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THE EUROPEAN SOCIETY OF SURGICAL ONCOLOGY

# Core Curriculum

U.E.M.S.

2013

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## ESSO Curriculum Committee

The Core Curriculum has been developed and approved by the ESSO Curriculum Committee with contributions from expert advisors from within the European Society of Surgical Oncology (ESSO), the European Society for Medical Oncology (ESMO), the European Society for Radiotherapy and Oncology (ESTRO) and the European Association for Cancer Research (EACR). The content of the curriculum has been reviewed and approved by the American Society of Surgical Oncology (SSO).

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# European Surgical Oncology Training

## Introduction

Over the past 4 decades cancer care has undergone a revolution. No longer is surgery the only treatment for most solid malignancies but adjuvant therapies with highly focussed radiotherapy, targeted molecular therapies and multi-modal chemotherapy are the standard of care. These multi-modal treatment regimes have had a great impact on cancer survival rates, as have improved diagnostics (for example screening for breast, cervical and bowel cancer). Forty years ago the general surgeon would often be the only specialist to have contact with most cancer patients but had little knowledge of the broader aspects of cancer care. Today, general surgeons can no longer work in isolation and must be part of a multi-disciplinary team. The surgeon must be more than just a technician and must understand the contributions made by other disciplines and how this may impact on the type and timing of surgery: he/she must be a Surgical Oncologist. Excellent examples are the use of neoadjuvant chemotherapy or radiotherapy, which may render surgery possible or minimise its impact.

The technical side of surgery has also been transformed in the past few decades with advances in minimally invasive cancer surgery, improved understanding of surgical margins (the TME in rectal cancer for example), robotic surgery, reconstructive surgery and enhanced recovery programmes to name but a few.

For senior surgeons, keeping up to date with these advances requires dedication and a significant commitment to continuous medical education, in all its various forms, across Europe[1].

## Training in Surgical Oncology

The modern cancer surgery trainee is faced with the daunting task of mastering a subject of unprecedented complexity, which is continuously and rapidly evolving. High quality training, ensuring exposure to all treatment modalities in the cancer armamentarium and adequate levels of direct procedural 'hands on' training is essential. The ability to provide this is hampered by the restrictions imposed by the European Working Time Directive[2-3]. It is therefore essential that training for surgical oncologists be fit for purpose. Moreover, the right to practice of EU trained doctors and specialists in all EU member states, enshrined in EU law, means that harmonisation of training is more essential than ever if patient care is to be optimised and standardised.

In 2008 Professor Peter Naredi and colleagues proposed a core curriculum for specialist trainees in surgical oncology[4-5]. The curriculum set out a series of recommendations for the knowledge and skills required by oncology surgeons in Europe and the optimal facilities required by an ideal training centre in the hope that this would stimulate and harmonise improved training. This would help to ensure that patients in all European member states would have access to the same standard of care, facilitate training opportunities for junior surgeons and encourage the rapid dissemination of new knowledge across Europe by enhancing ease of mobility for specialists. Links with, and standardisation with, similar initiatives in the USA (led by the American Society for Surgical Oncology, SSO) would also help to facilitate global improvements in knowledge transfer and care standardisation.

## European Law

European Community Law aims to ensure that European member states mutually recognise the qualifications of doctors to facilitate freedom of movement of individuals within Europe[6]. As most European member states operate different courses and issue different qualifications this has been quite difficult to achieve. In 1996, European member states agreed to mutually recognise each other's primary medical qualifications and mechanisms are in place to allow a medical practitioner to have their basic medical qualifications recognised in each European member state. In addition, there is also provision for the recognition of specialist qualifications, so a doctor who is a fully trained anaesthesiologist in Germany should be able to take up a post as an anaesthesiologist in the UK for example.

This system seems to work well for fully qualified specialist practitioners and for very junior doctors at the start of training. It is more problematic for partly trained doctors due to differences in training programmes between member states which can result in significant problems, especially for trainees who wish to move outside their primary training territory to undertake a fellowship for example.

Standardisation and harmonisation of training would undoubtedly facilitate such mobility and enable enhanced training opportunities within member states.

## Surgical Oncology in Europe

At present, there is no pan-European Training Programme in Surgical Oncology and no standard form of accreditation for Surgical Oncologists in Europe. Indeed, Surgical Oncology is not recognised as a specialist discipline in many European countries. Most European Member states have their own professional bodies, which regulate surgical training and accreditation. In many cases, the accreditation is speciality specific (breast, colorectal, upper GI, etc) and therefore puts a broad emphasis on all diseases and techniques within an anatomic area. Whilst cancer surgery often forms a significant part of these disciplines, for many surgeons, complex oncological procedures will be undertaken infrequently or referred into highly specialised tertiary referral centres with high case loads. Examples include HIPEC, sarcoma surgery, isolated limb perfusion, liver resection and laparoscopic cancer surgery. This is widely recognised to improve surgical outcomes[7-9].

Outside of Europe and in other oncology disciplines, progress towards specialist accreditation has been greater: in the USA, Advanced Surgical Oncology was provisionally recognised as a sub-specialty area with its own certification by the American Board of Surgery (2009)[10]. A certifying examination will run alongside designated training programmes in US Institutions, although the number of such training slots per year is still small. In the US, despite pressure from the SSO to have designated surgical oncology training and certification for well over 20 years, the majority of oncological procedures are still performed by generalists with no specific oncology training. It is hoped that this new sub-speciality recognition, along-side focused and advanced training and examination, will improve the situation.

Medical and radiation oncologists in Europe have also achieved progress in the standardisation of their training. ESTRO, the European Society for Therapeutic Radiotherapy and Oncology, developed a curriculum for radiotherapy training in 1991[11]. This document led to improvements in standardisation of radiation oncology training across Europe. It was updated in 2002[12] and again in 2010[13]. The most recent iteration sets out in detail the knowledge and skills required for all radiation oncology trainees and makes recommendations for assessments to monitor and assess progress. It recommends 360° feedback, workplace based assessments (mini Clinical Examination Exercises, CEX), portfolio and logbook review and regular progress interviews.

Medical oncology has also established a core curriculum. In 2004, in collaboration with the American Society for Clinical Oncology (ASCO), ESMO published a core curriculum in medical oncology[14-15].

The main argument against a specialism of Surgical Oncology is that it would not be possible for a single surgeon to have the expertise to perform a full range of oncological procedures ranging from pancreatico-duodenectomy to breast reconstruction, oesophagogastrectomy to radical neck dissection. This is indeed the case and is a situation which will become more marked with further technological advances. However within each sub-specialist area there is much shared knowledge and expertise (basic biology of cancer, radiotherapy effects and uses, targeted molecular therapies) and in many cases, cross-fertilization of techniques and ideas between site-specific disciplines has much to offer. It is envisaged that the 'Advanced Surgical Oncologist' will have a broad base of relevant knowledge that transcends site specialisation. This should be supplemented with a high level of advanced knowledge and technical expertise and experience in the practical conduct of the surgical procedures relevant to their main disease site of interest.

## The European Union of Medical Specialists (UEMS) and the European Board of Surgery Qualification (EBSQ)

The UEMS was established in 1958 to promote the free movement of medical specialists within Europe and to ensure the highest standards of medical care. It contains 37 specialist sections, representing 35 countries and includes the European Board of Surgery (EBS). The European Board of Surgery runs a number of Specialist Examinations once or twice per year. These were first established in 1996 in a limited number of sub-specialist areas. The number of sub-specialist exams has progressively increased such that they are now available in Coloproctology, Trauma Surgery, General Surgery, Surgical Oncology, Thoracic Surgery, Transplant Surgery, Transplant Medicine, Transplant Coordination, Endocrine Surgery, HPB Surgery and Hand Surgery. The most recent sub-specialist area to offer an EBSQ is Breast Surgery, which was launched in 2010. The European Society for Surgical Oncology (ESSO) in collaboration with the EBS runs two of these examinations: the European Board of Surgery Qualification (EBSQ) in Surgical Oncology (commenced 2003) and the EBSQ in Breast Surgery (a joint initiative with the European Society of Breast Cancer Specialists, EUSOMA).

The aim of these qualifications is to provide evidence of expertise in the subject at a level that would be acceptable in all European Countries and to act as a quality standard.

The first part of the assessment process for the EBSQ in all specialist areas is a formal review of experience, qualifications and academic outputs. The eligibility criteria are demanding but vary slightly between sub-specialist areas.

- Candidates must have completed specialist training in their chosen surgical discipline.

- Log Book: Candidates must submit a logbook demonstrating the number of cases they have performed of certain index procedures. These may be objectively assessed by the exam board or more objectively assessed against a set of predefined index cases.
- Training duration and quality: Candidates must submit a CV detailing the centres in which they have undergone training. It is usually specified that candidates must have completed their common General Surgical training and then undergone a variable period of training in nationally recognised centres of expertise in their specialist area.
- Referees: Candidates must have signed references from at least 1 of their trainers.
- Academic outputs: Candidates must submit evidence of peer-reviewed publications, conference presentations and training courses they have attended. These may be subjectively assessed by the exam board or more objectively by using a minimum number or a points-based system.

The part II EBSQ examinations also vary slightly in structure and content. They are held between once and 3 times per year. They usually comprise a variable combination of either a multiple choice question (MCQ) written exam, one or more viva voce examinations or an objective structured clinical examination (OSCE).

The details of the eligibility criteria and formats for the different exams are summarised in Table 1.

| Sub-specialist area | Surgical Oncology | Breast | Colo-proctology | Hepatopan-creatobiliary | Endocrine | General Surgery |
|---|---|---|---|---|---|---|
| **Year of inception** | 2003 | 2010 | 1998 | 2009 | 2003 | 1996 |
| **MCQ** | Yes | Yes | No | No | No | No |
| **Oral exam format** | Two viva voce exams | Two viva voce exams on breast topics & critique of scientific paper | Three viva voce exams on case discussion, scientific paper and diagnostic tests | Four viva voce exams on basic science, liver, pancreas and topic presentation | Two viva voce exams on basic science and clinical issues and scientific critique | One viva voce followed by an OSCE exam |
| **Duration and quality of training** | Two years in specialist surgical Oncology Unit (or equivalent) | One year in a Unit treating over 150 breast cancer cases/ year | Two years of training in nationally recognised coloproctology unit. | Two years of post CCST HPB training | Reviewed but no minimum standard set | Minimum of 3 years of Post-CCST training |
| **Academic achievements** | Curriculum sets out a points based scoring system | Attended 1 breast training course and 1 international meeting | Points system used to assess publications and presentations | Points system used to assess publications and presentations | Reviewed but no minimum standard set | Points system used to assess publications and presentations |
| **Log book** | Curriculum sets out a points based scoring system | Specified numbers of index cases and clinical experience | Specifies 400 coloproctology cases generally and specific numbers of index procedures | Specifies number of HPB Index cases | Specifies a minimum number of index cases as set out in a curriculum | Specifies minimum number of cases using a points based system |
| **Examination frequency** | Annual | Biannual | Triannual | Annual | Annual | Annual |

Table 1. Summary of the EBSQ examinations by Sub-Specialist Area

## Curricula

Running along-side the examinations are core curricula, which are intended to serve as knowledge templates for specialist surgeons. Once again, these vary in the level of detail specified according to sub specialist area. The Core Curriculum for Surgical Oncology can be downloaded from the ESSO and UEMS websites: (http://www.bdc.de/bdc/uems/uems.nsf/0/b3f86d2e653b42dbc12573a2004efcc5/$FILE/Core_Curriculum.pdf). The equivalent curricula for the other sub-specialist exams are variably available from the UEMS website.

## European Training Centres in Surgical Oncology

Training for surgical oncologists is provided by European member state accredited general surgical training programmes, in most cases supplemented with a senior level fellowship in a centre of excellence for 1 or 2 years. The latter will give the trainee advanced level competencies in surgical oncology. Such programmes should include the following:

- Regular attendance at multi-disciplinary team meetings (MDTs).
- Regular professional contact with medical and radiation oncologists.
- Access to high quality medical imaging including MRI and PET-CT.
- Access to high quality pathology services, including a wide range of extended assessments such as cytogenetics, mutational analysis and immunohistochemistry.
- Regular progress reviews with formative and summative assessments of competencies in both surgical technical skills and non-surgical competencies such as communication skills, decision-making and diagnostics.

## Training Courses

The ESSO Core Curriculum is intended to act as a guide for the requisite level of knowledge both for the practice of surgical oncology but also for the EBSQ examination in surgical oncology.

## Core Curriculum in Surgical Oncology

It is expected that a surgical oncologist will have a basic level of knowledge of all areas with advanced level knowledge of their own specialist subject. The following curriculum is divided into a basic principles section which has general relevance to all disease sites and a series of site specific sections. The latter have been divided into 2 parts: a basic level of knowledge which all surgical oncologists would be expected to have to permit recognition of areas where their practice may overlap or reflect a level of knowledge of a generalist and a specialist or advanced level of knowledge which would be expected of a practitioner who is practicing at the highest level in this field.

# 1. Basic Principles of Oncology

## 1.1. Carcinogenesis

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| **Cellular Mechanisms of Carcinogenesis** | **DNA Synthesis and Repair** | The mechanism of DNA synthesis, DNA to RNA transcription and RNA to protein translation. The mechanisms by which genetic code mutation occurs. Role of genes such as TP53 and other tumour suppressor genes. |
| | **Epigenetic Modification** | DNA may be modified by addition of other molecules to the DNA strand which alter transcription e.g. DNA methylation. This is recognised as an increasingly important mechanism of carcinogenesis. |
| | **Cell cycle regulation** | Role of the cell cycle in cancer promotion. The phases of the cell cycle, G1/S/G2 and M and the regulatory machinery, cyclins and cyclin dependant kinases, which control progress of cells between phases should be understood. Awareness of tumour suppressors which interact with these checkpoint regulators such as TP53, p38 and the RB protein. |
| | **Apoptosis** | The biological function of apoptosis and its role in tumour suppression should be understood. |
| | **The Telomere** | A key process in carcinogenesis is immortalisation by restoration of the telomere by an enzyme called telomerase which is up regulated in most cancers. Awareness of the role of the telomere and telomerase in cellular senescence and carcinogenesis. |
| | **Cell signalling cascades: kinases and phosphorylases** | Intracellular cascades which transmit regulatory signals both from outside and inside the cell are often controlled by the level of phosphorylation of the signalling molecules. Kinases are enzymes which de-phosphorylate and phosphorylases are enzymes which phosphorylate. Alteration in the levels of these regulatory enzymes is a common occurrence in cancerous cells and is implicated in the development of many types of cancer. Awareness of these regulatory pathways and some of the more common examples of how they may be dysfunctional in cancer. |
| | **Cell surface growth factor receptors** | Cells respond to external signals from hormones in their environment. Some inhibit cellular proliferation whilst others stimulate it. Up-regulation of stimulatory growth factor receptors is implicated in carcinogenesis. E.g. the Epidermal Growth Factor Receptor type 2 (Her-2) in breast cancer. Candidates should be familiar with some of the more common examples of growth factor receptor dysfunction in cancer. |
| | **Angiogenesis** | Cancers must induce the in-growth of new blood vessels to sustain growth once they exceed a few mm in size. They induce angiogenesis which involves a range of processes including endothelial cell proliferation, migration, tubule formation and extracellular matrix degradation. A wide range of mediators are released to stimulate this process |

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| | | including Vascular Endothelial Growth Factor (VEGF) and Platelet Derived Growth Factor (PDGF). Some of these regulatory molecules are now targets for molecular therapies (e.g. bevacizumab). |
| | **Oncogenes** | Oncogenes are genes whose activation stimulates or facilitates cancer development. There are numerous mechanisms by which this may occur, usually related to the cellular systems listed above. Familiarity with some of the more common oncogenes such as ras and myc. |
| | **Tumour Suppressor Genes** | Tumour suppressor genes are genes whose normal function is to protect cells from potentially carcinogenic processes such as DNA damage or unnecessary cell proliferation. Aberrations in the functions of these genes play an important role in both sporadic and some of the most widely known examples of hereditary cancers (TP53, RB, BRCA). |
| | **Metaboliser status** | Carcinogens are an important cause of cancer. Some chemical agents require metabolism by the body to become activated and some are innately active and the body metabolises them to deactivate them. There is a range of levels of function of the enzymes which either activate or deactivate carcinogens which is a significant cause of variability in a subject's sensitivity to certain carcinogens. Familiarity with the importance of these biological processes and how they may cause variability in cancer susceptibility. |
| | **Tumour Heterogeneity** | Aware of the increasing knowledge relating to tumour heterogeneity as identified by phenotypic and genotypic markers of single and multiple proteins and genes progressing from single receptors such as the oestrogen receptor in breast cancer to multi-gene arrays and most recently next generation sequencing. Understanding of the uses and implications of these tumour typing technologies in the evolution of personalised medicine |
| | **Tumour microenvironment** | Aware of the complex interactions of the tumour associated stroma and tumour associated cells such as macrophages, fibroblasts and endothelial cells and the complex interaction between the tumour cells and its microenvironment. These interactions are increasingly recognised as important in the development of cancer, for example distinct patterns of invasion and metastases. |

## 1.2. Carcinogens

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| **Carcinogens** | **Radiation** | **Therapeutic Radiation:** Knowledge of the balance between the curative and carcinogenic potential of radiotherapy. For example breast radiotherapy following breast conservation surgery results in a substantial reduction in the risk of local recurrence but a very small, delayed, risk of angiosarcoma.<br>**Diagnostic radiation**. Awareness of the radiation dose in a standard chest X ray, a CT scan and a mammogram and awareness of the carcinogenic potential of these imaging modalities.<br>**Hiroshima, Nagasaki and Chernobyl**: Familiarity with the dose; effect curves derived from the long term follow-up of the survivors of the nuclear attacks on Japan. For example, the increased risk of thyroid cancer following radiation exposure in survivors. |
| | **Viruses** | Certain viruses have a causal role in the development of cancer. In some cases the virus inserts genetic material into the host genome which triggers replication. In others, the virus causes tissue damage and the resultant chronic inflammation acts as a promoter for cancer. Some cause cancer by inducing an immune-compromised state. The following viruses are important in the aetiology of common cancers: Hepatitis B and C, Human Papilloma Virus, Human Herpes Virus, HIV, HTLV1, Epstein Barr Virus. |
| | **Disease processes** | Aware of the association between chronic diseases and the development of cancer. The aetio-pathogenesis is usually chronic inflammation and increased proliferation which acts as a promoter. The following diseases are causally linked to the development of cancer: Cirrhosis of the liver, Immunosuppression, lymphoedema, ulcerative colitis, reflux oesophagitis |
| | **Chemical Carcinogens** | Carcinogenic chemicals were the first agents to be recognised as aetiological factors in the development of cancer (scrotal cancer in chimney sweeps due to coal tar exposure). Awareness of chemical carcinogens, including the most widely known agents: asbestos, cigarettes, vinyl chloride, coal tar. |
| | **Diet and lifestyle** | The effect of lifestyle on the development of cancer. Awareness of the links between certain cancers and the following lifestyle choices: obesity, alcohol, exercise. |
| | **Hereditary Cancer Syndromes** | Some cancers have a familial risk due either to the effect of shared lifestyle, polygenic factors or powerful hereditary gene mutations which significantly elevate the risk of cancer. Awareness of the following genetic syndromes: BRCA 1 and 2, Hereditary Gastric Cancer Syndrome, HNPCC, FAP, Peutz Jeghers, Ataxia Telangiectasia, Retinoblastoma, Li Fraumeni, MENI and MENII. |

## 1.3. Epidemiology of Cancer

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| **Epidemiology of Cancer** | **Epidemiological outcomes** | Recognising the importance of epidemiology in the understanding of disease patterns, aetiology, trends and for monitoring treatment effects. The study of the distribution and determinants of disease in the human population. It identifies why different populations are at risk and enables us to understand the aetiology of a disease. At an individual level, it permits us to determine why an individual has developed a disease or what their risk of doing so may be.<br>Understanding of the following terms: prevalence, incidence, (absolute and age adjusted), mortality (absolute and disease specific), relative and absolute risks, lifetime risks. |
| | **Types of epidemiological research** | **Observational epidemiological research:** generates hypotheses about potential causation. Ideally this would be tested with a RCT but cohort or case control type studies may be used in some circumstances.<br>Clinical studies supplemented with basic science research to demonstrate a plausible biological mechanism. Understanding of Bradford Hill's criteria for causation. Understanding of the roles, indications for, strengths and weaknesses of different study types: cohort study, case control study, cross sectional studies, surveys, case series, case reports. |
| | | **Descriptive Epidemiology:** Describes how frequently cancer occurs in a population, e.g. incidence rates, prevalence and risks |
| | | **Analytic Epidemiology:** Analyses the underlying causes within a population by sub-group analysis, identifies aetiology. Identification of associations or links between disease in the population under study and the factor that may be causal. It usually looks at the observed (O) to expected (E) ratio of disease in 2 populations with or without the causal factor. The ratio of O to E gives the relative risk (RR).<br>The size of the RR can be analysed statistically to see if the linkage is likely to be significant or not. Subtypes include occupational, environmental, ethno-cultural, genetic. |
| | | **Genetic epidemiology:** Includes segregational analysis, linkage analysis, microsatellite studies, population based association studies and ultimately molecular genetics. Understanding of variable penetrance of different risk factors. Basic knowledge of mutations, polymorphisms, haplotypes and their inheritance. |
| | | **Exploratory studies:** Useful when the cause of a disease is not known Looks at all variables and attempts to find associations. Usually 2 populations are studied with high and low disease risk and data on as many characteristics is collected. Caution is needed as may be subject to bias. Useful for generation of hypotheses to be tested |
| | **Sources of bias in epidemiological studies** | **Recall bias:** Who can recall how much they weighed many years earlier for example. Problem with case control studies<br>**Response bias**: Are those who take part in the study different to those who do not.<br>**Berkson's bias**: Relates to bias in studying hospitalised patients, e.g. lung cancer and smoking. Smoking causes more hospitalisation than just lung cancer and the hospital population likely differs from the normal population in smoking rates.<br>**Confounding**: i.e. if 2 factors are linked such as obesity and diabetes, smoking and alcohol, smoking and poverty.<br>**Temporality:** In cohort studies this isn't a problem but in case controls, it is more difficult to be sure that exposure preceded the development |

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| | | of the disease.<br>**Stage migration:** Understanding the phenomenon of stage migration (Will Roger's) in explaining observed differences in clinical outcomes; for example the differences in survival following gastric cancer surgery between Japanese and Western populations. |

## 1.4. Screening for Cancer

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| **Screening for cancer** | **General principles of screening** | Principles of screening (Wilson and Jungner 1968): Important clinical disease, treatable, recognisable early or latent phase, effective, acceptable screening test available, cost efficacy. How current and investigational screening programmes measure up to these criteria. |
| | **Sources of bias** | Lead time, length and lag time bias: understand concepts and impact on outcomes of trials. |
| | **Risks of screening** | Over-diagnosis: understand concept and likely effect size in current screening programmes. |
| | | Over treatment: i.e. treatment for disease which would never have threatened life (low grade DCIS in an elderly female) may be treated with mastectomy with little or no benefit |
| | | Anxiety: understand sources of anxiety for screened individuals and how they may be offset or minimised. |
| | | Morbidity of the screening test: endoscopy, biopsy, radiation, pain, inconvenience. |
| | | Costs of screening both to the individual and the service provider (state run schemes). |
| | **Benefits of screening** | Earlier stage at diagnosis: aware of evidence from different cancer screening programmes. |
| | | Reduced treatment morbidity due to earlier stage: aware of evidence. For example reduced rate of mastectomy with breast screening. |
| | | Reduced mortality: aware of evidence for screening in all major cancer sites. |
| | **Types of screening** | **Breast cancer**. Screening modality, frequency, age range, efficacy and risks. High risk screening with MRI. |
| | | **Cervical cancer:** Screening modality, frequency, age range, efficacy and risks. |
| | | **Ovarian cancer**: evidence for and against, modalities under evaluation, on-going trials. |
| | | **Colorectal cancer**: modalities (endoscopic, Faecal occult blood), frequency, age range, risks and efficacy |
| | | **Gastric cancer**: modalities used (barium and endoscopic), which countries have programmes, efficacy and reason for non-utilisation in European states |
| | | **Prostate Cancer**: arguments for and against. Modality (PSA), on-going trials. Risks and benefits. |
| | | **Lung Cancer:** Current trials, (CT, blood tests), methods and arguments for and against. |

## 1.5. Clinical Trials and Research Methods

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| **Clinical Trials and Research Methods** | **Trial design** | **Randomised Controlled Trial:** Understanding of the principle of randomisation and why it is regarded as the gold standard trial design. Methods of randomisation. Blinding. Placebo controlled. Per protocol and intention to treat analysis. Instances where a randomised controlled trial is not appropriate or feasible. Understanding of the hierarchy of research evidence and its pre-eminence therein. |
| | | **Cohort study:** Understanding of the principles of this type of study, the potential for bias between groups, how to minimise this. Understanding differences between retrospective and prospective cohort studies. When such a methodology is (and isn't) appropriate. |
| | | **Case control:** Understanding of the principles of this type of study, the potential for bias between groups, how to minimise this. When such a methodology is (and isn't) appropriate. |
| | | **Phases I, II and III and IV trials**: Understanding the difference in design and intent. |
| | | **Qualitative research methods, questionnaire design and validation, quality of life methodologies:** Understanding of the appropriate indications for these methods, their limitations and strengths. |
| | | **Health economics**: Basic understanding of the importance of health economics to clinical practice. Understanding of Quality Adjusted Life Years (QALY). |
| | | **Systematic reviews and meta-analysis**: Understanding of how to perform a systematic literature review. The importance of meta-analysis, its limitations and strengths. |
| | | **Audit:** Understanding of the audit cycle and how to design and conduct a good quality audit project. Understanding the importance of audit in quality control and quality improvement. Awareness of key national and international audits related to surgical oncology practice. |
| | **Trial regulation** | **Research Ethics.** Aware of the declaration of Helsinki and the ethical issues relating to research. Aware of special issues relating to children and mentally incompetent adults (dementia, the unconscious patient). Understanding of the informed consent process. |
| | | **Monitoring and conduct:** Aware of National and European legislation. Aware of Good Clinical Practice (GCP) Guidelines. |
| | | **Data protection and confidentiality**: Aware of the need to protect patient confidentiality in all aspects of their clinical and research activities. Legal requirements specific to their National legislation. Aware of the security issues relating to electronic data storage devices. |
| | **Statistical analysis** | **Sample size calculation**: Understanding the importance of a pre-study sample size calculation, the parameters on which this is based and how this is performed. |
| | | **Statistical analysis techniques**: Understand null and alternative hypotheses, understand the appropriate use of a range of parametric and non-parametric tests for statistical analysis. Normal and non-normal population distribution. Type 1 and 2 statistical errors. P values and confidence intervals.<br>Able to critique a research paper in terms of its statistical design and analysis. |
| | | **Relative and absolute outcome measures**. Able to interpret data in a research paper. |

## 1.6. Radiation Biology

Richard Pötter, Austria and Jesper Grau Eriksen, Denmark

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| **Mechanism of action** | **Direct DNA damage** | Radiation (RT) induces DNA damage: normal cells can repair sub-lethal DNA damage whereas tumour cells often have relatively impaired repair mechanisms. This differential is exploited in RT. Radiation damage to the DNA may be as double strand breaks, single strand breaks, base damage and DNA-DNA and DNA-protein cross-links. |
| | **Oxygenation** | Oxygen stabilises radiation produced free radicals which then contribute to DNA strand breaks. Hypoxic areas of a cancer are therefore relatively radio-resistant. As a tumour shrinks during fractionated treatment, more areas become oxygenated and therefore sensitive to radiotherapy. |
| | **Radio-resistance** | Certain molecular markers suggest relative radio-resistance: hypoxia, P21 and P53 mutations and a low proliferation rate. Absence of HPV-influence in head and neck cancer patients (HPV-positive HNSCC are more radiosensitive). |
| **Types of radiotherapy** | **External beam** | May be delivered as electrons, photons or protons. Tumour targeting is achieved by beam collimation and image guidance, shielding and selection of the optimal type of radiation and energy which dictates the depth of penetration. Electrons are negatively charged sub atomic particles which have a relatively low penetration depth (up to ~6cm). Photons (X rays/gamma rays) are able to pass through the body (energy dependant) and can target tumours at any depth. Protons of a given energy have a certain range and very few protons penetrate beyond that distance. The dose delivered to tissue is maximum over the last few millimetres of the particle's range (Bragg peak). |
| | **IMRT** | Intensity modulated radiotherapy (IMRT); Highly targeted RT using computer and CT controlled multiple beams with automatic collimation in linear accelerators. Used in avoiding radiation damage to critical structures and target dose escalation such as CNS in sarcomas, parotid gland in head and neck cancers, bowel in prostate cancer etc. |
| | **Brachytherapy** | Direct placement of radioactive sources into the tumour or tumour bed. Able to deliver higher focal RT doses with relative sparing of normal tissue due to rapid dose fall-off around the sources. E.g. Iridium 192 after-loading for cervical and breast cancer, radioactive iodine seeds for prostate cancer. These produce mainly electrons and photons. |
| | **Intra-operative** | A number of applications for intra-operative radiotherapy such as in breast conservation surgery. |
| | **Stereotactic radiotherapy** | Systems such as cyber knife, external beam radiotherapy, tomotherapy, gamma knife or linear accelerator based used to deliver RT to the brain, liver and lung metastases and small primary tumours. They may achieve highly targeted treatment areas by means of multiple highly collimated beams with a need for precise fixation of the target area. |
| | **Proton therapy** | Protons can be precisely targeted, with little side scatter, at a well defined range and release most of their energy in the last few mm of this range. Protons are useful for specific indications (e.g. chordoma, occular melanoma). Limited equipment availability. |
| | **Radio-pharmaceuticals** | Use of Iodine 131 bound either to thyroxine or Meta Iodo Benzyl Guanidine (MIBG) to treat thyroid cancer or neuroendocrine tumours. |
| **Side effects** | **Acute (within 3 months after treatment)** | Skin desquamation, nausea, diarrhoea, oedema. Specific side effects by disease site (proctitis in pelvic RT, dysphagia in head and neck RT etc). |
| | **Chronic (more than 3 months** | **Radiation fibrosis, vascular obliteration**: complex cellular mechanism including myofibroblast activation and up-regulated fibrogenesis, |

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| | **after treatment)** | fibrogenic cytokine release, hypoxia due to enhanced atherosclerosis, endarteritis obliterans. |
| | | **Second cancer development**: typically occurs with a rate of 1:1000, from 5 to 15 years and later after exposure. E.g. soft tissue and bone sarcoma, breast cancer. |
| | | **Organ damage** depending on total and fraction dose, volume and treatment time: pulmonary fibrosis, stricture, neuropathy, transverse myelitis, blindness, dementia, poor wound healing, joint contracture, infertility, lymphoedema). Different organs have different thresholds. |
| **Dosing and administration** | **Fractionation** | Radiotherapy is fractionated to allow time for normal cells to recover from damage whilst tumour cells have a reduced capacity to recover. Doses of 1.8-2.0 Gy are typical. Dose, dose/fraction and number of fractions/week can be manipulated in order to increase tumour cell killing, reducing acute and late morbidity. The sensitivity of a tumour to radiotherapy can, in certain cases, be manipulated by sensitizers such as concurrent chemotherapy but will also affect normal tissue toxicity. |

## 1.7. Principles of Chemotherapy and Targeted Molecular Therapies

### Andres Cervantes, Spain

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| **Chemotherapy** | **General Principles** | Tumours have a subpopulation of actively dividing cells termed the growth fraction, other cells will be in growth arrest or necrotic. The growth fraction cells tend to be the ones that are most sensitive to chemotherapy. Some agents act only in certain cell cycle phases whereas others may act at any cell cycle phase. Agents may act by a range of mechanisms to damage DNA, prevent DNA synthesis or arrest the cell cycle. Principles of combination chemotherapy to reduce the occurrence of drug resistance. Regime types by intent: induction, consolidation, adjuvant, neoadjuvant and maintenance. |
| | **Side effects** | Understanding of key common toxicities for chemotherapy generally and more detailed toxicity profiles for agents relative to their field of specialisation |
| | **Drug classes** | **Alkylating agents**: Platinum agents (cisplatin, oxaliplatin and carboplatin), ifosphamide, cyclophosphamide, melphalan. |
| | | **Antimetabolites:** 5 fluourouracil, capecitabine, gemcitabine, methotrexate |
| | | **Cytotoxic antibiotics**: Bleomycin, doxorubicin, epirubicin, mitomycin C |
| | | **Mitotic inhibitors**: Taxanes, vinca alkaloids |
| | | **Topoisomerase inhibitors**: Etoposide, irinotecan |
| | **Dose modification** | Aware of dose calculation and need for modification in renal and hepatic impairment and impact of age on tolerance |
| **Endocrine therapies** | **Breast Cancer** | Tamoxifen and other SERMS (raloxifene): indications, contraindications, side effects and mode of action |
| | | Aromatase inhibitors: indications, contraindications, side effects and mode of action |
| | | Fulvestrant: indications, contraindications, side effects and mode of action |
| | **Prostate Cancer** | Oestrogens |
| | | LHRH partial agonists: goserelin, leuprolide |
| | | Anti-androgens<br>New agents, e.g. abiraterone,<br>Immunotherpay: Sipuleucel T |
| | **Thyroid Cancer** | Thyroxine (for TSH suppression) |
| **Targeted molecular therapies** | **Small molecule targeted therapies** | Agents which directly target the regulatory mechanism of cells. Broad range of targets. Can penetrate the plasma membrane to interact directly with the cellular machinery. Includes tyrosine kinase inhibitors such as imatinib (CML, GIST), sunitinib (GIST and renal cell cancer) gefitinib (NSCLC) and erlotinib (NSCLC and pancreatic cancer). Awareness of the classes of agents, molecular mechanisms and new agents under trial (DNA demethylating agents, histone deacetylase inhibitors) |
| | **Monoclonal antibodies** | Basic principles of immunotherapy. Classes of antibody (murine:omab, chimeric:ximab, humanised: zumab and human: mumab) and implications for immunogenicity. Act by binding antigens on cell surface or growth factors. Aware of key targets and therapeutic examples, side effects, cost issues. E.g. Trastuzumab for EGFR2 in breast cancer, rituxumab for CD20 of B cell lymphoma, bevacizumab for VEGF. |
| | **Prophylactic vaccines** | Human papilloma virus vaccines (Cervarix and Gardasil) |
| | | Hepatitis B surface antigen to prevent both hepatitis and therefore HBV |

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| | | associated hepatocellular carcinoma |
| | **Therapeutic vaccines** | Bacille Calmette-Guerin for the treatment of bladder cancer |
| | | Sipuleucel-T for the treatment of prostate cancer (attacks a prostate specific antigen, prostatic acid phosphatase. |
| | **Cytokines** | Granulocyte colony stimulating factor: mechanism of action, indications for use (filgrastim). Erythropoetin: for chemotherapy related anaemia. |

*Excludes treatments for leukaemias and lymphomas as these are not part of surgical oncology.*

## 1.8. Palliative and end of life care

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| **Palliative and end of life care** | **Symptom control** | Advanced techniques for pain control and relief of nausea and vomiting. Types and modes of administration of opiates, side effects, dose escalation regimes. TEMS machines, acupuncture, implantable devices such as epidurals for intractable pain. Different anti-emetic drug classes and mechanism of action. Indications and contraindications. Appetite stimulants and nutritional support. |
| | **Living wills and advanced directives** | Aware of the legal importance of living wills and advance directives and how these may be arranged by patients. Preferences for the place of death (home, hospice, hospital). Do not resuscitate (DNR) orders. |
| | **Physical support in the home** | Aware of the need for social care and physical support in the home and how this may be provided. |
| | **Social and financial support** | Aware of the financial implications of terminal illness and how patients may obtain advice and support in their local health system |
| | **Family and carer issues** | Bereavement counselling, communication |

## 1.9. Psycho-Oncology and Communication Skills

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| **Psycho-oncology** | **Acute Psychological impact of a cancer diagnosis** | Candidates should have a good understanding of the psychological impact of cancer, at all stages of the cancer journey. These include denial, shock, fear of death, acute anxiety. |
| | **Influence of pre-existent psychological/ psychiatric illness** | May have a profound effect on ability to cope with the diagnosis and treatment. Understanding of how to identify relevant pre-morbid illness and risk factors for severe psychological distress or illness. Understanding of how to support and treat. |
| | **Long term psychological impact of cancer** | Depression, chronic anxiety, post-traumatic stress disorder. |
| | **Methods for psychological support** | Good informational support. Emotional and psychological support through good doctor patient relationship, nurse specialists, psychologists, empowerment by involvement in decision making. |
| **Communication skills** | **Patient counselling** | Aware of ideal techniques for patient communication, the role of written and verbal information. |
| | **Breaking bad news** | Aware of ideal technique of communicating bad news. Importance of environment and support, verbal as well as body language, able to interpret and be guided by patient reactions to guide speed and level of consultation. Importance of family and friends for support. Importance of specialist nurse support. Verbal and written information. |
| | **Shared decision making facilitation** | Aware of importance of involving patient in decision making about their care where possible and at the level they desire. Aware of tools to aid in decision making. Aware of variation in decision making styles and preferences and level of desired knowledge between patients. Aware of and respects patient's preferences. |

# 2. Disease Site Specific Oncology

## 2.1. Breast Cancer

**Marjut Leidenius, Finland and Lynda Wyld, UK**

| | Basic Knowledge | Advanced Knowledge |
|---|---|---|
| **Incidence** | 1:8 in Europe.<br>Increasing incidence | Factors contributing to increase risk: lifestyle (reduced number of & later pregnancy, obesity, alcohol) and the effect of screening over-diagnosis. Awareness of age & race specific variance in cancer incidence. |
| **Aetiology** | Age, nulliparity, obesity, alcohol, oestrogen, radiation, familial. | Detailed awareness of the relative risk of aetiological factors and the evidence base and underpinning mechanism of effect. Risks of HRT, the pill. Protective effect of oophorectomy, anti-oestrogens. Risk estimation and risk calculator tools (Gail, Claus, Tyrer Cuzick, BOADICCEA) |
| **Genetics** | Aware of BRCA1 and 2 and their effect on breast and ovarian cancer risk<br><br>Aware of other genetic cancer syndromes (e.g. Li-Fraumeni) and their effect on breast cancer risk | **BRCA1 and 2:** The effects of carriage of a BRCA1 or 2 mutation on breast and ovarian cancer risk. Management strategies for confirmed gene carriers. The relative merits of screening with mammography or MRI, risk reducing mastectomy, oophorectomy. The biological function of tumour suppressor genes. The link between BRCA1 and triple negative tumours.<br>**Li Fraumeni:** The effects of carriage of a p53 mutation on breast and other cancer risk. Management strategies.<br>**Ataxia telangiectasia:** Heterozygotic female carriers of this autosomal recessive gene are at a 30-68% increased risk of breast cancer. Risk management strategies such as earlier screening.<br>**Low penetrance genes:** alter breast cancer risk slightly but are not yet routinely tested for, (E.g. CHEK-2, caspase 8). |
| **Proliferative lesions** | Ductal In Situ Neoplasia | Proliferative benign and precancerous breast lesion management. Effect on breast cancer risk: ductal & lobular in situ neoplasia; ADH; radial scar; papillomas; hyperplasia. |
| **Pathology & prognostic factors** | Awareness of 2 main subtypes: ductal & lobular. Grading systems. Prognostic & predictive factors (ER, PgR, HER-2). | Aware of all histological sub-types and grades and how they affect treatment and prognosis. Prognostic and predictive factors (ER, PgR, HER-2, Ki67). The prognostic value of DNA microarray tests, (e.g. Oncotype Dx or Mammaprint) and their influence on systemic adjuvant treatment & patient outcome. Knowledge of prognostic tools (Adjuvant On-Line) |
| **Staging and staging methods** | TNM Staging.<br>Dissemination patterns: regional nodes, bone, liver, lung, skin, brain.<br>Staging procedures: CT scan, PET scan and Isotope bone scan<br><br>Differential diagnosis between breast cancer and other metastasis. | Detailed knowledge of the TNM system & effect on prognosis.<br>Dissemination patterns: regional nodes, bone, liver, lung, skin, brain & differences according to breast cancer subtypes.<br>**CT scan:** Aware that staging for women with high risk breast cancer should include a CXR or CT of the chest, CT or US of the abdomen and pelvis and isotope bone scan to identify lung, liver and bony metastases.<br>**PET Scan:** Understand mechanism of action & indications for PET scans. Sensitivity, specificity & factors influencing these.<br>**Isotope bone Scan:** Isotope bone scan may be required to identify skeletal metastases in patients with breast cancer. How an isotope bone scan works.<br>Differential diagnosis between breast cancer metastasis versus another primary or secondary tumour (lung mass on CT, axillary metastases with no identifiable breast primary). |

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| **Diagnosis** | Triple assessment with mammography (and ultrasound), clinical examination and biopsy. The importance of MDT review | **Mammography:** Indications for it, sensitivity and specificity and factors influencing these, the risks of the procedure. Being able to identify a range of mammographic abnormalities.<br>**Ultrasound:** Indications for it, how it is performed, its sensitivity and specificity and factors influencing these and the risks of the procedure.<br>**MRI:** Understanding the indications for breast & axillary MRI: to identify occult primary cancers, to assess for multifocal disease, lobular cancer or with neoadjuvant chemotherapy. The sensitivity & specificity of MRI & factors influencing these.<br>**Biopsy (types and indications):** Fine needle aspiration, core biopsy, vacuum assisted biopsy, percutaneous breast lesion excision, open incision or excision biopsy.<br>**The importance of MDT concordance and review** |
| **Screening** | Aware of mammographic screening benefits and risks. Age ranges screened and periodicity. | Aware of the scientific evidence which underpins breast screening and knowledge of the screening trial data. The technique for screening should be understood and the screening interval in their own country. Understanding the controversies surrounding screening (informed consent, over-diagnosis, bias, risks of screening). |
| **Surgical treatment** | Broad indications for mastectomy versus breast conserving surgery.<br>Axillary clearance versus sentinel node biopsy.<br>Availability and broad subtypes of reconstruction techniques. | Understand the relative indications & contraindications for mastectomy vs breast conservation & SLNB versus axillary clearance. Factors influencing the aesthetic outcome of breast conservation, oncoplastic remodelling techniques in conservative surgery. Knowledge of surgical anatomy of the breast & axilla. Indications & contraindications for reconstructive techniques. Practical experience of reconstructive surgery including implant based, dermal flap, dermal matrix, TRAM, DIEP, latissimus dorsi, therapeutic mammoplasty, oncoplastics and lipofilling. Complications of surgery. Understanding advantages & disadvantages of axillary surgery in relation to the patient and tumour characteristics. How surgery & anaesthesia may be modified in older patients |
| **Adjuvant Treatments** | Aware of indications for the 4 main types:<br>Endocrine therapy<br>Chemotherapy<br>Radiotherapy<br>Trastuzumab | Detailed understanding of the types of adjuvant therapy, their indications and contraindications, side effects and long term sequelae. The interaction with surgery- like implant reconstruction and radiotherapy. How age and co-morbidity interact with the indications and benefits of these treatment. Knowledge of the key research underpinning current practice. |
| **Locally Advanced** | Aware of alternative strategies for management of patients with inoperable disease. | Aware of the criteria for disease to be locally advanced. Neoadjuvant treatment strategies. Surgical techniques: salvage surgery, resurfacing techniques, wound management and symptom control (lymphoedema care for example) |
| **Metastatic** | Treatment: may include: palliative surgery, chemotherapy, radiotherapy, bisphosphonates, endocrine therapy, trastuzumab, supportive | Understand how to diagnose & manage metastatic disease including palliative surgery for bone metastases, resection of the primary or distant metastases (liver, skin, brain, lung) in patients with small volume disease, chemotherapy & endocrine therapy, uses of palliative radiotherapy, prognostic factors. The role of bisphosphonates. Palliative symptom control. The role of the specialist nurse. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. Aware of altered body image of loss of the breast | Insight into the psychological impact of a cancer diagnosis, loss of femininity, loss of a breast, sexuality, depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. |

## 2.2. Colorectal Cancer

### Harm Rutten, The Netherlands

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | **Colorectal**: 1: 15 men 1: 19 women. **Anal**: rare. | **Colorectal:** Specific incidence rates and trends by age and ethnicity. National variations. Disease specific mortality trends. **Anal:** Increasing incidence |
| **Aetiology** | **Colorectal**: Age, diet, chronic inflammation (ulcerative colitis), familial (polygenic and single gene effects). **Anal**: HPV infection. Immuno-suppression. | **Colorectal:** Detailed awareness of the relative risk of aetiological factors and the evidence base and underpinning mechanism of effect. Understand progression from polyps to malignancy. Malignancy risks of chronic inflammatory disease (ulcerative colitis). **Anal:** Infection with human papilloma virus 16 and 18. HIV and other causes of immune-suppression (transplant, ageing) |
| **Genetics** | **Colorectal:** Aware of FAP and HNPCC and broad understanding of syndromes and their management. **Anal**: No familial association. | **Colorectal:** Understanding of the polygenic and single genes that predispose to colorectal cancer. Lifetime risk of a FAP or HNPCC gene carrier. How to manage risk (screening, colectomy, types of colectomy) and the pros and cons of each strategy. Research relating to NSAIDs in prevention. Link to mesenteric fibromatosis. Peutz Jeghers syndrome and juvenile polyposis syndrome. Use of Amsterdam or Bethesda criteria to identify high risk cases. Understanding of underlying mutations and cellular mechanisms. |
| **Pathology** | **Colorectal:** Polyps, dysplastic polyps and adenocarcinoma. **Anal:** AIN and anal squamous carcinoma | **Colorectal:** Detailed understanding of the polyp to adeno-carcinoma sequence and key mutations involved in the transition. Aware of rare variants (squamous carcinoma of the rectum, colonic & rectal GISTs, appendiceal carcinoids). Management & prognosis variation by subtype, stage, location. **Anal:** Anal Intra-epithelial neoplasia, squamous cell carcinoma (& its variants; basaloid, mucoepidermoid & cloacogenic), melanoma, small cell carcinoma & adenocarcinoma. Generally locally aggressive, low metastatic potential other than to regional nodes. Management & prognosis by subtype & stage. |
| **Staging** | **Colorectal:** TNM Staging, Duke's Staging | **Colorectal:** Detailed knowledge of the TNM system and Duke's staging system. Awareness of pre-operative staging investigations including the role of MRI in rectal cancer, staging liver and lungs with pre-operative CT, endoscopy and biopsy. **Anal:** TMN classification. Prognosis and treatment variation by stage. Staging investigations with physical examination/EUA, pelvic, abdominal and chest CT, protosigmoidoscopy and biopsy, inguinal node assessment/biopsy and use of PET-CT. |
| **Diagnosis** | **Colorectal:** Clinical features. Role of endoscopy, biopsy, CT, MRI. **Anal:** Physical & proto-scopic exam, CT/MRI. | **Colorectal:** Clinical signs and symptoms of disease of different stages and different locations in the bowel. Indications for and contraindication to pre-operative tests and their potential risks and limitations (colonoscopic perforation, bleeding). Interpretation of scans for operability and stage of disease. **Anal:** Clinical signs & symptoms, diagnostic & staging work-up. |
| **Screening** | **Colorectal:** Aware of screening strategies. Age ranges screened and periodicity. | **Colorectal:** Aware of the scientific evidence which underpins colorectal cancer screening and knowledge of the trial data on which screening is based. The limitations and advantages of the different techniques (FOB, endoscopic). Controversies surrounding screening including issues relating to informed consent, types of bias in data interpretation and the potential harms of screening. Justification for the screening age range. |

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| **Surgical treatment** | **Colorectal:** Types of resectional surgery according to tumour location and presentation.<br>**Anal:** Treatment primarily non-surgical with surgery for salvage by APR | **Colorectal:** Detailed understanding of the relative indications (by stage and location) and contraindications for resectional surgery and of the technical aspects of surgery (right, extended right and left hemicolectomy, anterior resection, transanal and TEMs excision, Kraske, York Mason and APR procedures for rectal cancers, sphincter preserving techniques, colo-pouches, sub-total colectomy, laparoscopic versus open surgery and the underpinning trials). Awareness of the role and consequences of neoadjuvant short course RT and long course chemoradiotherapy. The importance of the TME and obtaining clear resection margins for rectal cancer and preferred margins for colonic cancer. Adequate level of lymphadenectomy for colorectal cancer. Pre-operative preparation and post-operative care and complication. Fast track surgery. The role of epidurals. Stoma indications, care and placement. Anatomy of the pelvic nerves and the consequences of their damage. Awareness of how surgical and anaesthetic techniques may be modified in older, frailer patients. Special considerations in emergency cases. Uses and indications for colorectal stents and temporary stomas. Emergency surgery for obstruction or perforation.<br>**Anal:** Stage and type specific treatment protocols. Use of chemoradiotherapy (FU and cisplatin plus external beam radiotherapy) and rates of complete response. Aware of key trial data. Indications for surgery (local, abdominoperineal resection, groin node dissection) if disease persists after chemo-radiotherapy or recurs. Use of defunctioning stomas. Follow-up protocols. Treatment of Anal Intraepithelial Neoplasia (AIN). |
| **Adjuvant Treatments** | **Colorectal:** Aware of the main types of adjuvant treatments (chemotherapy and radiotherapy) and their broad indications | **Colorectal:** Types of adjuvant therapy, their indications & contraindications, side effects & long term sequelae. Aware-ness of regimens (5-fluourouracil, leucovorin, capectitabine & oxaliplatin & key trials). How age & co-morbidity interact with the indications & benefits of these treatment. Use of adjuvant radiotherapy for rectal cancer in selected high risk cases. |
| **Locally advanced cancer** | **Colorectal:** Aware of alternative strategies for management of patients with inoperable disease. | **Colorectal:** Understanding of neoadjuvant radiotherapy (RT) & chemo-RT for rectal cancer: indications, drug & RT regimes & timing. Consequences of neoadjuvant therapy on surgery. Assessment of disease extent pre & post neoadjuvant therapy. Role of palliative surgery: defunctioning stomas, bypass surgery, stents & palliative chemo- & radiotherapy regimes.<br>**Anal:** Palliative & neoadjuvant chemo & RT regimes. Stomas. |
| **Metastatic colorectal cancer** | **Colorectal:** Aware may be potentially curable in cases with liver metastases if suitable for surgery. Palliative surgery for obstruction, chemotherapy, radiotherapy, supportive care. | **Colorectal:** Understand diagnosis & management of metastatic disease including palliative surgery. Role of HPB team in assess-ment of operability of liver metastases. Neoadjuvant chemo-therapy & chemoembolisation. MRI & PET scans in assessment of potentially operable cases. Palliative surgery for obstruction (resectional, bypass, stoma). Palliative chemotherapy agents (FOLFOX, FOLFIRI, capecitabine, cetuximab, bevacizumab). Importance of the mutational status of K-RAS to make decisions on the use of anti-EGFR antibodies. Symptom control: analgesia & anti-emesis. Palliative rectal radiotherapy. Role of the specialist nurse. End of life care & advanced directives. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. Aware of effects of stoma | Insight into the psychological impact of a cancer diagnosis, the impact of a stoma, depression and anxiety, the role of the clinical nurse specialist. How to recognise & manage the symptoms and signs of psychological distress and secondary mental illness. |

## 2.3. Thoracic Cancer

### Beate Rau, Germany

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | **Lung:** Most common cause of cancer death in the Western World. Second most common cancer.<br>**Mesothelioma** uncommon: 1% of all cancers | **Lung:** Detailed knowledge of age specific incidence rates and variations in rates internationally. Understanding of linkage to past smoking trends in the population and the threat of future smoking epidemics in 3rd world countries whose smoking habits have still not peaked.<br>**Pleural:** Mesothelioma is rare, (1% of all cancers). Aware of the increasing incidence of mesothelioma and the trends with a peak expected in 2020 followed by a subsequent decline due to the long latency related to asbestos exposure |
| **Aetiology** | Cigarettes smoking, asbestos | **Lung**: Link between smoking and lung cancer and the 30-40 year latency. Effect of metaboliser status as a genetic modifier of risk. Passive smoking. Link with asbestos, coal and other forms of mining. Occupational lung disease: cadmium, arsenic, uranium and terpenes.<br>**Pleural**: Specific link between mesothelioma and asbestos and very long latency (20 years). |
| **Genetics** | Genetic predisposition of minor significance in most cases. | **Lung:** Cytochrome P450 metaboliser status and risk of lung cancer in smokers. Li Fraumeni syndrome (inherited p53 mutation) and lung cancer risk. |
| **Pathology** | Small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC). | **Lung:** Detailed understanding of the 2 main histological subtypes, SCLC and NSCLC. Understanding of the subtypes of NSCLC (adeno, squamous, bronchoalveolar and large cell types) and SCLC (carcinoid spectrum/Kulchitsky classification). Clinical, pathological and treatment differences.<br>**Pleural**: Detailed understanding of the range of histological appearences of mesothelioma (epithelial, sarcomatoid and mixed). |
| **Staging** | TNM Staging, | **Lung:** Detailed knowledge of the TNM staging for both SCLC and NSCLC and how each stage relates to prognosis and treatment. Aware of the requirements for staging of SCLC (bone scan, bone marrow biopsy, CT chest abdo and brain, mediastinoscopy) and NSCLC (CT chest and upper abdomen, PET CT scan).<br>**Pleural:** Detailed knowledge of the TNM classification and how to stage the disease (CT)<br>**Metastatic:** Aware of the common malignancies that present with lung metastases: how this impacts on prognosis and stage. |
| **Diagnosis** | Aware of presenting clinical symptoms and signs. Diagnostic tests including CXR, CT scan, PET scan. | **Lung:** Aware of the wide range of presenting symptoms and signs including rarer manifestations: paraneoplastic syndromes, Pancoast's syndrome, SVC obstruction, recurrent laryngeal, phrenic and vagal nerve involvement). Understands indications for different diagnostic and staging tests, including the indications for different types of biopsies, (transthroacic, open, transbronchial endoscopic biopsy) use of CT and PET scans and bone marrow biopsies. Able to interpret the operability and stage of a cancer based on the imaging appearances.<br>**Pleural:** Aware of the often vague symptoms of mesothelioma, especially in its early stages. |
| **Screening** | Aware of screening strategies currently under investigation but | **Lung:** Aware of the evidence base of trials for lung cancer screening including CXR, CT and immunologically based blood tests. Can argue for and against screening in terms of the risk |

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| | that none are yet in routine clinical use | to benefit ratio and cost effectiveness. Aware of trials currently underway.<br>**Metastases:** Aware of the use of surveillance for certain types of malignancy for lung metastases (sarcoma). |
| **Surgical treatment** | Types of resectional surgery according to tumour location, type and presentation | **Lung:** Aware that SCLC is usually disseminated at presentation and is treated primarily by systemic chemotherapy with rare early stage disease (peripheral T1 or 2, N0) treated surgically. The indications for and contraindications to different surgical procedures for NSCLC (wedge resection, segmentectomy lobectomy, pneumonectomy, open resection, Video Assisted Thoracoscopic Surgery (VATS), indications for nodal surgery and staging, mediastinal node dissections, extended resections). Pre-operative preparation of the patient for surgery. Post-operative care and complications of surgery. Use of lung radiotherapy in patients with poor performance status instead of surgery.<br>**Pleural:** Indications for surgery for mesothelioma: extrapleural pneumonectomy or pleurectomy. Pre-operative preparation, technical aspects of surgery and aftercare. Complications<br>**Metastatic:** Indications for and contra-indications to metastasectomy. Pre-operative preparation, technical aspects of surgery and aftercare. |
| **Adjuvant Treatments** | Aware of the main types of adjuvant treatments (chemotherapy and radiotherapy) and their broad indications | **Lung:** NSCLC: Detailed understanding of the types of adjuvant therapy, their indications and contraindications, side effects and long term sequelae. How age and co-morbidity interact with the indications and benefits of these treatment. Knowledge of the key research that underpins current practice. Types of chemotherapy used. Cisplatin based regimes, erlotinib and the emerging role of molecular markers to direct therapies.<br>SCLC: in the uncommon case of a single early stage peripheral nodule suitable for surgery, adjuvant chemotherapy +/- radiotherapy may be given post-operatively.<br>**Pleural:** No role for adjuvant chemo or RT |
| **Locally advanced** | Use of chemotherapy and radiotherapy for palliation | **Lung:** Palliative chemotherapy and radiotherapy for both SCLC and NSCLC. Symptom control measures.<br>Use of neoadjuvant chemotherapy in some locally advanced NSCLC: response rates, agents in use, indications and contraindications.<br>**Pleural:** Role of and efficacy of palliative chemotherapy and radiotherapy. Emerging new agents: pemextred + cisplatin in advanced mesothelioma |
| **Metastatic disease** | Use of chemotherapy and radiotherapy for palliation | **Lung:** NSCLC: Use of chemotherapy and palliative radiotherapy<br>SCLC: Aware of EGFR mutational status. Patients with EGFR mutations benefit from antiEGFR tyrosine kinase inhibitors. Patients with ALK positivity should be treated with ALK inhibitors. Aware that chemotherapy may achieve complete response although 5 year survival rates are poor. Regimens based in platinum derivatives and taxanes are commonly used, often in addition to RT to the lung. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a lung cancer diagnosis, the impact of guilt in smokers, depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. |

## 2.4. Upper Gastro-intestinal Cancer (Oesphageal, Gastric, GIST, Small Bowel)

Thomas Lehnert, Germany

| | Basic Knowledge | Advanced Knowledge |
|---|---|---|
| **Incidence** | **Oesophageal**: 1 in 60 male, 1:120 females<br>**Gastric:** similar to above<br>**GISTs and small bowel**: extremely rare | **Oesophageal:** Males 3x as likely to develop as females. Rates of SCC are static, rates of adenocarcinoma are increasing rapidly.<br>**Gastric:** Rates falling generally apart from cancer of the gastric cardia which is increasing slightly. Wide variation in rates globally with highest in East Asia.<br>**Small bowel:** Very rare. Carcinoids increasing.<br>**GIST:** Very rare |
| **Aetiology** | **Oesophageal:** Barrett's metaplasia, smoking, alcohol, acid reflux, obesity, male sex and diet.<br>**Gastric:** smoking, autoimmune gastritis, alcohol and helicobacter | **Oesophageal:** Aetiology differs by histological type. SCC: smoking, alcohol, caustic stricture, Plummer Vinson syndrome, Tylosis (both rare), radiotherapy. Adenocarcinoma: obesity, Barrett's oesophagus & reflux disease (bile reflux in particular).<br>**Gastric: L**ink to deprivation, smoking, helicobacter, atrophic gastritis, diet, male gender. 10% familial link (hereditary diffuse gastric cancer, p53, BRCA2, Peutz jeghers & HNPCC). Aware of the link of MALToma with helicobacter infection. |
| **Genetics** | **Gastric**: Hereditary diffuse gastric cancer syndrome as rare cause of early onset gastric cancer | **Oesophageal:** Awareness of the possible hereditary component of risk in Barrett's mucosa associated oesophageal cancer.<br>**Gastric:** Understanding of hereditary diffuse gastric cancer syndrome (CDH1 mutation, multi-centricity) and link to breast cancer and how this is managed (prophylactic gastrectomy), p53 & BRCA2, Peutz jeghers & HNPCC mutations increase risk.<br>**GIST:** Aware of the acquired mutations underlying GISTs in the kit and PDGFR genes and how these affect disease biology and drug sensitivity to imatinib and sunitinib. |
| **Pathology** | **Oesophageal:** 2 main types: adeno and squamous.<br>**Gastric:** Mainly adenocarcinoma. Gastric lymphoma rare<br>**GIST**: Rare. | **Oesophageal:** Two main types: squamous & adenocarcinoma. Awareness of differing locations, aetiology, mode of spread & infiltration of the oesophagus, different treatment regimes.<br>**Gastric:** Aware 95% are adenocarcinoma with 2 subtypes according to the Lauren classification: intestinal & diffuse or 4 subtypes by the WHO (tubular, mucinous, signet ring & papillary. Aware of the different presentations & patterns of local infiltration. Aware of mucosa associated lymphoid tissue (MALToma) associated lymphoma & its link to Helicobacter.<br>**Small bowel:** Adenocarcinoma, carcinoids, lymphomas<br>**GIST:** Aware of the classifications of GISTs in terms of level of malignancy and prognosis. Role of mutational analysis in GIST. |
| **Staging** | Broad understanding of TNM Staging. Basic understanding of the methods for staging and prognostic implications | **Oesophageal:** Knowledge of the TNM system for staging. Prognosis & treatment selection according to stage of disease.<br>**Gastric:** TNM classification. TNM & Lugano for MALTomas.<br>**Small bowel:** TNM classification for adenocarcinoma and neuroendocrine tumours. Ann Arbor system for lymphomas.<br>**GIST:** Understanding of other classification systems such as the Meittinen and Joensue classifications for GIST. |
| **Diagnosis** | Aware of presenting clinical symptoms and signs. Diagnostic tests including CT scan, endoscopy and biopsy, transluminal ultrasound. | **Oesophageal:** Aware of presenting clinical symptoms and signs. The indications for and limitations of different investigations to stage include CT, PET-CT, Endoscopic Ultrasound, thoracoscopy and laparoscopy. Able to interpret the operability and stage of a cancer based on the CT scan or EUS appearances. Need for upper aerodigestive tract examination in squamous cell cancer. |

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| | | **Gastric:** Aware of symptoms & signs including those of metastatic disease. Indications for & limitations of CT scans, EUS, endoscopy & biopsy. Role for laparoscopy prior to laparotomy. Awareness of different diagnostic criteria in Asia vs western world.<br>**Small bowel:** Aware of symptoms & signs, including systemic features of carcinoid syndrome. Pre-operative assessment with barium studies, endoscopic techniques, videocapsule, push-pull enteroscopy, CT scan, serum chromogranin A & MIBG scans (neuroendocrine).<br>**GIST:** Aware of symptoms & signs. Pre-operative assessment with CT scan, endoscopy & biopsy +/- PET scan.<br>**All:** Able to interpret operability & stage based on imaging. |
| **Screening** | Aware of screening strategies currently in use in some countries | **Gastric:** Understanding the different types of screening that are used for gastric cancer & the arguments for & against them in the West. Aware of screening techniques in some countries such as Japan & Chile & how disease & population factors specific to this population justify screening. |
| **Surgical treatment** | Types of resectional surgery according to tumour location and presentation<br>Aware of role of neoadjuvant therapies in broad terms. | **Oesophageal:** The indications for and contraindications to different surgical procedures: endoscopic mucosal resection, submucosal dissection, subtotal and total oesophagectomy, (transhiatal, transthoracic or 3 stage), oesophagogastrectomy, Merendino procedure. Indications and contraindications for laparoscopic resection and nodal clearance. Techniques of reconstruction (incl. colonic interposition). Possible indications for and regimes for neoadjuvant chemoradiotherapy. Pre, peri and post-operative care. Management of complications. Nutritional support (e.g. PEG, TPN).<br>**Gastric:** Indications for endoscopic mucosal resection, submucosal dissection, Indications and technical expertise in oesophago gastrectomy, total gastrectomy, distal gastrectomy. En-bloc lymphadenectomy, D1-3. The debate relating to splenectomy. Laparoscopic versus open resection. Pre, peri and post-operative care. Nutritional support. Special case of MALTomas and role of helicobacter eradication, radiotherapy and the very rare need for surgery. Management of complications, management of perforated gastric cancer.<br>**Small Bowel:** Indications for pancreaticoduodenectomy (duodenal adenocarcinoma), segmental bowel (duodenal) resections. Technical expertise. Pre, peri and post op. care.<br>**GISTs:** As above depending on site. |
| **Multimodal Treatments** | Aware of the main types of adjuvant treatments (chemotherapy and radiotherapy) and their broad indications | **Oesophageal and Gastric:** Detailed understanding of the concepts of (neo-) adjuvant therapy, their potential benefits and hazards, contraindications, side effects and long term sequelae. How age and co-morbidity limit the application and potential benefit of these treatments. Be aware of the concept of definitive chemoradiotherapy. Critically discuss the key research in multimodality therapy.<br>**GISTs:** The risk stratification tools used to guide therapy and indications for use of adjuvant tyrosine kinase inhibitors. Use of induction therapy with imatinib to downsize locally unresectable disease. |
| **Incurable Disease: Locally advanced** | Aware of strategies for palliative management of patients with locally unresectable disease. | **Oesophageal:** Palliative chemotherapy and radiotherapy. Symptom control. Palliative treatments such as stenting, PDT, dilatation, laser ablation, brachytherapy, PEG. Emergency strategies for bleeding, perforated or obstructing tumours. |

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| | | **Gastric**: indications for stenting and bypass surgery. Rationale of palliative chemotherapy. Consider the importance of determining HER2 status. HER2 +++ could benefit from the addition of Trastuzumab to chemotherapy. |
| **Metastatic** | General palliation of symptoms. | **Gastric and oesophageal**: Common metastatic sites for each cancer and how these are managed. Palliative control of pain, anorexia, nausea and nutritional support. Palliative surgery (resectional/bypass/stenting/laser ablation/cytoreductive surgery and HIPEC)<br>**Small bowel:** Management of neuroendocrine liver metastases (resection, transplantation, RFA, embolisation), medical management of carcinoid syndrome, (octreotide, newer agents: lanreotide, interferon, targeted therapies, radio-pharmaceuticals).<br>**GISTs:** Palliative imatinib and sunitinib. Response monitoring (PET, CT), use of mutational profiles in response prediction. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, depression, aggression and anxiety. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Socioeconomic implications of malignant disease. Management strategies. |

## 2.5. Hepatopancreatobiliary Cancer

**Graeme Poston, UK and Bert Bonsing, Tthe Netherlands**

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | Broad knowledge of the incidence of this group of cancers in Europe and globally. | **Colorectal liver metastases:** Overall age standardised & age related incidence in the general population & in population with colorectal cancer. Trends in Europe & underlying causal factors.<br>**Pancreatic cancer:** Overall incidence & age variance in Europe. Trends in Europe. Disease specific mortality.<br>**Hepatocellular carcinoma**: Overall incidence & age variance in Europe. Global incidence rates & trends & links to rates of hepatitis B & C, fatty liver disease & alcohol. Disease specific mortality.<br>**Cholangiocarcinoma and gallbladder cancer:** Overall incidence and age variance in Europe. Trend in Europe. Disease specific mortality. Specific problem of GB cancer in UP State in India. |
| **Aetiology** | Aware of the major risk factors for each cancer type. | **Colorectal liver metastases:** Risk factors for development.<br>**Pancreatic cancer:** Chronic pancreatitis, hereditary predisposition, smoking, obesity, diabetes, diet rich in meat and low in fruit and vegetables.<br>**Hepatocellular carcinoma:** Alcohol, Hep B and C, aflatoxin, cirrhosis, haemochromatosis, Wilson's disease.<br>**Cholangiocarcinoma and gallbladder cancer:** Linked to sclerosing cholangitis, clonorchis sinensis, chronic liver disease, choledochal cysts, gallstone disease & chronic cholecystitis. |
| **Genetics** | Aware of difficulties in screening for malignant disease in primary HPB cancer | **Pancreatic cancer:** Association of familial cancer syndromes with increased risk of pancreatic cancer (BRCA2, Lynch syndrome, MEN1 & others). Familial Pancreatic Cancer (gene not known)<br>**Hepatocellular carcinoma:** Haemochromatosis, Wilson's disease.<br>**Cholangiocarcinoma:** Lynch syndrome, Caroli's disease. |
| **Pathology** | | **Colorectal liver metastases:** Mechanisms of spread to the liver & other distant sites. Metastasis angiogenesis. Morphological characteristics of both primary tumour and metastases that indicate better prognoses after liver resection<br>**Pancreatic cancer**: Subclassification of ductal, acinar and islet (neuroendocrine)<br>**Hepatocellular carcinoma:** Understanding of the aetiological role of cirrhosis/fibrosis<br>**Cholangiocarcinoma & gallbladder cancer**: link to aetiological factors |
| **Staging** | Broad understanding of the TNM classification systems for each cancer type | **Colorectal metastases**, TMN and Duke's system<br>**Pancreatic cancer**, TNM<br>**Hepatocellular carcinoma**, TNM<br>**Cholangiocarcinoma and gallbladder cancer**, TNM |
| **Diagnosis** | Understanding of the indications for and limitations of ultrasound, CT and MRI in pre-operative assessment.<br>Importance of specialist MDT review before biopsy is undertaken. | **Liver lesions.** The role of CT, MRI, US & PET scanning in pre-operative workup. The role & significance of CEA, liver function & coagulation tests & alpha feto protein measurement at both diagnosis & monitoring of treatment. The role of laparoscopy. Indications & contraindications to percutaneous biopsy.<br>**Pancreatic lesions:** The role of CT, MRI, US & PET scanning in pre-operative workup. ERCP and biopsy. The role of, indications and contraindications for percutaneous biopsy.<br>**Biliary lesions:** CT, MRI, Ultrasound and PET scanning in pre-operative workup. ERCP and biopsy. The role of, indications |

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| | | and contraindications for percutaneous biopsy.<br>**For all cancer types**: Understanding of the clinical symptoms and signs of the disease. Ability to interpret MRI and CT scans for diagnostic and operability decision making. |
| **Screening** | Screening for HCC in cirrhosis | **Hepatocellular carcinoma:** Understanding of the arguments for and against screening for HCC in cirrhosis |
| **Surgical treatment** | Colorectal specialists should have a detailed knowledge of the treatment and assessment for colorectal liver metastases. All other specialist areas should be broadly aware of the range of techniques used for surgery of HPB cancers but not their precise indications or contraindications. | **Colorectal liver metastases:** Indications and contraindications for metastsectomy/hemihepatectomy/extended hepatectomy, ablation or multimodal therapies.<br>**Pancreatic cancer:** Different types of pancreatic resections (distal pancreatectomy, Whipple's procedure, pylorus preserving pancreatico-duodenectomy, total pancreatectomy). Techniques for reducing pancreatic fistulae formation and its post operative treatment. Palliative bypass procedures.<br>**Hepatocellular carcinoma:** Indications and contraindications for resection, ablation and liver transplantation (Milan Criteria).<br>**Cholangiocarcinoma and gallbladder cancer**: Defining resectability of cholangiocarcinoma. Resection of GB cancer and relationship to stage. Management of the incidental GB cancer found at Laparoscopic Cholecystectomy<br>**For all cancers**: Detailed understanding of pre-operative preparation, peri and post operative care. Understanding of the intra-operative techniques specific to HPB surgery (low CVP anaesthesia, CUSA and other dissection aids, coagulation aids, argon beam coagulation). |
| **Adjuvant Treatments** | | **Colorectal metastases**: Evidence for systemic and regional therapies for hepatectomy<br>**Pancreatic cancer**: Knowledge of the data (or lack of) to support adjuvant therapies.<br>**Hepatocellular carcinoma:** Knowledge of the data (or lack of) to support adjuvant therapies.<br>**Cholangiocarcinoma and gallbladder cancer**: Knowledge of the data (or lack of) to support adjuvant therapies |
| **Locally advanced and metastatic cancer** | Aware of the impact of liver metastases and how they should be treated with reference to their own disease site and how to identify other pathologies which may require more specialist treatments. Aware of the broad range of therapies on offer (surgery, systemic chemotherapy, stenting, targeted arterial infusions, bypass surgery, RFA) but not the precise indications or contraindications. | **Colorectal metastases:** Understanding the role of neoadjuvant therapies to down stage & render operable such as systemic chemotherapy, hepatic arterial infusion, chemoembolisation. Aware of indications for and complications of surgery after neoadjuvant therapy. Stenting for palliation of obstructive jaundice. Steroids and chemotherapy for liver capsular pain.<br>**Pancreatic cancer:** Stenting and surgical bypass for biliary or gastric outlet obstruction. Chemotherapy for palliation.<br>**Hepatocellular carcinoma:** Systemic chemotherapy, radiofrequency ablation, intra-arterial chemotherapy, focussed radiotherapy, cryotherapy, molecular therapies (sorafenib) and percutaneous ethanol injection may all be used. Indications and contraindications should be understood.<br>**Cholangicarcinoma:** Systemic chemotherapy, hepatic arterial infusion, chemoembolisation. Stenting for palliation of obstructive jaundice.<br>**Metastatic GISTs:** Role of imatinib in the palliative setting. Treatment response assessment with CT and PET. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. |

## 2.6. Skin Cancer and Melanoma

Schlomo Schneebaum, Israel

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | Incidence increasing in Western countries | Aware of the rising incidence in Western countries and worldwide at a rate of approximately 5% per year. In the United States and Canada, melanoma has increased at a rate exceeding that of any other tumor except lung cancer in women.<br>This increase is multi- factorial: Sun exposure, skin texture, changing of dress code and travelling. Australia and the United States have two of the highest incidence rates of melanoma in the world. |
| **Aetiology** | Ultraviolet light | They should be able to discuss ultraviolet light exposure as etiological factor and other risk factors: heritable predisposition, dysplastic nevus syndrome, history of skin cancer, associated with sun exposure and Xeroderma pigmentosum. |
| **Genetics** | | Dysplastic nevus syndrome, Xeroderma pigmentosum. |
| **Pathology** | Melanoma classification by depth and link to prognosis. Recognise common subtypes. | **Melanoma subtypes:** histologic growth patterns: Superficial Spreading Melanoma, Nodular Melanoma, Acral lentiginous Melanoma, Lentigo Malignant Melanoma.<br>Prognostic factors for primary melanoma: Depth of invasion, Ulceration, Regression, Mitotic rate.<br>Different depth of invasion classifications Clark's and Breslow's.<br>Mucosal Melanoma: Aware of their existence, treatment and prognosis |
| **Staging** | General principles of TNM staging. | Melanoma TNM classification and the clinical and pathological staging of melanoma |
| **Diagnosis** | **Morphological signs** that make a pigmented lesion suspicious for Melanoma (ABCD for asymmetry, border irregularity, colour variation, diameter) | **Morphological signs** that make a pigmented lesion suspicious for Melanoma (ABCD for asymmetry, border irregularity, colour variation. diameter)<br>Proper biopsy technique (excision vs. incision) and non proper technique (shaving)<br>**Physical exam for melanoma**<br>**Imaging Studies**<br>**CT scan** Aware that standard staging for Melanoma should include total body CT. CT of the brain, chest, abdomen and pelvis as a base line and to identify brain lung, liver, pelvic and spinal bony metastases<br>**PET Scan** Understand the mechanism of action of PET scans and the indications for their use in subjects with Melanoma. This includes use to confirm or identify the presence of metastatic disease. |
| **Screening** | Not applicable | Not applicable |
| **Surgical treatment** | Wide excision and the importance of adequate margins. SLNB and nodal clearance. | **Primary lesion:** wide local excision for stage I and II melanoma and the results of the clinical trials of melanoma excision margins . Timing of wide excision and anatomical directions<br>**Sentinel Node Biopsy:** Indications, contraindications complication, technique of imaging prior to surgery, results of multi centre studies, pathology work up, completion lymph nodes dissection.<br>**Treatment of clinical lymph node metastasis:** Indications and surgical technique of radical axillary dissection, groin dissection: |

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| | | superficial and deep Iliac, neck dissection |
| **Adjuvant Treatments** | Aware of use of interferons | **Adjuvant systemic therapy:** Interferon alpha -2b high dose, pegylated form: indications, contraindications, regimes, side effects.<br>**Adjuvant radiotherapy:** Indications |
| **Locally advanced** | Aware of use of ILP | **Treatment of in transit metastasis:** Awareness of isolated limb perfusion & be able to describe the technique, its indications, contraindications and complications |
| **Metastatic** | | **Radiological work up and classification.**<br>**Medical treatment:** Aware of the different modalities.<br>**Chemotherapy:** DTIC<br>**Immunotherapy:** Interlukin-2 , Chemo-immunotherapy , adoptive cellular therapy,<br>anti –CTLA-4 monoclonal antibody (ipilimumab) and BRAF and MEK inhibitors |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, the depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. |

## 2.7. Urological Malignancies

### Theo de Reijke, the Netherlands

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | **Bladder cancer**: Uncommon<br>**Renal cell carcinoma**: Uncommon<br>**Prostate cancer:** Very common<br>**Testicular Cancer**: Rare<br>**Penile Cancer**: Very rare | **Bladder cancer**: 2.5% of men and just under 1% of women. Rates decreasing due to reductions in smoking and occupational carcinogen exposure.<br>**Renal cell carcinoma**: 1.5% of men and 1% of women. Rates increasing possibly due to incidental detection on cross sectional imaging and link to obesity<br>**Prostate cancer**: 11% of males. Percentage affected is roughly equal to mans age after age 50. Massive increase in incidence may reflect increased detection with PSA testing but mortality is largely static. Incidence linked to affluence (availability of PSA testing).<br>**Testicular Cancer**: Rare. Incidence rising.<br>**Penile Cancer**: Very rare, higher incidence in Eastern countries |
| **Aetiology** | **Bladder cancer**: Main causes smoking and chemical carcinogens<br>**Renal cell carcinoma**: Smoking and obesity<br>**Prostate cancer**: Age<br>**Testicular Cancer**: Cryptorchism, familial risk.<br>**Penile Cancer**: HPV infection. | **Bladder cancer**: Smoking, chemical carcinogens, radiation exposure, familial risk, schistosomiasis.<br>**Renal cell carcinoma**: Smoking, obesity, familial risk, acquired cystic disease.<br>**Prostate cancer**: Age, familial risk.<br>**Testicular Cancer**: Linked to cryptorchidism and infertility. Probable hereditary factor as yet unidentified.<br>**Penile Cancer**: HPV infection (esp. types 16 and 18). Links to smoking, immunosuppression. Circumcision seems protective. |
| **Genetics** | **Renal, prostate & bladder cancer:** Have a familial association.<br>**Testicular:** Likely hereditary factor, not yet identified.<br>**Penile**: Familial association | **Prostate cancer**: Linkage with the BRCA1/2 mutation in male carriers.<br>All three types are more common in cases with affected family members due to polygenic factors.<br>**Testicular cancer**: Gene (s) not yet identified. Definite familial risk for relatives of patients with the disease<br>**Penile Cancer**: More likely in relatives of affected individuals |
| **Pathology** | Aware of common types. | **Bladder cancer**: Urothelial carcinoma, squamous, adenocarcinoma and undifferentiated.<br>**Renal cell carcinoma**: Clear cell, papillary, chromophobe, oncocytic. Rarely in children: Wilm's tumour.<br>**Prostate cancer**: Adenocarcinoma (small cell rare)<br>**Testicular Cancer**: 2 main types: seminoma and non-seminoma (choriocarcinoma, embryonal, yolk-sac and teratoma). Sometimes metastatic lesions e.g. lymphoma. Aware of frequency and age specific incidence and presentational variance.<br>**Penile Cancer**: 90% squamous, rarely adenocarcinoma, melanoma or basal cell carcinoma. |
| **Staging** | Aware of use of TNM for all types but not detailed classification. | **Bladder cancer:** TNM staging system.<br>**Renal cell carcinoma:** TNM staging system.<br>**Prostate cancer**: TNM staging system.<br>**Testicular**: TNM staging system, IGCCCG prognostic grouping classification in metastatic disease (good, intermediate and poor)<br>**Penile:** TNM staging system (which includes tumour grade) |

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| | | Prognosis and treatment variations according to stage of disease for all types |
| **Diagnosis** | Broad understanding of investigative work up for each type of cancer and symptoms and signs of clinical presentation. | **Bladder cancer**: Aware of the presenting symptoms and signs. Flexible cysto-urethroscopy, urine cytology, CT scanning/MRI scanning. Role of TURBT, random biopsies, chest X ray, bone scan.<br>Able to interpret scans for tumour stage and operability.<br>**Renal cell carcinoma**: Aware of the presenting symptoms and signs including significant number of asymptomatic cases detected on scans incidentally. Paraneoplastic symptoms. Diagnostic tests: CT (and MRI) scan of abdomen and also chest to look for evidence of lung metastases. Bone scan to stage for bone metastases if indicated. Role of biopsy for small renal masses, also in case of exclusion of metastatic lesions. Able to interpret scans for tumour stage (including renal vein and IVC involvement) and operability<br>**Prostate cancer**: Aware of the presenting symptoms and signs. Diagnostic tests: biopsy, CT scan, MRI, and TRUS. Able to interpret scans for operability and stage.<br>**Testicular Cancer**: Role of US, CT scan to stage for nodal and lung metastases. Serum alpha-fetoprotein, beta-HCG and LDH. Aware that biopsy is contraindicated if surgical cure is contemplated.<br>**Penile Cancer**: Biopsy, nodal staging with US and FNA. MRI for more locally extensive disease. |
| **Screening** | **Prostate cancer**: Aware of controversy over pros and cons of screening with PSA | **Prostate cancer**: Detailed understanding of the screening trials with PSA and the controversy about the risks, benefits and cost effectiveness of screening.<br>No effective screening for the other types of cancer |
| **Surgical treatment** | **Bladder cancer:** Aware of a range of treatment options from non surgical, minimally invasive to radical and broad indications.<br>**Renal cell carcinoma:** Nephrectomy<br>**Prostate cancer:** Aware of range of options from watch and wait to radical surgery and broad indications for each.<br>**Testicular:** Inguinal orchidectomy plus or minus retroperitoneal node surgery.<br>**Penile:** Aware of range of options from locally ablative to radical surgery. | **Bladder cancer**: Indications for TURBT, chemotherapy instillation, BCG instillation for high-risk disease, radical cystectomy, radiotherapy. Detailed technical understanding of the procedure for cystectomy, lymphadenectomy and urinary diversions. Pre-operative preparation and post operative complications of surgery<br>**Renal cell carcinoma**: Surgical partial or radical nephrectomy. Different surgical approaches and techniques, including laparoscopic surgery. Surgical techniques in case of extensive tumour process e.g. cava thrombus, metastatic lesions.<br>**Prostate cancer:** Indications for active surveillance, radiotherapy (different techniques) or surgery. Technical aspects of radical prostatectomy including different techniques (laparoscopic, open, lymphadenectomy, robotic). Understands pre-operative preparation and post-operative complications and their management. Salvage procedures.<br>**Testicular Cancer:** Radical Inguinal orchidectomy. For seminomas and non-seminomatous tumours, role of, indications for and controversy surrounding use of retroperitoneal lymph node dissection. Role of chemotherapy and salvage procedures.<br>**Penile Cancer:** Indications for and operative technique for circumcision, locally ablative therapies (laser, cryotherapy), wide excision, glansectomy, partial and complete penectomy. Reconstructive options. Indications for and technique for groin nodal dissection and sentinel node biopsy. |
| **Adjuvant** | **Bladder cancer:** None | **Bladder cancer: (**Neo-) adjuvant chemotherapy |

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| **Treatments** | **Renal cell carcinoma:** None<br>**Prostate cancer:** Radiotherapy and endocrine therapy.<br>**Testicular**: Broad awareness that radiotherapy and chemotherapy used depending on stage and type.<br>**Penile:** None | **Renal cell carcinoma.** None (discussion on pre- and post targeted therapy e.g. Sutent)<br>**Prostate cancer:** Indications for radiotherapy and endocrine therapy.<br>**Testicular cancer:** Indications for and extent of radiotherapy to the retroperitoneal nodes. Indications for active surveillance and adjuvant carboplatin. Difference in seminoma and non-seminoma. Chemotherapy may be curative for most advanced germ cell tumors.<br>**Penile Cancer**: None |
| **Locally advanced** | | **Bladder cancer: surgery,** radiotherapy, chemotherapy.<br>**Renal cell carcinoma: surgery,** targeted therapy<br>**Prostate cancer:** surgery, radiotherapy +/- endocrine therapy, endocrine therapies alone (anti-androgens, orchidectomy, LHRH), watchful waiting, chemotherapy (taxane based) radiotherapy (external beam, IMRT or brachytherapy).<br>**Testicular**: Indications for neo-adjuvant chemotherapy, response rates and regimes. Indications for and risk of post neoadjuvant chemotherapy retroperitoneal node dissection.<br>**Penile:** Indications for radiotherapy |
| **Metastatic** | **Renal cell carcinoma:** aware of emergence of targeted therapies.<br>**Prostate cancer:** Endocrine therapies.<br>**Testicular:** May still be cured with chemo- and radiotherapy and surgery. | **Bladder cancer:** Chemotherapy<br>**Renal cell carcinoma:** Potential role for chemotherapy (IL2 and newer biological agents: e.g.sunitinib, sorafenib, everolimus, temsirolimus and bevacizumab).<br>**Prostate cancer**: Role of endocrine therapies: GNRH agonists/antagonists, orchidectomy, chemotherapy, bisphosphonates, RT to metastatic bone disease.<br>**Testicular:** Chemotherapy, radiotherapy and surgery may all be appropriate and long term cure achieved.<br>**Penile Cancer:** Indications for and types of chemotherapy and chemoradiotherapy for palliation |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, the depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. Fertility issues associated with testicular cancer and strategies to preserve fertility. Cosmetic issues with testicular cancer and availability of testicular implants. Psychological and sexual issues with penile and testicular cancers. |

## 2.8. Endocrine Malignancies (thyroid, parathyroid, adrenal and pancreatic endocrine)

### Sabapathy Balasubramanian (UK)

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | **Thyroid:** Uncommon nature of thyroid cancer and gender and age specific differences. .<br>**Parathyroid:** Prediliction of female gender, rarity of malignancy .<br>**Adrenal:** Rarity of cancer and frequent occurrence of incidental lesions.<br>**Neuroendocrine tumours** (pancreas, liver, GI and bronchus): uncommon | **Thyroid:** 1 in 240 for women. 1 in 650 for men. Rates vary across Europe and globally. Rate is increasing (up to 3 fold in last 30 years) – largely due to increased detection of 'dormant' incidental tumours.<br>**Parathyroid:** Female:male ratio : 4:1 for benign adenomas/hyperplasia. Sex ratio equal for carcinomas<br>**Adrenal:** Adrenal cortical carcinoma very rare (1/million/yr). Metastatic adrenal cancer common (lung, gastric and breast primaries). Functional adrenal adenomas (phaeos, steroid secreting) usually benign and all uncommon.<br>**Neuroendocrine tumours:** arising from tissues of foregut, midgut and hindgut origin. Increasing diagnosis with widespread use of cross-sectional imaging and endoscopy. Malignant behaviour is uncommon. |
| **Aetiology** | **Radiation:** exposure may predispose to thyroid cancer and primary hyperparathyroidism.<br>**Genetic:** Several genetic syndromes underlie a number of patients with multiple endocrine tumours (especially MEN1 and 2). | Understanding of the link between radiation and thyroid and parathyroid disease. Understanding of the clinical phenotypes associated with MEN1, MEN2A and MEN2B syndromes (can affect a number of endocrine glands including pituitary, thyroid, parathyroid, adrenal and neuroendocrine cells of the gastrointestinal and respiratory tract). |
| **Genetics** | Awareness of MEN1 and MEN2 syndromes and the existence of non-MEN familial endocrine disease. | **Thyroid:** pathogenesis linked to BRAF kinase activation, the ras oncogene, PAX8-PPARG and the RET proto-oncogenes. Familial links to MENS 2A and B, FAP, Cowden's and familial Medullary Thyroid Cancer Syndrome.<br>**Parathyroid:** MEN1, MEN2A familial isolated primary hyperparathyroidism (FIPHPT) and Hyperparathyroidism-Jaw tumour syndrome (HPT-JT).<br>**Adrenal:** Adrenal cortical tumours are often sporadic but may be associated with MEN1, Li Fraumeni and Beckwith-Wiedeman syndroms. Similarly, phaeochromocytomas may be a component of MEN 2A, MEN 2B, neurofibromatosis type I, von-Hippel Lindau and hereditary paraganglioma syndromes<br>**Neuroendocrine:** Mostly sporadic**.** Small number linked to Wermer syndrome (MEN1). Should have detailed understanding of MEN syndromes and underlying genetic abnormality and how to manage it. |
| **Pathology** | **Thyroid:** Aware of different types of differentiated thyroid cancer, medullary thyroid cancer, poorly differentiated/anaplastic cancer and lymphoma | **Thyroid:** Predominantly papillary (80%), but others include follicular (10%), Hurthle cell (3%), medullary (5%), anaplastic (2%) and miscellaneous (1%). Aware of the different subtypes in each category and prognostic and therapeutic significance of different subtypes.<br>**Parathyroid**: Understand the therapeutic significance of single gland (85%) and multigland disease (15%) and the rarity of |

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| | and broad differences in behaviour<br>**Parathyroid:** Benign adenomas common, carcinomas very rare<br>**Adrenal:** cortical and medullary – benign and malignant lesions<br>**Neuroendocrine:** Awareness of different sites of origin and differences in behaviour of well and poorly differentiated subtypes. | parathyroid cancers (<1%).<br>**Adrenal:** Detailed understanding of cortical and medullary pathology. Understanding of the difficulty in differentiating between benign and malignant tumours histologically.<br>**Neuroendocrine tumours:** Functioning (insulinoma, gastrinoma, glucagonoma, VIPoma, somatostatinoma etc) and non-functioning subtypes. Understanding of the differences in malignant potential of various subtypes. |
| **Staging** | **Thyroid:** Understand the staging system, especially the importance of age and gender. Awareness of generally excellent prognosis of most subtypes. | **Thyroid:** TNM system and other staging systems (such as AMES, AGES and MACIS). Impact of subtype on prognosis. Awareness of the controversy around lymph node involvement in prognosis of differentiated thyroid cancer. Role of calcitonin levels in predicting prognosis in Medullary Thyroid Cancer.<br>**Parathyroid:** No currently accepted staging system. Aware of prognostic factors.<br>**Adrenal:** TNM system, Weiss score for cortical neoplasms, and PASS score for phaeochromocytoma.<br>**Neuroendocrine:** TNM system, importance of histologic grade and the differences in staging systems depending on site of tumour. |
| **Diagnosis** | **Thyroid:** Thyroid function tests, FNA and Ultrasound.<br>**Parathyroid:** Role of urine and blood biochemistry<br>**Adrenal:** Biochemical assessment and imaging (initially CT or MRI)<br><br>**Neuroendocrine:** Biochemical assessment, cross sectional and/or radio-nuclide imaging, | **Thyroid:** Awareness of symptoms and signs of thyroid lumps and thyroid dysfunction. Understanding of the role of thyroid function tests, ultrasound and other cross-sectional imaging, radionuclide imaging and biopsy (usually FNA, rarely core biopsy).<br>**Parathyroid:** Awareness of symptoms and signs of hypercalcemia and differential diagnosis of hypercalcemia. Palpable lumps are very rare and increase likelihood of cancer. Role of imaging in pre-operative localisation: US, Technetium sestamibi scans, single photon emission CT, MRI and 4D-CT.<br>**Adrenal:** Detailed understanding of biochemical workup for cortisol, aldosterone and sex-hormone excess for cortical tumours and catecholamines and metanephrines for medullary tumours. Presentation may be with features of hormonal excess or incidental, although local symptoms may occur in locally invasive malignant tumours.<br>Understanding of the role of cross-sectional imaging such as CT/MRI, functional imaging such as MIBG and venous sampling in instances such as Conn's syndrome.<br>**Neuroendocrine:** Aware of symptoms of functioning tumours and local symptoms of non functioning tumours. Aware of incidental presentations and postoperative histological diagnoses (such as appendiceal neuroendocrine tumours). Role of cross sectional imaging (Ultrasound, EUS, CT, MRI), functional imaging (such as Octreotide imaging), biochemical assessment and selective arterial stimulation and venous sampling studies. |
| **Screening and prevention** | Possible in certain familial syndromes and high risk families. | Understanding of need for screening in index patients, family members and carriers of specific mutations. Examples include MEN1, MEN2A, MEN2B and paraganglioma syndromes. Awareness of need for multidisciplinary input and the |

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| | | involvement of other endocrine glands in patients presenting with one endocrine problem. |
| **Surgical treatment** | **Thyroid:** Types of thyroidectomy and indication for nodal surgery.<br>**Parathyroid:** Aware of different approaches to parathyroidectomy.<br>**Adrenal:** Awareness of open and laparoscopic approaches via the anterior, lateral and posterior aspects. Awareness of need for adequate preoperative biochemical assessment and preparation.<br>**Neuroendocrine:** depends on site of tumour | **Thyroid:** Ability to debate about the extent of thyroidectomy, (total, subtotal, bilateral) in different situations and the underpinning evidence.<br>Detailed understanding of neck anatomy.<br>Understanding complications of surgery and effective means of prevention and treatment.<br>Role of prophylactic and therapeutic central and lateral neck dissection in thyroid cancer. Understand the role of mediastinal lymphadenectomy in certain situations.<br>Understanding the role of frozen section.<br>**Parathyroid:** Role of preoperative localisation techniques (such as US and Sestamibi scans) and intraoperative adjuvants (IOPTH, frozen section, radio-guidance, Methylene Blue) in predicting single gland disease and determining operative strategy.<br>Detailed understanding of targeted/focussed approaches and unilateral/bilateral explorations and the decision making underlying these approaches and the use of appropriate adjuncts.<br>Recogniation of carcinoma in the rare instance and the appropriate management (i.e need for enblock resection +/- thyroidectomy +/- lymph node dissection).<br>**Adrenal:** Detailed understanding of pre- and peri-operative management of adrenal tumours and the importance of multidisciplinary input. Understanding of the decision making regarding operability in cancer.<br>Understanding of the operative approach depending on disease characteristics, patient features, expected pathology and local experience.<br>Understanding the role of cortical sparing or subtotal resections.<br>**Neuro endocrine:** Understanding the role of multi-disciplinary input for adequate preoperative preparation and disease localisation (for example in functioning pancreatic neuroendocrine tumours).<br>Understanding the need for intraoperative localisation techniques (such as Ultrasound and EUS). |
| **Adjuvant Treatments** | **Thyroid:** Role of radio iodine and TSH suppression in differentiated thyroid cancer.<br>**Parathyroid:** none<br>**Adrenal and neuroendocrine:** Endocrine therapy and radio-nuclide treatment in certain situations | **Thyroid:** Aware of uses and indications/contraindications for radioactive iodine and TSH suppression in differentiated thyroid cancer. Understanding the long term risks of TSH suppression.<br>Role of external beam radiotherapy in certain incompletely resected cancers (anaplastic, medullary etc.)<br>**Parathyroid:** none.<br>**Adrenal and neuroendocrine:** Understand the role of endocrine therapy and radio-nuclide treatment in certain specific situations where risk of recurrence is high.<br>For several tumours, an understanding of monitoring for recurrence by biochemical means (using tumour markers) and functional imaging is important. |
| **Locally advanced** | **Thyroid:** Role of radioiodine ablation, TSH suppression and external beam radiotherapy | **Thyroid:** Usual stage of presentation of anaplastic carcinoma.<br>Role of radioiodine, TSH suppression in differentiated thyroid cancer<br>Role of external beam radiotherapy in locally advanced cancer of all types |

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| | **Parathyroid:** Role of enbloc resection, radiotherapy<br>**Adrenal and neuroendocrine:** see metastatic disease section | Role of targeted molecular therapies such as tyrosine kinase inhibitors and<br>**Parathyroid**: Role of and risks of radical surgery in recurrent and locally advanced disease. Role of external radiotherapy and potential for unproven treatments such as cinacalcet and active Vitamin D.<br>**Adrenal and neuroendocrine:** see metastatic disease section |
| **Metastatic** | **Thyroid:** Role of radioiodine ablation, TSH suppression and potential for new biological therapies.<br>**Parathyroid:** Medical treatment of hypercalcaemia<br>**Adrenal and neuroendocrine:** Role of endocrine and molecular therapies | **Thyroid:** Role of radioiodine and TSH suppression in differentiated thyroid cancer<br>Role of external beam radiotherapy for symptomatic relief<br>Targeted molecular therapies (Tyrosine Kinase Inhibitors and monoclonal antibodies) for certain subtypes.<br>**Parathyroid:** Medical control of hypercalcaemia, (using a variety of agents including loop diuretics, bisphosphonates, cinacalcet etc.).<br>**Adrenal and Neuroendocrine:** Understanding of endocrine treatments (such as alpha blockade in malignant phaeochromocytoma) and therapeutic radionuclide treatments (such as radiolabeled Octreotide treatment of neuroendocrine cancers).<br>Role of combination chemotherapy in adrenal cancers and poorly differentiated neuroendocrine tumours.<br>Role of targeted molecular therapies such as sunitinib.<br>Role of radiotherapy for bone metastases.<br>Selective use of surgical metastatectomy in advanced disease. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, the depression and anxiety, the role of the clinical nurse specialist. Psychological impact of thyroid dysfunction. Psychological impact of neck scars and voice changes due to recurrent laryngeal nerve palsy. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. Impact of endocrine dysfunction on mental health (e.g. steroid psychosis, hyper and hypothyroidism, hypercalcaemia etc). |

## 2.9. Sarcoma

Odysseas Zoras, Greece and Lynda Wyld, UK

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | Very rare tumours. 1% of all malignancies. | Rare group of diverse malignancies of mesenchymal tissue origin. 1 % of all cancers in Western countries. Two age peaks: childhood and young adult (Ewings, Rhabdomyosarcomas, Osteosarcomas) and elderly (all other subtypes). Awareness of most common subtypes (liposarcomas, leimyosarcomas etc), of the broad range of types and their parent tissue. Anatomical sites of common sub-types. |
| **Aetiology** | Usually sporadic. Radiation induced. Rarely hereditary (p53) | Mostly sporadic. Radiotherapy may induce late sarcomas after 7-15 years e.g breast angiosarcoma after breast radiotherapy, pelvic osteosarcoma after prostate/cervical radiotherapy. Link with chronic lymphoedema, (Stewart Treves syndrome: lymphangiosarcoma in chronic lymphoedema), vinyl chloride, thoratrast. Rare genetic syndromes, (p53). Viral aetiology of some Kaposi's sarcoma (HIV associated). |
| **Genetics** | Rarely caused by the p53 gene mutation | Rare genetic syndromes may be linked to sarcomas. P53 mutation carriers (Li-Fraumeni syndrome) at increased risk of childhood sarcomas and breast cancer as well as numerous other cancer types. Neurofibromatosis and malignant peripheral nerve sheath tumour, FAP/HNPCC and desmoid or fibromatosis of the mesentery. Germline mutation of the retinoblastoma (RB) gene predisposes to sarcoma development. |
| **Pathology** | Complex. Multiple subtypes. Aware of a few common types | Familiarity with the major types and their biological behaviour and therapeutic strategies. Aware of the complexities of pathological classification, grading and immunohistochemistry and genetic analysis for specific mutations such as different exon mutations in the c-kit gene in GISTs, the EWS mutation in Ewing's, a reciprocal translocation between chromosomes 18 and X in synovial sarcoma. Important differential diagnoses. Aware of behavioural characteristics of different types: e.g. high metastatic potential of certain types (Ewing's, angiosarcoma, osteosarcoma, rhabdomyosarcoma, leiomyosarcoma) and low/no metastatic potential of others (dermatofibrosarcoma, desmoids, low grade liposarcomas). Grading determined by cellularity, differentiation, pleomorphism, necrosis and mitotic count (EU: Trojani or US: NCI system). |
| **Staging** | Depends on size, grade, depth and presence of metastatic disease | Familiarity with the UICC/AJCC classification and the different prognosis attached to each stage. Aware of specific prognostic classification systems used for GISTs (Miettinen or Joensuu). |
| **Diagnosis** | Clinical signs and symptoms of the disease. Tests including MRI, biopsy, US, CT scanning. | Indications for pre-operative investigations such as MRI, US, PET, CT, CXR, bone scan. Skill in iInterpretation of scans for operability and stage of disease. Indications for different types of biopsy. Principles of biopsy techniques and placement. Image guided biopsy of specific tumour areas. |
| **Screening** | None | None |
| **Surgical treatment** | Types of resectional surgery according to tumour location and presentation | Detailed understanding of the relative indications and contraindications for resectional surgery, detailed technique discussion. Role of and methods of specimen orientation and use of marker clips to localise the resection cavity for post |

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| | | operative RT guidance. Limb conservation versus amputation. Awareness of the role and consequences of neoadjuvant RT in 'usual' tumour types. Special tumour types that are treated with induction chemotherapy (Ewing's, Osteosarcoma, rhabdomyosarcoma) or primarily by medical therapies (HAART therapy/doxorubicin in HIV associated Kaposi's sarcoma). The importance of obtaining clear resection margins and how margins are classified (marginal, intralesional, wide, radical, compartmental) – evaluation of excision margins (quantitative and qualitative). Amputation types and their indications and techniques (forequarter, above-below elbow, hemi-pelvectomy, hip disarticulation, below knee). Wound closure techniques (flaps, grafts etc). Endoprosthetic replacement for primary bone sarcomas. Pre operative preparation and post operative care and complications (seromas, wound breakdown, phantom limb pain). Limb prostheses and rehabilitation. Issues relating to excision of retroperitoneal sarcomas (RPS): definition of anatomical region, principles of multiorgan resection in RPS; ureteric and vascular and nerve preservation, sacrifice or reconstruction; treatment principles of recurrent RPS. Wound closure techniques (flaps, grafts, abdominal wall prostheses etc). Endoprosthetic replacement for primary bone sarcomas. Pre operative preparation and post operative care and complications (seromas, wound breakdown, phantom limb pain). Limb prostheses and rehabilitation. |
| **Adjuvant Treatments** | Aware of the use of radiotherapy in the adjuvant setting. Little or no benefit to chemotherapy. Imatinib for GISTs | **Molecular Therapies.** Criteria for adjuvant imatinib in GISTs. Mechanism of action of imatinib. Mutational analysis in prediction of tumour response.<br>**External Beam Radiotherapy** Indications and contraindications, post surgical resection of high risk sarcomas. Short and long term complications of RT. Use of highly targeted RT with intensity modulated CT image guided RT (IMRT).<br>**Brachytherapy** Techniques and indications.<br>**Chemotherapy:** Aware of trials of adjuvant chemotherapy showing limited value in most sarcoma types and therefore use in the adjuvant setting with most types is not recommended. Use of specialized regimes for Ewing's, osteosarcomas, rhabdomyosarcomas as induction chemotherapy prior to surgery (e.g. VIDE chemotherapy for Ewing's) usually combined with further post-operative chemotherapy (consolidation chemotherapy with VAI for Ewing's). |
| **Locally advanced** | Aware of alternative strategies for management of patients with inoperable disease or local recurrence. | **Surgery**: Indications for amputation (limb sparing surgery not possible, recurrent disease, palliation). Appropriate consideration for neoadjuvant therapy to permit limb salvage<br>**Radiotherapy:** Use of external beam RT in the palliative or neoadjuvant setting. Indications for IMRT or more targeted techniques such as proton therapy in certain highly critical areas (skull base or paraspinal tumours).<br>**Chemotherapy:** Induction chemotherapy in in Ewing's osteos, rhabdos, as above. Neoadjuvant chemotherapy limitations in the majority of sarcoma subtypes.<br>**Molecular Therapies**: Use of neoadjuvant imatinib (Tyrosine Kinase Inhibitor, TKI) in GIST. Assessment of response with CT and PET scanning. Use of sunitinib (TKI) as second line therapy and use of mutational signatures to predict response to TKIs<br>**Isolated limb perfusion:** Indications and contra-indications and |

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| | | how it is administered. Complications. |
| **Metastatic** | Aware may be potentially curable in cases with operable lung metastases. Chemotherapy, radiotherapy, supportive care. | **Chemotherapy:** Indications for and limitations of chemotherapy. Doxorubicin, ifosphamide and dacarbazine are the most efficacious with >20% response rates in single agent series. Embolisation and ablation techniques.<br>**Molecular Therapies**: Imatinib and sunitinib in GISTs.<br>**Surgery:** Indications for lung metastasectomy and pre-operative work-up. Indications for palliative surgery for the primary tumour in low volume metastatic disease.<br>**Symptom control**: with analgesia and anti-emesis. The role of the specialist nurse. End of life care. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. | Insight into the psychological impact of a cancer diagnosis, the depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. Aware of the impact of a cancer diagnosis on children, teenagers and young adults and how to support. |

## 2.10. Gynaecological Malignancies

Georges Vlastos, Switzerland

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | All uncommon | **Cervical:** 1 in 134 women lifetime risk. Rates falling due to screening in most age groups but increasing in younger women. Geographically highest risk in African countries.<br>**Endometrial:** 1 in 46. Rates increasing, due to increased obesity rates. Disease of first world countries.<br>**Ovarian:** 1 in 54. Rates falling due to widespread use of the oral contraceptive.<br>**Vaginal/Vulval:** Rare<br>**Others:** Sarcoma, Gestational trophoblastic disease all rare |
| **Aetiology** | **Cervical:** Link between HPV virus and cancer of the cervix<br>**Endometrial:** Obesity<br>**Ovarian:** Sporadic, Genetic | **Cervical:** Sexually transmitted. HPV virus subtypes 16 and 18 linked to development of CIN and cervical cancer. Link to sexual activity, especially at early age, multiple sexual partners & smoking.<br>**Endometrial:** Linked to obesity and unopposed oestrogen. Tamoxifen. Nulliparity, early menarche, later menopause. Diabetes.<br>**Ovarian:** Protective effect of the oral contraceptive. Familial risk.<br>**Vaginal/vulval:** Older age, HPV virus infection<br>**Other:** Gestational trophobalstic disease linked to pregnancy. Uterine sarcomas may be caused by pelvic radiotherapy. |
| **Genetics** | **Ovarian:** Aware of link between BRCA1 and 2<br>**Endometrial** : HNPCC | **Ovarian:** Aware of the BRCA1 and 2 genes and a detailed understanding of the level of increased risk and how it should be managed. Able to discuss the ovarian cancer screening trials and the impact of prophylactic salpingo-oophorectomy.<br>**Endometrial:** 10% of endometrial cancers are hereditary, linked to HNPCC |
| **Pathology** | **Cervical:** Squamous<br>**Endometrial:** Adeno<br>**Ovarian:** Epithelial | **Cervical:** Usually squamous, occasionally adenocarcinoma.<br>**Endometrial:** Majority endometroid adenocarcinoma, rarely papillary, serous or clear cell.<br>**Ovarian:** Epithelial most common (multiple subtypes). Germ cell tumours, sex cord stromal tumours, mullerian less common.<br>**Vaginal/vulval:** Majority squamous<br>**Others:** Sarcoma: multiple subtypes including leiomyosarcoma, endometrial stromal sarcoma, carcinosarcoma and adenosarcoma.<br>Gestational trophoblastic disease: hydatidiform mole and malignant gestational trophoblastic disease.<br>**For all**: awareness of different presentations, risk factors and treatment by pathological type. |
| **Staging** | Aware of the FIGO system but not precise staging for each cancer | **Cervical:** FIGO staging system. (International Federation of Gynaecology and Obstetrics).<br>**Endometrial:** FIGO staging system.<br>**Ovarian:** FIGO staging system.<br>**Vaginal/vulval:** FIGO staging system.<br>**For all:** Awareness of the staging classification, prognostic implications, treatment options by stage. |
| **Diagnosis** | Role of physical examination, biopsy if appropriate and cross sectional imaging. | **Cervical:** Pelvic examination, biopsy, cystoscopy, proctoscopy, IVP, CT scan and MRI.<br>**Endometrial:** Pelvic examination, biopsy/curettage, cystoscopy, proctoscopy, IVP, CT scan and MRI. |

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| | | **Ovarian:** CT scan, Ca 125, pelvic and rectal examination.<br>**Vaginal/vulval:** Pelvic examination, biopsy, (depending on extent: cystoscopy, proctoscopy, CT scan and MRI.<br>**For all**: Ability to interpret relevant scans for stage and operability. |
| **Screening and prevention** | **Cervical :** Pap smear screening. Recent introduction of HPV vaccination to prevent cervical cancer | **Cervical:** Detailed understanding of the Pap smear cytology test, the age range and the fact that the disease may be detected at a pre-invasive stage. Costs and potential harms of screening. Impact of recently introduced HPV vaccination programme to prevent cervical cancer.<br>**Ovarian:** Targeted screening for high familial risk. Lack of evidence for ovarian cancer screening. Able to discuss the current and previous screening trials and their results and implications. |
| **Surgical treatment** | **Cervical:** Hysterectomy<br>**Endometrial:** Hysterectomy and BSO<br>**Ovarian:** Hysterectomy, BSO and omentectomy. | **Cervical:** Depending on stage varies from simple to radical hysterectomy +/- pelvic nodal dissection. Brachytherapy an alternative if surgery not possible.<br>**Endometrial:** Depending on stage: hysterectomy and BSO +/- pelvic nodal dissection +/- omentectomy.<br>**Ovarian:** Cytoreductive surgery, TAH, BSO, ascitic cytology, omentectomy. Optimal is residual disease volume less than 1 cm or no visible macroscopic disease.<br>**Vulval:** Wide excision + groin node dissection, radical vulvectomy, +/- radiotherapy depending on stage. |
| **Adjuvant Treatments** | **Cervical:** Radiotherapy<br>**Endometrial:** Radiotherapy/ chemotherapy<br>**Ovarian:** Chemotherapy | **Cervical:** Indications for adjuvant chemo-radiotherapy<br>**Endometrial:** Indications for post operative radiotherapy, chemotherapy.<br>**Ovarian:** Post cytoreductive surgery adjuvant chemotherapy with platinum and taxane based regimes.<br>**Vaginal/vulval:** Radiotherapy |
| **Locally advanced cancer** | **Cervical:** radiotherapy<br>**Endometrial:** radiotherapy<br>**Ovarian:** Chemotherapy | **Cervical:** Radiotherapy as palliative or neoadjuvant treatment.<br>**Endometrial:** Radiotherapy as palliative or neoadjuvant treatment.<br>**Ovarian:** Role for neoadjuvant chemotherapy prior to cytoreductive surgery. Role for intraperitoneal chemotherapy in optimally debulked patients.<br>**Vaginal/vulval:** Radiotherapy |
| **Metastatic cancer** | **Cervical:** Chemotherapy<br>**Endometrial:** Chemotherapy, anti-oestrogens<br>**Ovarian:** Chemotherapy<br>**Others:** | **Cervical:** Palliative chemotherapy (platinum based regimes). Radiotherapy may be indicated for symptom control.<br>**Endometrial:** Chemotherapy, anti-oestrogens, progestins.<br>**Ovarian**: Palliative Chemotherapy. |
| **Psycho-oncology** | Aware of effect of a general cancer diagnosis. Aware of psychological significance of the loss of fertility/feminity | Insight into the psychological impact of a cancer diagnosis, the impact of loss of reproductive organs on fertility and feeling or feminity and sexuality, depression and anxiety, the role of the clinical nurse specialist. How to recognise the symptoms and signs of psychological distress and secondary mental illness. Management strategies. |

## 2.11. Peritoneal Surface Malignancies

Santiago Gonzalez-Moreno, Spain

| | Basic Knowledge | Advanced Knowledge |
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| **Incidence** | **GI cancer**: 10-15% at diagnosis, 50% in recurrences after radical surgery.<br>**Other causes:** Rare | **Pseudomyxoma peritonei**: 1-2 cases per million-year, 1% of all colorectal malignancies<br>**Desmoplastic small round cell tumor (DSRCT):** Very rare<br>**Primary peritoneal neoplasms:** Rare<br>**Mesothelioma**: 25% of all mesotheliomas. Rising incidence in Europe (latency after asbestos exposure in 20$^{th}$ century). |
| **Aetiology** | **Secondary "peritoneal carcinomatosis":** From gastrointestinal or gynae malignancies, including sarcoma and GIST.<br>**Primary peritoneal:** possible link to asbestos | **DSRCT:** Unknown origin<br>**Pseudomyxoma Peritonei (PMP):** Appendiceal origin in vast majority. Definition and proper use of the term "PMP"<br>**Pathogenesis** of the peritoneal dissemination process:<br>-Natural history of peritoneal free cancer cells (clinical and molecular level)<br>-Lesions´ distribution pattern ("redistribution phenomenon")<br>-Contribution of surgical tumour manipulation (tumour cell entrapment hypothesis)<br>**Primary peritoneal neoplasms:** asbestos exposure identified in less than 25% of cases of mesothelioma. |
| **Genetics** | No genetic background known to date | **DSRCT** carries typical mutation in EWS (diagnostic) |
| **Pathology** | Aware of wide range of primary pathologies in secondary cases (gastric, appendiceal, ovarian etc). | **Pathology as a key prognostic factor** (appendix, mesothelioma, signet ring features)<br>-**Mesothelioma**: localized benign, diffuse malignant (epithelioid, sarcomatoid, biphasic), well-differentiated papillary, multicystic<br>-**Appendix**: epithelial (intestinal vs mucinous), carcinoid, adenocarcinoid<br>-**Colorectal**: intestinal vs mucinous<br>-**Gastric:** Lauren types<br>-**Ovarian:** serous, mucinous, endometrioid, clear cell<br>**- Appendiceal mucinous neoplasms**: nomenclature of primary lesion and peritoneal implant histopathology (Ronnett, Misdraji and Bradley classifications)<br>**Primary peritoneal neoplasms:** mesothelioma, papillary serous carcinoma, primary peritoneal adenocarcinoma<br>Aware of **discordant cases** (peritoneal implant and primary tumor pathological appearance differ) |
| **Staging** | **Stage IV** disease by definition (carcinomatosis) | No standard staging system for primary peritoneal neoplasms.<br>**Peritoneal Cancer Index** (PCI) as a measure of tumour burden<br>PCI validated as a key prognostic factor in all peritoneal surface malignancies (primary or secondary).<br>Newly proposed staging system for diffuse malignant peritoneal mesothelioma (PCI, N, M) |
| **Diagnosis** | **Clinical** (History and Physical exam)<br>**Imaging** (CT)<br>**Laparoscopy**<br>**Biopsy-** necessary to prove peritoneal malignant disease needed before treatment planning | Aware of limitations and indications of each imaging modality (CT, MRI, PET/CT) in the diagnosis and assessment of disease extent.<br>Recognizes direct and indirect imaging signs of peritoneal dissemination. Knowledgeable of expected sites of disease<br>Aware of need for expert pathologist<br>Pathological **differential diagnosis** of Diffuse Malignant Peritoneal Mesothelioma (immunohistochemistry) |

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| **Screening and prevention** | Aware of proper surgical handling of primary tumours (including appendiceal mucocele) in order to avoid peritoneal tumour spillage. | Aware of ongoing trials and studies on the prophylactic use of HIPEC in high risk scenarios.<br>Aware of indications and implications of systematic second-look surgery for early diagnosis of peritoneal dissemination.<br>Identify primary lesions or scenarios at high risk for developing subsequent peritoneal dissemination:<br>- appendiceal mucocele<br>- locally advanced, node positive primary colon and gastric cancer<br>- Positive peritoneal cytology<br>-Resected limited peritoneal carcinomatosis<br>-Ovarian involvement<br>- Intraoperative rupture of a tumour mass |
| **Surgical treatment** | Broad indications and patient selection for radical treatment: Cytoreductive surgery combined with Hyperthermic Intataperitoneal chemotherapy (HIPEC)<br>Aware of nearest specialist centre for opinion & treatment<br><br>Indications for palliative surgery | **Cytoreductive surgery**: Highly complex technical procedure. Aware of the indications and contra-indications. Able to interpret imaging for potential resectability. Understanding of how to perform the surgical procedure with detailed understanding of the anatomy. Pre, peri and post-operative care. Aware of stop signs. Learning curve.<br>**HIPEC**: detailed understanding of its indications and contraindications, techniques for use, available technology, different agents in use, their dosing and their pros and cons and side effects. Aware of possible occupational hazards and proper handling of chemotherapy in the Operating Room. |
| **HIPEC** | Aware of use of intraperitoneal chemotherapy as an adjunct to cytoreductive surgery. | **Perioperative intraperitoneal chemotherapy:**<br>- HIPEC<br>- EPIC (early postoperative intraperitoneal chemotherapy)<br>**Postoperative adjuvant bidirectional chemotherapy** through an i.p. port (ovarian, mesothelioma)<br>**Neoadjuvant bidirectional chemotherapy** (NIPS) in gastric cancer<br>**Systemic therapy:** Indications, efficacy, choice of drugs/biologicals and timing in relation to surgery (induction, adjuvant) |
| **Metastatic cancer** | N/A | **Simultaneous peritoneal and liver metastases:** Indications and patient selection for radical treatment (colorectal cancer) |
| **Psycho-oncology** | Emotional impact of diagnosis. Dealing with initial discouraging prognosis. | Impact on self and family of prolonged hospitalization.<br>Reinforce coping strategies.<br>Crucial role of proper information for patient to understand a complex treatment |

# 3. Generic Clinical Skills

| Domaine | Required Skills |
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| Clinical Diagnostic Skills | Recognise signs and symptoms of cancer both in their own specialist areas and generally. |
| Radiology Interpretation | Interpretation of CT, MRI, PET, mammography etc. and other scanning modalities such that disease can be recognised, stage assessed, operability assessed and other diagnostic modalities suggested to complement assessment. The limitations and indications for each imaging modality should be understood. |
| Pre-operative Assessment | Thorough understanding of how to assess a patient for suitability for surgery and anaesthesia including appropriate tests and their interpretation. Understanding of the impact of age and co-morbid diseases on fitness for surgery and how treatment may be modified to accommodate co-morbid diseases. Aware of alternative anaesthetic, surgical and non-surgical options for the least fit patients. Aware of how disease stage may modify treatment recommendations. |
| Peri-operative Care | Basic understanding of anaesthetic techniques and how they may interact with surgery. Awareness of the use of and mechanism of surgical equipment: diathermy, CUSA, lasers, intermittent calf compression, pro-coagulant agents, antibiotics, radioisotopes and gamma probes for SLNB. |
| Post-operative care and rehabilitation | Detailed understanding of how to manage post operative complications, including sepsis, bleeding, wound breakdown, anastomotic leakage, renal and respiratory failure, flap or tissue necrosis and venous thromboembolism. Understands the role of professions allied to medicine in the recovery process: physiotherapists, occupational therapists, dieticians, psychologists. Knowledge of post operative management: analgesia, anti-emesis, wound care, stoma care, graft and flap care, prophylactic antibiotics, nutrition. |
| The role of the MDT | The role of the MDT and each of its members. |
| Communication skills | Experience and expertise in discussing a new cancer diagnosis and a terminal disease diagnosis with a patient. Aware of the needs of the patient for information, sensitivity, involvement and feedback. Awareness of the psychological and emotional impact of the consultation and able to empathise and manage appropriately. Understanding of how to deal with complaints and litigation. |

# 4. Training Recommendations

A surgical oncologist must receive training in a fully multidisciplinary environment with regular interaction between surgical, medical and radiation oncologists, pathologists, radiologists and a range of other disciplines involved in cancer care and cancer research. Ideally all should receive at least some of their training in a European centre of excellence.

The following represent an aspirational blueprint for surgical oncology training in Europe.

## 4.1. Training Programme Content

In line with current practice across most European countries, the training period is usually 6 years with a common stem in General Surgery for at least 2 years followed by 4 years specialising in Surgical Oncology. The latter period should include involvement in research and a minimum of 1 year in a major teaching centre (National or International Cancer Centre).

## 4.2. Multidisciplinary Team Meetings

As a minimum, the trainee should attend 1 multidisciplinary cancer team meeting per week and should be expected to play an active role.

## 4.3. Surgery

They should receive direct operative training by experienced and accredited trainers in minor, intermediate, major and complex major surgery as their experience progresses. For all sub-specialist index procedures they should receive direct verbal and formal feedback and maintain a log book of all cases. By the completion of their training, trainees should be able to demonstrate that they can undertake complex major surgery in their chosen specialist area, to a high standard and unsupervised on the basis of their training and feedback logs.

## 4.4. Consulting/Clinic

Trainees should receive regular, at least twice weekly, supervised training in clinic. This should involve diagnostic and management consultations as well as breaking bad news. Regular performance appraisal should be undertaken by their trainer with both immediate verbal and written feedback of index consultations. Formalised training in communication skills is advisable.

## 4.5. Research

Trainees should be encouraged to take part in research recruitment for any large multicentre studies run through their units and must receive formal training in research governance, ethics and research methods. This should ideally form part of a higher degree course and should include a research project lead by the trainee themselves.

## 4.6. Appraisal and mentoring

All trainees should have regular meetings with a mentor to discuss their progress and training needs and should have annual appraisal of performance with the training programme director.

## 4.7. Teaching and Education

All trainees should have access to regular (at least monthly) high quality teaching, journal club and case review meetings (audit/morbidity and mortality meetings). In addition they should be encouraged to attend National and International Oncology meetings.

Training Units should have access to a full on line library of medical literature with books, journals and access to On-Line journals and electronic CME resources.

Trainees should work in Units with access to the most up to date investigational tools to permit practice at the forefront of their field of practice (PET Scans, MRI scanners, laparoscopic equipment, genetic analysis, basic science laboratories). These may not be present in all units but smaller units may offer integrated programmes with other geographically linked units.

# 5. Eligibility Criteria for the EBSQ Examination in Surgical Oncology

1. Each candidate must hold a current licence to practise as a general surgeon at the time of the examination.

2. Each candidate must have received certificate of specialist training from a European Union or associated country. Since 2010, candidates trained outside Europe are entitled to apply for the examination.

3. Each candidate must be able to demonstrate that he/she had worked for a minimum of two years in a designated oncology centre specialising in surgical oncology*

In addition to a completed application form and a *curriculum vitae* candidates will be required to submit a letter from their Head of Department supporting the application.

4. A log book of operative procedures in surgical oncology, including information on whether the candidate was First Assistant (A), Principal Surgeon assisted by Trainer (B) or Principal Surgeon not assisted by Trainer (C) must be included with this application. This list of operative procedures must be signed and stamped by the appropriate trainer.

# Suggested further reading

## Basic Science

The Basic Science of Oncology. Tannock IF, Hill RP, Bristow RG and Harrington L. McGraw-Hill Medical; 4th Edition 2005

Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics, Pecorino L. 3rd Edition, 2012, OUP Oxford.

The Biology of Cancer. Weinberg RA. Garland, 2006.

Hallmarks of Cancer: the next generation. Hanahan D and Weinberg RA. Cell, 2011, 144, 646-674.

Insight into the heterogeneity of breast cancer through next generation sequencing. Russness HG, Navin N, Hicks J, Borresen-Dale A-L. J. Clinical Investigation, 2011, 121 (10), 3810-3818.

## Site specific references

Hepatobiliary and Pancreatic Surgery: A Companion to Specialist Surgical Practice. Garden, OJ. Saunders Ltd, 2009.

Breast Surgery: A Companion to Specialist Surgical Practice, Dixon, M. Saunders Ltd, 2009.

Colorectal Surgery: A Companion to Specialist Surgical Practice, Phillips RKS. Saunders Ltd, 2009.

Oesophagogastric Surgery: A Companion to Specialist Surgical Practice, Griffin SM and Raimes SA. Saunders Ltd, 2009.

Sugarbaker PH (ed). Cytoreductive surgery & perioperative chemotherapy for peritoneal surface malignancy. Textbook and video atlas. Ciné-Med Publishing, Inc, 2013. ISBN 978-0-9846171-5-9. 214 pages and 4 DVDs

Esquivel J (ed). Treatment of Peritoneal Surface Malignancies. Surgical Oncology Clinics of North America 2012; 21(4) (Monograph)

Journal of Surgical Oncology 2008; 98 (4). Special Issue dedicated to the 5th International Consensus Meeting on Peritoneal Surface Malignancies Treatment (Monograph)

## Surgical Oncology

The MD Anderson Surgical Oncology Handbook. 5th Edition. Feig BW and Ching CD. Kluwer Wolters/Lippincott Williams & Wilkins, 2012.

Surgical Oncology (Oxford Specialist Handbooks in Surgery), Chaudry MA and Winslet MC. OUP Oxford, 2009.

Atlas Of Procedures In Surgical Oncology With Critical, Evidence-Based Commentary Notes (with Dvd-Rom) - RA. Audisio (Editor), World Scientific Publ. 2011

## Medical/Clinical Oncology/Palliative Care

Oxford Handbook of Palliative Care (Oxford Medical Handbooks) Watson M, Lucas C, Hoy A and Wells J. OUP Oxford 2009

Clinical Oncology: Basic Principles and Practice, Neal AJ, Hoskin PJ. Hodder Arnold, 4th Edition, 2009.

Oxford Handbook of Oncology (Oxford Medical Handbooks) Cassidy J, Bissett D, Spence R and Payne M. OUP Oxford, 3rd Edition, 2010.

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2. Benes V. The European Working Time Directive and the effects on training of surgical specialists (doctors in training): a position paper of the surgical disciplines of the countries of the EU. *Acta Neurochir (Wien)* 2006;148(11):1227-33.
3. Parsons BA, Blencowe NS, Hollowood AD, Grant JR. Surgical training: the impact of changes in curriculum and experience. *J Surg Educ* 2011;68(1):44-51.
4. Naredi P, Leidenius M, Hocevar M, Roelofesen F, van de Velde C, Audisio RA. Recommended core curriculum for the specialist training in surgical oncology within Europe. *Surg Oncol* 2008;17(4):271-5.
5. Naredi P, Audisio RA, Taylor I. Why do we need a core curriculum in surgical oncology in Europe? *Surg Oncol* 2008;17(4):267-9.
6. Whale S. Developments in the European Legal Orders: Implications for the Medical Profession. *The Medico-Legal Journal* 2002;70(April):1-7.
7. Smith JK, McPhee JT, Hill JS, Whalen GF, Sullivan ME, Litwin DE, et al. National outcomes after gastric resection for neoplasm. *Arch Surg* 2007;142(4):387-93.
8. Skipworth RJ, Parks RW, Stephens NA, Graham C, Brewster DH, Garden OJ, et al. The relationship between hospital volume and post-operative mortality rates for upper gastrointestinal cancer resections: Scotland 1982-2003. *Eur J Surg Oncol* 2010;36(2):141-7.
9. Gruen RL, Pitt V, Green S, Parkhill A, Campbell D, Jolley D. The effect of provider case volume on cancer mortality: systematic review and meta-analysis. *CA Cancer J Clin* 2009;59(3):192-211.
10. Michelassi F. 2010 SSO presidential address: subspecialty certificate in advanced surgical oncology. *Ann Surg Oncol* 2010;17(12):3094-103.
11. Leer JW, Overgaard J, Heeren G. The European core curriculum on radiotherapy. *Radiother Oncol* 1991;22(3):153-5.
12. Baumann ML, JWH. Dahl, O. De Neve, W. Hunter, R. Rampling, R. Verfaillie, C. Recommended Curriculum for the Specialist Training of Medical Practitioners in Radiotherapy within Europe. *http://www.estro-education.org/europeantraining/Documents/Core%20Curriculum%20Radiation%20Oncologists.pdf* 2002:1-10.
13. Recommended ESTRO core curriculum for radiation oncologists/radiotherapists, Third Edition. *http://www.estro-education.org/europeantraining/Documents/CC_FINALapprovedESTRO_CCApril2010.pdf* 2010.
14. Hansen HH, Bajorin DF, Muss HB, Purkalne G, Schrijvers D, Stahel R. Recommendations for a Global Core Curriculum in Medical Oncology. *Ann Oncol* 2004;15(11):1603-12.
15. Hansen HH, Bajorin DF, Muss HB, Purkalne G, Schrijvers D, Stahel R. Recommendations for a global core curriculum in medical oncology. *J Clin Oncol* 2004;22(22):4616-25.