Objectives | • To be able to understand the challenges of treating cancer with limited resources |
| Awareness | • Awareness of the existence of vast heterogeneity among low- and middle-income countries (LMCs) in terms of available resources, public policy-related and social conditions and healthcare infrastructure<br>• Awareness of the existence of important discrepancies in cancer treatment outcomes across the globe<br>• Appreciation of the principles of cancer prevention in limited-resource environments<br>• Awareness of the variability of access to radiotherapy and cancer medicines across the globe |
| Knowledge | • Familiarity with the epidemiology of cancer in LMCs, including incidence and mortality rates by regions of the world<br>• Understanding of the challenges that the current trends and the cancer epidemic will bring to LMCs<br>• Understanding of the aetiology of cancer in LMCs, particularly as related to infectious diseases<br>• Familiarity with interventions for cancer prevention and early detection in LMCs<br>• Understanding of common barriers to cancer control in LMCs, including public awareness and education, healthcare provider training and workforce issues, financial resources and governmental prioritisation<br>• Familiarity with the important discrepancies in availability of cancer care, in terms of cancer medication, access to radiotherapy and quality surgery<br>• Understanding of the construct of the WHO Essential Medicines List<br>• Familiarity with the concept of resource-stratified treatment guidelines<br>• Familiarity with the practice of multidisciplinary management of patients with cancer |
| Skills | • Ability to find, report and critically discuss epidemiological evidence from LMCs<br>• Ability to contribute to discussions on general management strategies of cancer in LMCs, including prevention<br>• Ability to discuss the content of the WHO Essential Medicine List for cancer<br>• Ability to discuss the practical application of resource-stratified guidelines |

### References


1. Anderson BO, Yip CH, Smith RA, *et al*. Guideline implementation for breast healthcare in low-income and middle-income countries: overview of the Breast Health Global Initiative Global Summit 2007. *Cancer* 2008;113(8 Suppl):2221–43.
2. Eniu A, Carlson RW, El Saghir NS, *et al*. Breast Health Global Initiative Treatment Panel. Guideline implementation for breast healthcare in low- and middle-income countries: treatment resource allocation. *Cancer* 2008;113(8 Suppl):2269–81.
3. Distelhorst SR, Cleary JF, Ganz PA, *et al*. Breast Health Global Initiative Global Summit on Supportive Care and Quality of Life Consensus Panel Members. Optimisation of the continuum of supportive and palliative care for patients with breast cancer in low-income and middle-income countries: executive summary of the Breast Health Global Initiative, 2014. *Lancet Oncol* 2015;16: e137–47.
4. El-Saghir NS, Charara RN, Kreidieh FY, *et al*. Global practice and efficiency of multidisciplinary tumor boards: results of an ASCO international survey. *J Global Oncol* 2015;1:1–8. http://jgo.ascopubs.org/content/early/2015/09/30/JGO.2015.000158
5. Stewart BW, Wild CP, eds. *World Cancer report 2014. The International Agency for Research on Cancer, 2014*. http://apps.who.int/bookorders/anglais/detart1.jsp?codlan=1&codcol=80&codcch=275
6. Global cancer surgery. *Lancet Oncol* 2015. http://www.thelancet.com/commissions/global-cancer-surgery
7. Responding to the cancer crisis: expanding global access to radiotherapy. *Lancet Oncol* 2015. http://www.thelancet.com/commissions/radiotherapy
8. WHO Model Lists of Essential Medicines. http://www.who.int/medicines/publications/essentialmedicines/en/
9. Yip CH, Cazap E, Anderson BO, *et al*. Breast cancer management in middle-resource countries (MRCs): consensus statement from the Breast Health Global Initiative. *Breast* 2011;20(Suppl 2):S12–19.


## 12 SKILLS

**Michael Kosty**

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| Objectives | • To understand how to prescribe anticancer agents for the treatment of solid tumours and haematological malignancies<br>• To understand the indications for and interpretation of bone marrow aspiration and biopsy<br>• To understand the use of Ommaya reservoir and lumbar puncture for the administration of intrathecal cytotoxic agents<br>• To understand the indications for thoracentesis and paracentesis, and the role of intraperitoneal chemotherapy in the management of selected intra-abdominal tumours |

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| | • To be able to assess treatment response to therapy using standard Response Evaluation Criteria in Solid Tumours (RECIST) or criteria appropriate to the specific tumour type (eg, Prostate Cancer Working Group criteria) |
| Awareness | • Awareness of the interpretation of bone marrow aspirates and biopsies, including the role of cytogenetic, immunohistochemical and flow cytometric analysis<br>• Appreciation of the effectiveness and potential toxicities of treatments administered intrathecally, including the appropriate doses, which agents can be safely administered intrathecally, and potential toxicities of drugs administered intrathecally<br>• Recognition of the specific indications for intraperitoneal therapy, including the limitations, contraindications and effectiveness of treatment administered by this route<br>• Appreciation of the definitions of complete and partial response, stable disease and progressive disease and of the significance of clinical benefit, and how often assessments of response to therapy should be undertaken |
| Knowledge | *Anticancer agent administration*<br>• Familiarity with the indications for each antineoplastic agent prescribed, including the role of monotherapy and combination therapy; this familiarity should include appropriate dose adjustments for toxicity, haematological, hepatic and renal dysfunction<br>• Knowledge of how to prescribe and safely administer anticancer agents by oral and parenteral routes<br>*Bone marrow aspiration, biopsy and interpretation*<br>• Familiarity with the interpretation of marrow aspirations and biopsies based on fundamental knowledge about marrow interpretation<br>*Ommaya reservoir and lumbar puncture*<br>• Familiarity with the indications<br>*Paracentesis, thoracentesis*<br>• Familiarity with the indications for, complications of, diagnostic and therapeutic thoracentesis and paracentesis, including appropriate laboratory evaluation of the specimen obtained<br>• Knowledge of the techniques of paracentesis and thoracentesis<br>• Familiarity with the indications for and administration of intraperitoneal chemotherapy, and the use of sclerosing agents for management of malignant pleural effusions<br>• Familiarity with the complications of these techniques and their management<br>*Tumour assessment*<br>• Knowledge how to assess tumour size and response to therapy by physical examination and radiological techniques<br>• Familiarity with RECIST and definitions of complete and partial responses, stable disease and progressive disease<br>• Understanding of the appropriate use of radiological studies in the initial staging of patients and in the monitoring of response to treatment |
| Skills | • Ability to write appropriate orders for administration of antineoplastic agents, including relevant supportive care drugs and dose modifications based on current laboratory parameters and prior toxicities<br>• Ability to care and access indwelling venous catheters<br>• Ability to handle chemotherapeutic and non-chemotherapeutic anticancer agents<br>• Ability to perform supervised bone marrow aspiration and biopsies that includes obtaining appropriate consent, performing the procedure with minimal patient discomfort and basic interpretation of the results<br>• Ability to perform supervised intrathecal administrations of chemotherapy by lumbar puncture and/or Ommaya reservoir, a subcutaneous device<br>• Ability to administer chemotherapy through an Ommaya reservoir including obtaining appropriate consent, performing the procedure with minimal patient discomfort and treating potential complications of the procedure<br>• Ability to discuss the indications, contraindications and efficacy of intraperitoneal chemotherapy<br>• Ability to assess the response to therapy using standard RECIST or other appropriate criteria, including which imaging modalities are most appropriate for initial assessment of disease status, as well as subsequent assessments |

## References


1. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *Ann Oncol* 2004;15:1603–12.
2. Hansen HH, Bajorin DF, Muss HB, *et al*. ESMO/ASCO Task Force on Global Curriculum in Medical Oncology. Recommendations for a Global Core Curriculum in Medical Oncology. *J Clin Oncol* 2004;22:4616–25.
3. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. https://www.esmo.org/content/download/8171/168764/file/ESMO-ASCO-Revised-Recommendations-for-a-Global-Curriculum-in-Medical-Oncology.pdf
4. ESMO/ASCO recommendations for a Global Curriculum in medical oncology, 2010 update. http://www.asco.org/sites/default/files/esmo-asco_revised_recommendations.pdf
5. ACGME Program Requirements for Graduate Medical Education in Medical Oncology (Internal Medicine), 2015. https://www.acgme.org/acgmeweb/Portals/0/PFAssets/ProgramRequirements/147_medical_oncology_int_med_07012015.pdf

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TN has ownership interest with Bioclassifier LLC; has role for invention of PAM50 breast cancer assay, which has been licensed to NanoString technologies and being marketed as Prosigna; has served as a consultant for NanoString. KÖ received speaker bureau from Novartis, Ipsen. PÖ received consulting fees, honoraria, travel grants or lecturing fees from Amgen, Bayer, Baxalta, Celgene, EliLilly, Merck, Nordic Drugs, Prime Oncology, Sanofi Oncology. AP received honoraria and consultancy fee from Amgen, Novartis, Bristol-Myers Squibb, Genmab A/S, Celgene, Janssen-Cilag, Millennium Pharmaceuticals, Onyx Pharmaceuticals, Sanofi Aventis. MR received honoraria from AstraZeneca; has served in a consulting or advisory role for Bayer, Pfizer, McKesson; received research funding from AstraZeneca (to Institution), AbbVie (to Institution), Myriad Genetics (to Institution), Biomarin (to Institution); received travel, accommodations, expenses from AstraZeneca, Biomarin. LS has served in a consulting or advisory role for bioTheranostics. MS conduct research sponsored by AstraZeneca, Bayer, Eisai, Exelixis, Genzyme. H-JS is an advisor for Roche, Bayer. LS has served in leadership for Eviti; has served in a consulting or advisory role for Merck; has patents, royalties, other intellectual

property; as Co-Editor-in-Chief of *UpToDate*, *Oncology*. JS is an employee of Genentech; received honoraria, speakers' bureau, travel, accommodations, expenses from Genentech. CNS received honoraria or research grant from Novartis, GSK, Pfizer, Merck, Lilly, BMS, Astellas, Bayer, Janssen, Sanofi. FS received unrestricted industry grants for clinical research from Celgene, Fresenius, Helsinn; FS participates in Novartis-lead clinical trials and received punctual advisorship (boards, expert meetings) from Acacia, ACRAF, Amgen, Baxter, Celgene, Danone, Fresenius, GlaxoSmithKline, Grünenthal, Helsinn, ISIS Global, Millennium/Takeda, Mundipharma, Novartis, Novelpharm, Nycomed, Obexia, Otsuka, Ono, Pharm-Olam, Pfizer, Psioxus, PrIME, Santhera, Sunstone, Teva, Vifor. RS received honoraria or consulting fee (paid to institution) from Roche, Merck KGaA/EMD-Serono, MSD/Merck & Co, Pfizer, Ipsen Pharma, Novartis. JT has worked in a consultant/advisory role for Amgen, Bayer, Boehringer Ingelheim, Celgene, Chugai, Lilly, MSD, Merck Serono, Novartis, Pfizer, Roche, Sanofi, Symphogen, Taiho and Takeda. EV has stock and other ownership interests with McKesson; has worked in a consulting or advisory role for Abbvie, AstraZeneca, Boehringer Ingelheim, Celgene, Clovis Oncology, GeneCentric, Genentech, Merck, Synta, VentiRx, Eisai, Lilly, Transgene; received speakers' bureau for Amgen; received research funding from Abbvie (to Institution), Bristol-Myers Squibb (to Institution), Gen Vec Inc, (to Institution), Sanofi (to Institution), Monsanto (to Institution), Cyclacel (to Institution); received travel, accommodations, expenses from Amgen. JSW has stock and other ownership interests with Altor BioScience, Celldex, cCam Biotherapeutics; received honoraria from Bristol-Myers Squibb, Merck, Genentech, Abbvie, AstraZeneca, Daiichi Sankyo, GlaxoSmithKline, Eisai, Altor BioScience, Lion Biotechnologies, Amgen, Roche, Ichor Medical Systems, Celldex, cCam Biotherapeutics, Pieris; has worked in a consulting or advisory role for Celldex, Ichor Medical Systems, cCam Biotherapeutics, Lion Biotechnologies, Pieris, Altor BioScience, Bristol-Myers Squibb, Merck, Genentech, Roche, Amgen, AstraZeneca, GlaxoSmithKline, Daiichi Sankyo, Abbvie, Eisai; received research funding from Bristol-Myers Squibb (to Institution), Merck (to Institution), GlaxoSmithKline (to Institution), Genentech (to Institution), Astellas Pharma (to Institution), Incyte (to Institution), Roche (to Institution), Novartis (to Institution); received travel, accommodations, expenses from Bristol-Myers Squibb, GlaxoSmithKline, Daiichi Sankyo, Pieris, cCam Biotherapeutics, Lion Biotechnologies, Roche, Celldex, Amgen, Merck, AstraZeneca, Genentech.

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## Notes