

**Anhang / Annexe**  
**SWISS CATALOGUE OF OBJECTIVES IN ANESTHESIA AND REANIMATION**  
**(SCOAR)**

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## Roles

Anesthesia is a medical specialty which tasks include patient assessment and evaluation, maintenance of organ function as well as analgesia and amnesia of all patients undergoing diagnostic, therapeutic or surgical procedures.

The following roles have been identified as the most important for any specialist in anesthesia:

### 1. Medical Expert

The main field of an expert in anesthesia is the perioperative medical field, and he/she should acquire all necessary competences enabling him/her to fulfill this expert role and function in a multidisciplinary setting.

- a. Domain of perioperative medicine: It comprises the continuum in patient care starting before the operative procedure until the postoperative period ; it concerns all patient categories (including children and pregnant women) ; it comprises the following tasks :
  - i. Preoperative:
    1. Preoperative evaluation, including cooperation with consultants of other specialties for optimal patient care and preoperative medical preparation; risk assessment, evaluation of emergency/elective surgical strategy and benefit/risk assessment.
    2. Preoperative discussion and information of patients; use of communication skills, both oral and written. Provision of information and obtaining informed consent.
    3. Appropriate choice and relevant use of laboratory tests and other examinations/investigations.
  - ii. Intraoperative:
    1. Selection and conduct of the safest anesthetic technique, best suited to the medical status of the patient and to the operative procedure planned.
    2. Knowledge and use of various invasive and non invasive monitoring techniques; use of appropriate accessory means and equipment (i.e., heating humidification devices, positioning materiel).
    3. Safe conduct of anesthesia as well as recognition and treatment of intraoperative incidents and complications.
    4. Complete and accurate record keeping.
  - iii. Postoperative :
    1. Appropriate selection of postoperative management and care, including transfer towards other specialized surveillance structures.
    2. Postoperative pain management as well as treatment of side-effects; recognition and treatment of other postoperative complications.
- b. Other domains of competences:
  - i. Emergency medicine, acute care and in- and out of hospital resuscitation.
  - ii. Intensive Care Medicine (Specific objective in ICM curriculum).
  - iii. Management of acute, palliative and chronic pain.
  - iv. Use of specific and/or invasive technical competences out of the perioperative.

### 2. Communicator/ « team expert »

The specialist in anesthesia should have competences in communication which enables him/her to deal with the different aspects of human interactions and relationships.

1. Effective communication with patient, family/relatives.
2. Effective communication with colleagues and other professionals working in the medical/hospital field, in order to ensure optimal patient care.

3. Master multidisciplinary team work in acute care (operating theatre, emergency, intensive care and recovery room, labor wards), as well as in the context of resuscitation.
4. Effective communication in the setting of multidisciplinary teams in the resolution of conflicts; give feed-back; take and assume leadership when necessary.

### **3. Manager**

The specialist in anesthesia should have competences which permit effective organization and management tasks to take place during professional activities.

1. Implementation of quality assurance programs and use of recognized standards.
2. Promotion and participation in better and safer patient care.
3. Knowledge of administrative and economic aspects of anesthesia practice :
  - a. OR management
  - b. HR management
  - c. Basic knowledge in budgeting
4. Implementation and use of practice guidelines and standards both local and national (SSAR/SGAR); national healthcare policy.
5. Cost-effective and relevant use of all diagnostic, prophylactic and therapeutic means and measures (health economics)

### **4. Scholar**

It is the specialist's responsibility to maintain a high degree of professional competence, to facilitate development of colleagues and other groups of professionals, as well as favor development of the specialty itself.

1. Maintain life-long learning; critical reading and appraisal of information, evaluation of new information and technologies.
2. Acquisition of basic pedagogical tools for education, skills for research and education presentations, teaching of young colleagues, residents, nurses.
3. Contribute to research, development, and implementation/transmission of new medical knowledge.
4. Contribute to patient education, and other students or healthcare professionals.

### **5. Professional**

The specialist in anesthesia will exhibit irreproachable behavior and be aware of duties and responsibilities inherent to his/her role as a professional.

1. Deliver quality care with integrity, honesty and compassion.
2. Recognition of personal limits by appropriate consultation with others when caring for the patient.
3. Competences in ethical decision-making when linked to patient care, and management of ethical conflicts.
4. Knowledge of medico-legal aspects of anesthesia practice, in particular in the management and prevention of conflicts of interest, as well as in the management of anesthetic incidents and accidents.

## Domains and Competencies

In order to fulfill the five professional roles of a specialist in clinical anesthesia, a list of domains of expertise and competencies in these domains have been identified.

These domains of expertise can be divided into “general core competencies” and “specific core competencies” (see detailed list below). Throughout the course of their training, residents will progressively achieve the required level of competence in each domain.

**9 domains** of general core competencies have been identified:

- 1.1 Disease Management, Patient Assessment and Preoperative Preparation
- 1.2 Intraoperative patient care
- 1.3 Postoperative patient care and pain management
- 1.4 Resuscitation and Emergency management
- 1.5 Practical anesthetic procedures / Skills
- 1.6 Quality - Management - Health economics
- 1.7 Anesthesia Non-Technical Skills (ANTS)
- 1.8 Professionalism, Ethics
- 1.9 Education, self-directed learning, Research

**8 domains** of specific core competencies have been identified:

- 2.1 Obstetrics
- 2.2 Airway surgery and management
- 2.3 Thoracic and Cardiovascular surgery
- 2.4 Neuroanesthesia
- 2.5 Pediatric Anesthesia
- 2.6 Medical and perioperative care of critically ill patients
- 2.7 Anesthesia outside the OR
- 2.8 Chronic, palliative and Interventional pain management

In the following sections of this document, both general and specific core competencies in each domain have been expressed in the form of a list of “competence statements”.

Two phases have been evidenced in the postgraduate training program: a first phase of 18 to 24 months over which the trainee is expected to acquire mainly general core competences, the level of which is described below. A second phase of 3 years follows (36 months) where more specific competencies are acquired and the level of acquisition deepened for the core competencies.

The level of acquisition/expertise for each competence defined in each domain ranges from “A” to “D”:

- A: Has knowledge of, describes...
- B: Performs, manages, demonstrates under supervision
- C: Performs, manages, demonstrates independently
- D: Teaches or supervises others in performing, managing, demonstrating.

For each domain of expertise, a detailed list of “learning objectives” has been identified. These learning objectives have been broken down into “Knowledge, Skills and Attitudes” that are deemed necessary to achieve the required level of competencies in each domain.

The “learning objectives” are realistic endpoints that should be attained by the end of the anesthesia residency period.

The “learning objectives” also represent measurable endpoints that should serve as a basis for the development of future evaluation modalities in order to objectively and reliably measure the acquisition of competencies throughout the curriculum.

Furthermore, the learning objectives relevant to the domains and competencies are completed by a detailed “mini-syllabus”.

## Part 1: General Core Competencies

### Domain 1.1: Disease Management, Patient Assessment and Preoperative Preparation

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.1.1	Identifies, optimizes, and treats all relevant patient pathologies, including those with direct impact on anesthetic techniques (anterior mediastinal mass, pulmonary hypertension, tamponnade)	B	C
1.1.2	Assesses preoperative risk	B	D
1.1.3	Uses and interprets preoperative investigations appropriately and rationally.	B	D
1.1.4	Assesses airway for potential difficulty with intubation and /or ventilation	B	D
1.1.5	Knows and applies the principles involved in pre-operative therapy, fasting guidelines and pre-medication	B	D
1.1.6	Elaborates an individualized preoperative anesthetic strategy, including rational use of drugs and techniques	B	D
1.1.7	Provides adequate information and obtains consent for anesthesia	B	D

### Learning Objectives

#### a. Basic knowledge

During the course of the training, anesthesia residents must acquire knowledge on all relevant medical pathologies and those with direct impact on anesthetic techniques.

- Anatomy, physiology, pathophysiology of following organs systems (c.f. syllabus)
  - o Airway
  - o Respiratory
  - o Cardiovascular
  - o Nervous and muscular
  - o Urinary/excretory
  - o Endocrine
  - o Digestive
- Knowledge and experience of the etiology, natural history, diagnosis, treatment and complications:
  - o Respiratory
    - Obstructive lung disease (COPD and asthma)
    - Respiratory infection like pneumonia, tuberculosis
    - Restrictive lung disease
    - Malignancies
    - Pulmonary hypertension (primary and secondary)
    - Acute respiratory failure (see ICU domain 2.3)
  - o Cardiovascular:
    - Congestive heart failure

- Coronary artery disease
- Hypertension
- Arrhythmias
- Valvular heart disease and cardiac shunt
- Cardiomyopathies
- Thromboembolic disease
  
- Nervous and muscular
  - Cerebrovascular diseases
    - TIA, carotid artery disease, stroke
  - Intracranial tumor and raised IC pressure
  - Chronic spinal cord transection
  - Muscular and myotonic dystrophy
  - Myasthenia Gravis, myasthenic syndrome
  - Epilepsy
  - Chronic pain and chronic postoperative persistent pain
  
- Urinary/excretory
  - Renal failure and common causes
  - Disorder of acid-base balance
  - Electrolyte disorders
  
- Digestive
  - Esophageal disease ( reflux, hiatus hernia)
  - Gastric disease ( peptic ulcer disease)
  - Carcinoid tumors
  - Disease of liver
    - Acute hepatitis (toxic, infectious) and chronic hepatitis
    - Cirrhosis and complications
  
- Endocrine
  - Diabetes mellitus and complications (hyperglycemia, hypoglycemia, acidocetosis)
  - Thyroid gland dysfunction (hyperthyroidism, hypothyroidism)
  - Parathyroid gland dysfunction
  - Adrenal gland dysfunction
    - Hypoadrenocorticism
    - Pheochromocytoma
  - Diabetes insipidus
  
- Understanding disease processes, natural evolution and knowing the influence on the management of perioperative period
- Treatment of above-mentioned diseases, in order to optimize patients before anesthesia and surgery in cooperation with other physicians
- Pharmacology of perioperative drugs (c.f. Syllabus)
- Fasting guidelines
- Airway assessment including bedside tests to assess difficult ventilation and intubation
- Other medical history (personal and family history of previous anesthesia, allergy, drug abuse, chronic use of analgesics, habits)
- The transplant patient undergoing general surgery

**b. Clinical skills**

- Patient assessment based on history and physical examination, use of appropriate examinations and laboratory tests
- Evaluation of the preoperative ASA physical status
- Specific consideration in airway management (c.f. domain airway)
- Interpretation, considering the value and limitation of:
  - o Electrocardiogram, and other methods assessing cardiovascular function (echocardiography, ergometry myocardial scintigraphy, coronography)
  - o Pulmonary function test and arterial blood gas analysis
  - o Common radiological testing with special emphasis on chest X-ray
  - o Coagulation
  - o Liver and renal function test
  - o Endocrine function
  - o Drug monitoring
- Selection and planning of the anesthesia technique, including monitoring and other equipments required for the procedure
- Decision-making relating to postponement or cancellation of surgery
- Accurate preoperative record keeping

**c. Specific attitudes**

- Effectively communicate with patients, let patients know of risks and benefits of various techniques used, and treat patients with respect and courtesy in answering all questions and concerns they may have
- Establishing effective interaction with patients and their relatives
- Develop strategies to provide informed consent and disclosure of risk (information leaflets, multi-media)
- Discuss alternatives with the patient, the surgeons and other team colleagues



## Domain 1.2: Intraoperative Care

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and intraoperative care of patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.2.1	Prepares the workplace according to local checklists (equipment and anesthesia machine, drugs, monitoring, etc...)	B	D
1.2.2	Uses appropriately all standard safety (electrical, laser, X-ray) and infection control (HIV, Hepatitis, resistant organism infection ) measures	B	D
1.2.3	Uses and monitors patient's positioning safely	B	D
1.2.4	Masters knowledge of pharmacology relevant to general and regional anesthesia, including preparation, administration and monitoring of drug effects	B	D
1.2.5	Provides a safe induction, maintenance, and emergence from general anesthesia, including choice of drugs, airway management, ventilation techniques and monitoring	B	D
1.2.6	Provides a safe conduct of regional anesthesia, including choice of drug, choice of regional technique and monitoring	B	D
1.2.7	Uses appropriate skills for safe provision of general or regional anesthetic techniques (c.f. Technical Skills)		
1.2.8	Maintains homeostasis of organ systems of patients throughout different procedures, including adequate fluid and volume management, safe use of blood and blood products, and maintains normothermia	B	D
1.2.9	Provides adequate record keeping of anesthetic procedures	B	D
1.2.10	Recognizes, diagnoses and manages intraoperative critical incidents	B	D

### Learning Objectives

#### a. Basic knowledge

- Physics and Clinical measurement (Behavior of fluids (gases and liquids); Flow of fluids; Measurement of volumes, flows, and pressures; Measurement of temperature; Humidification; Oximetry; Analysis of gases; Capnography; Electrical safety; Fires and explosions)
- Equipment and apparatus (Equipment design and standards; Gas supply in bulk and cylinders; Anesthesia delivery system, including pressure valves and regulator; Vaporizer; Breathing system; Devices to maintain the airway such as laryngoscopes, endotracheal tubes, tracheotomy tubes, face masks, airway devices; Information systems; Ultrasonography and its use in echocardiography, regional anesthesia, vascular access and pain interventions)
- Minimum monitoring standards, and additional monitoring when appropriate (including central venous pressure, invasive arterial pressure, cardiac output monitoring, cerebral function, coagulation, blood gas analyses, urinary output)
- Planning and physical layout of an operating theatre suite (Operating rooms and post-anesthesia recovery room; Lighting; Safety; Infection and pollution control in operating rooms; Sharps policies)
- Principles of safety such as lifting and positioning patients
- Conduct of anesthesia:
  - o Management of the airway and intraoperative complications

- Applied cardiac and respiratory physiology
- Routine inhalation and intravenous inductions; Maintenance of anesthesia
- Application of mechanical ventilation
- Correct use of anesthesia delivery systems
- Applied pharmacology and variability in drug response
- Correct use of muscle relaxants, neuromuscular blockade monitoring
- Application and interpretation of monitored variables
- Fluid management, including blood replacement therapy
- Common regional anesthesia techniques (epidural and spinal anesthesia and upper/lower limb blocks)
- Maintenance of accurate records

## **b. Skills**

### **Technical skills:**

- Rapid sequence induction
- Maintenance of an adequate airway
- Advanced Life Support
- Aseptic techniques
- Peripheral and central venous access including cannulation of major vessels for volume resuscitation, arterial cannulation and arterial blood gas collection
- ECG recording and interpretation
- Lumbar puncture, thoracic and lumbar epidural, and spinal anesthesia
- Blood salvage and conservation

### **Clinical and case management skills:**

Trainees are expected to identify and manage the following co-existing medical conditions relevant to anesthesia:

- Disorders of the airway and respiratory system
- Disorders of the cardiovascular system
- Disorders of the nervous system
- Renal disorders; Water, electrolyte and acid-base disturbances
- Hematological disorders, including coagulopathies
- Disorders of the liver, biliary tract and gastrointestinal system
- Endocrine disorders such as Pheochromocytoma, hyperthyroidism, hypothyroidism, and diabetes mellitus
- Skin and musculoskeletal disorders, including rheumatoid arthritis and ankylosing spondylitis
- Psychiatric disorders and substance abuse
- Ageing
- Obesity

Trainees are further expected to identify and manage the following major intraoperative problems:

- Inadequate airway: obstructed airway, failed intubation, esophageal intubation, endobronchial intubation, and unplanned extubation
- Laryngospasm and Bronchospasm
- Gas embolism, Pulmonary aspiration, and Pneumothorax
- Hypoxia, Hypocarbica, Hypercarbia, Hypoventilation, Hyperventilation, and High ventilator peak inspiratory pressures
- Hypertension, Hypotension, Arrhythmias, Myocardial Ischemia
- Hypothermia, Hyperthermia, and Malignant hyperthermia
- Anaphylaxis

- Residual neuromuscular blockade (or regional anesthesia)
- Inadequate neuraxial blockade
- Intraoperative awareness
- Seizures

**c. Specific attitudes**

- Effectively communicate with other members of the operating room in order to voice issues and concerns; work together with other health care professionals to ensure smooth patient care and safety

## Domain 1.3: Postoperative patient care and pain management

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.3.1	Provides appropriate handover of a patient in recovery or ICU, summarizing relevant clinical features of the patient's pre- and intraoperative care	B	D
1.3.2	Provides adequate patient monitoring in PACU	B	D
1.3.3	Assesses and adequately treats post-operative pain and post-operative nausea and vomiting	B	D
1.3.4	Anticipates, recognizes, diagnoses and manages postoperative critical incidents, including indication for transfer to ICU	B	D
1.3.5	Uses correct discharge criteria from both in and outpatient settings	B	D

### Learning Objectives:

#### a. Knowledge

- Postoperative Care:
  - o Safe transport and handover of anesthetized patient
  - o Acute pain Management:
    - Anatomy and physiology of pain pathways, the neuroendocrine response to acute pain and its effects of major organ systems  
Knowledge about specific management of acute pain in patients with chronic pain an chronic use of analgesics
    - Knowledge of the clinical pharmacology of medications used in treatment of acute pain, including:
      - Medications: opioids, local anesthetics, NSAIDS, alpha-2 agonists, NMDA-Receptor antagonists, intravenous lidocaine
      - Route of administration: oral, SC, IM, IV (including PCA), epidural, intrathecal, peripheral nerve blocks
      - Knowledge of the advantages of one pain relief delivery system over another, of specific doses, rates and details of these delivery systems
  - o Knowledge of common complications related to the anesthetic technique and the surgical procedure used, as well as therapeutic issues:
    - Bronchoaspiration / Pneumothorax
    - Hypoxemia
    - Hypercarbia
    - Hypotension/Bleeding/Shock of different etiologies
    - Fluid requirements/Electrolyte disturbances
    - Arrhythmias
    - Residual neuromuscular blockade
    - Side-effects and complications of regional techniques (PDPH)
    - Postoperative confusion and altered mental states
    - TURP syndrome
    - PONV

- Nerve and muscular damage
- Patient malpositioning
- Knowledge of potential complications related to comorbid conditions of patients
  - Respiratory distress
  - Ischemic, rhythmic and hypertensive heart disease
  - Renal failure
  - Sepsis
  - Diabetes
  - Transfusion and coagulation disorders
- Appropriate monitoring techniques and their interpretation

## **b. Skills**

### **Technical skills:**

- Basic vascular access and airway management
- CPR (basic and advanced life support)
- Regional anesthesia techniques: single shot and catheter techniques of neuraxial and peripheral nerve blocks
- Skills to use pain pumps in a correct and safe manner

### **Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Indications and interpretation of common laboratory and radiological exams
- Manage common and life threatening adverse reactions to medications used during anesthesia and to treat acute pain
- Perform drills such as advanced life support to manage emergencies conditions (see above)
- Management of post-spinal syndrome, including the indications for, and side effects of, an epidural blood patch

## **c. Specific Attitudes**

- Demonstrate knowledge of the policies which must be in place to safely and effectively treat acute pain, monitor its efficacy and promote safety within a multidisciplinary team
- Demonstrate responsibility for the Acute Pain Service and management of patients in a timely and professional manner; follow up on patients who experienced complications and/or side effects in PACU
- Recognition of life-threatening complications requiring ICU transfer

## Domain 1.4: Resuscitation and Emergency management

During the course of their training, anesthesia residents must acquire clinical abilities and skills in managing medical and surgical acutely ill patients, including life threatening situations. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.4.1	Adopts a structured and timely approach to the recognition, assessment and stabilization of the acutely ill patient with disordered physiology	B	C
1.4.2	Manages cardiopulmonary resuscitation and post-resuscitation stabilization	B	C
1.4.3	Triages and prioritizes patients appropriately, including timely admission to ICU and OR; Describes the management of mass casualties	A	B
1.4.4	Assesses and provides initial management of the trauma patient including the patient with burns according to established protocols	B	C

### Learning Objectives:

#### a. Knowledge

Knowledge and understanding of the physiopathology and treatment of:

Trauma emergencies (blunt or penetrating according to ATLS list of life threatening injuries):

- Mechanisms of injury and trauma scoring
- Head and spinal injury
- Maxillo-facial trauma
- Chest trauma
- Abdominal trauma
- Pelvic trauma
- Musculoskeletal trauma
- Burns

Medical emergencies (c.f. ACLS manual and ICU learning objectives)

- Respiratory
- Cardiac
- Neurology
- Endocrinology
- Acid Base and electrolyte disorders
- Intoxications
  - o Poisonings with alcohol, salicylates, paracetamol, antidepressants, opioids, benzodiazepines, carbon monoxide
  - o Implication of addiction, dependence and withdrawal

#### b. Skills

##### Technical skills:

- CPR in adults, children and neonates
- Emergency airway management, including needle and surgical cricothyroidotomy

- Emergency vascular and transosseous accesses
- Immediate chest needle decompression
- Needle thoracocentesis and intercostal chest drainage

**Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Adopting a structured and prioritized approach to emergency situations (Adult and pediatric advanced life support)
- Knowing and applying the principles of triage
- Identifying patients with an immediate threat to life
- Dynamic and repetitive assessments (primary and secondary) in parallel with therapeutic interventions
- Appropriate use of resuscitative procedures and drugs
- Safe and effective use of pain therapy in an emergency environment
- Appropriate use of complementary exams (laboratory and radiology)

**c. specific attitudes**

- Establishing effective communication and interaction with other specialists to ensure optimal care
- Developing and demonstrating effective teamwork skills
- Adapting to a physically and psychologically challenging environment, using debriefing and other coping strategies
- Exercise good judgment as to when resuscitation is futile or inappropriate
- Recognizing psychological issues and their implications for the patients and their families in the emergency environment

## Domain 1.5: Practical anesthetic procedures / skills

During the course of their training, anesthesia residents must acquire the clinical abilities and skills to perform the following procedures in an appropriate and safe way.

	<u>Competence statement</u>	1st phase	2nd phase
1.5.1	Provides basic airway management	C	D
1.5.2	Provides specific airway management	B	C
1.5.3	Provides basic vascular access	C	D
1.5.4	Provides specific vascular access	B	C
1.5.5	Provides basic peripheral and central blocks	C	D
1.5.6	Provides specific peripheral and central blocks	B	C
1.5.7	Operates technical monitors and machines and troubleshoots basic technical malfunctions	C	D
1.5.8	Can describe specific monitoring procedures	A	B

### Learning Objectives:

#### a. Knowledge (c.f. syllabus)

- Airway management:
  - o Anatomy of the upper airway
  - o Airway assessment and identification of the potential difficult airway (scores / grading)
  - o Knowledge of the algorithm for the difficult airway
  - o Knowledge of criteria for a safe extubation
  - o Protocol for extubation of a difficult airway
  - o Management of pulmonary aspiration during general anesthesia
- Vascular accesses:
  - o Basic anatomy relevant to the vascular accesses
  - o Knowledge of indications and contraindications of the different vascular accesses
  - o Knowledge of risks and complications of the different vascular accesses
- Peripheral and central blocks
  - o Basic anatomy relevant to the peripheral and central blocks
  - o Early recognition of systemic local anesthetic toxicity, knowledge of symptoms and signs, as well as its prevention, treatment and resuscitation measures
  - o Knowledge of the physiological changes following regional anesthesia
  - o Knowledge of indications and contraindications of peripheral and central blocks
  - o Knowledge of risks and complications of peripheral and central blocks with special emphasis on coagulation disorders.
  - o Knowledge of appropriate use of peripheral and central blocks both intraoperatively, as an anesthetic technique, and postoperatively as an acute and chronic pain management technique
- Technical devices (c.f. intraoperative LOs)



## **b. Skills**

- Airway management
  - o Uses different available maneuvers to clear the airway (head extension, jaw-thrust, oropharyngeal and nasopharyngeal airways)
  - o Airway management using the following devices:
    - Face mask and self inflating bag
    - Laryngoscope and different blades
    - LMA and other supraglottic airways
    - Endotracheal tubes
    - Fiberoptic devices
  - o Performs routine preparation of equipment
  - o Performs equipment setup for the difficult intubation
  - o Performs routine airway management (mask ventilation, intubation and extubation)
  - o Performs drills in the algorithm for the difficult mask ventilation
  - o Performs the rapid sequence induction
  - o Performs drills in the handling of the difficult airway (including fiberoptic intubation asleep and awake)
  - o Performs drills in cricothyroidotomy and jet ventilation
  - o Performs the emergency management of a pneumothorax and placement of a chest tube
  - o Performs the extubation protocol in the difficult airway, with a plan to “not lose the airway”
  - o Performs intraoperative bronchoscopy and bronchial lavage in case of problems with secretion or pulmonary aspiration
- Vascular accesses
  - o Correct identification of landmarks and positioning of patient
  - o Demonstrates effective skin antisepsis and site preparation
  - o Insertion of peripheral, central venous, and arterial lines
  - o Is able to recognize and treat complications related to vascular accesses
- Peripheral and central blocks
  - o Is able to position the patient appropriately for the performance of the blocks
  - o Demonstrates effective skin antisepsis and site preparation
  - o Performs peripheral blocks of the upper extremity (single shot and catheter techniques), including intravenous, axillary and interscalene blocks
  - o Performs peripheral blocks of the lower extremity (single shot and catheter techniques) including intravenous, femoral, obturator
- Uses appropriate equipment including needles, devices for nerve location and catheters
  - o Performs the common central neuraxial blocks such as spinal, epidural (thoracic/lumbar) and combined spinal/epidural
  - o Assesses the extent and degree of a block with an appropriate method
- Technical devices
  - o Is able to check and operate the following equipment and machines:
    - Gas supply
    - Anesthesia delivery systems
    - Vaporizers
    - Breathing systems
    - Anesthetic ventilator machines
    - Infusion pumps/rapid infusion devices
    - CNS monitoring

- Warming devices
  - Blood salvaging devices
- Selects the appropriate monitoring methods, both invasive and non invasive, and provides a critical interpretation of the monitored variables
- c. Specific attitudes**
- Is aware of his own limits when performing technical procedures, anticipates problems and can act accordingly, including calling for help early

## Domain 1.6: Quality management and health economics

During the course of their training, anesthesia residents must acquire skills to assess the quality of their work. Adequate performance requires the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.6.1	Provides the best anesthetic care in accordance to standards and recommendations of the SSAR/SGAR	B	D
1.6.2	Applies in his work the local in-hospital guidelines of the quality and safety programs (checklists, transmissible diseases, patient and operative site identification, etc...).	B	C
1.6.3	Is aware of his own limits and is capable of seeking help when required	C	C
1.6.4	Organizes effectively his work with a multidisciplinary team	B	D
1.6.5	Ensures continuity of care through effective handover of clinical information	B	D
1.6.6	Demonstrates an understanding of the managerial and administrative responsibilities	A	C

### Learning Objectives:

#### a. Knowledge

- Standards of quality and security, and recommendations of the SSAR/SGAR
- Tools for quality assurance (Cirrnet, local reporting systems, A-QUA, Stiftung für Patientensicherheit)
- Governmental Regulations relevant for anesthesia practice (both cantonal and federal)
- Economic aspects:
  - o Demographic data and resource utilization data relevant for anesthesia practice (DRG, TarMed, OFSP-BAG, etc...)
  - o Basic knowledge on financial aspects of anesthesia practice
  - o Basic knowledge on organizational and budgeting aspects of anesthesia practice

#### b. Skills

- Understands and applies standards of quality, security and recommendations in daily practice
  - o Understands the importance and uses checklists and follows guidelines
  - o Supports and provides data for both local and national ADS
  - o Demonstrates awareness for critical incidents and reports them
- Applies standards of quality and safety with respect to organizational aspects
  - o Applies organizational knowledge to provide a cost-effective organization

## Domain 1.7: Anesthesia Non-Technical Skills (ANTS)

During the course of their training, anesthesia residents must acquire non-technical abilities to master interpersonal and organizational tasks during the perioperative care of patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.7.1	Develops and maintains an overall dynamic awareness of the situation based on perceiving the elements of the operating room environment (patient, team, time, monitoring and equipment) and understands what they mean and anticipates what could happen in the near future	B	C
1.7.2	Makes decisions to reach a judgment or diagnosis about a situation, or to select a course of action, based on experience or new information under both normal conditions and in time-pressured crisis situations	B	D
1.7.3	Manages resources and organizes tasks to achieve goals, be they individual case plans or longer term scheduling issues	B	C
1.7.4	Communicates effectively and works with others in a team context, in any role, to ensure effective joint task completion and team satisfaction	B	C

### Learning Objectives:

#### a. Knowledge

- Psychological aspects of team performance for successful task performance
- Crisis resource management
- Human error research, relevant for the perioperative setting
- Behavioral marker systems, relevant for successful training

#### b. Skills (Aberdeen)

- Task management
  - o Planning and preparing
  - o Prioritizing
  - o Providing and maintaining standards
  - o Identifying and utilizing resources
- Team working
  - o Coordinating activities with team members
  - o Exchanging information
  - o Using authority and assertiveness
  - o Assessing capabilities
  - o Supporting others
- Situation Awareness
  - o Gathering information
  - o Recognizing and understanding
  - o Anticipating
- Decision making
  - o Identifying options

- Balancing risks and selecting options
- Re-evaluating
- Leadership
  - To work as a team member but to assume responsibilities and to delegate duties as a team leader when necessary

## Domain 1.8: Professionalism and Ethics

During the course of their training, anesthesia residents must develop the attributes of a medical professional and a specialist in anesthesia. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
1.8.1	Formulates clinical decisions with respect of ethical and legal principles	C	D
1.8.2	Communicates effectively with patients and relatives (doctor-patient relationship); involves patients and/or their surrogates in decisions about care and treatment	C	D
1.8.3	Involves fellow colleagues from different other specialties in decision-making about care and treatment	B	D
1.8.4	Maintains accurate and legible records, and documentation of clinical activities	C	D
1.8.5	Respects privacy, dignity, confidentiality and legal constraints on the use of patient data	C	D
1.8.6	Supports and participates in activities regarding professional and specialty development	A	C
1.8.7	Within the context of a multidisciplinary team, provides end-of-life and palliative care and applies the ethical and legal guided process of withholding and withdrawing treatment	A	C

### Learning Objectives:

#### a. Knowledge

Professional Attributes:

- Principles of medical ethics : autonomy, beneficence, non-maleficence, and justice
- The Geneva Declaration and Helsinki protocol
- Legal principles and medicolegal obligations defining medical practice and the use of patient data
- Principles of communication with patients and physician-patient “contract” including:
  - o Rights and responsibilities of patient, doctors and other medical staff
  - o Informed consent
  - o Patient confidentiality and privacy
  - o Error and incidents disclosure
- Principles of communication with colleagues including:
  - o Methods (verbal, written, consultation or referral)
  - o Manner (courtesy, integrity, respect)
  - o Adequate record keeping (including medicolegal implications)
- Personal issues including:
  - o Balancing family and work, and the importance of non-professional activities
  - o Depression; recognition and care plans
  - o Substance abuse; recognition and access to appropriate referral
  - o Mentoring; types and their applications
  - o Leadership responsibilities and styles; team behaviors
  - o Stress and crisis management
  - o Principles underpinning conflict resolution

- Use and influence of role model

## **b. Skills**

Clinical and case management skills:

Trainees are expected to integrate and demonstrate the application of the above knowledge and attributes to their clinical practice by:

- Applying principles of medical ethics to problem solving; for example in the following areas: end-of-life and palliative care; withholding and withdrawing treatment; Jehovah's witnesses; NTBR order; patient unable to display judgment; minor patient.
- Effective communication with patients and their relatives; for example, breaking bad news, error and incident disclosure, diagnosing and explaining brain death, requesting organ donation.
- Effective communication with colleagues and other actors of the multidisciplinary team through appropriate handover, patient referral, consultation request or assistance.
- Appropriate behaviors and communications in the case of tensions and conflicts arising among members of the multidisciplinary team.
- Displaying optimal maintenance of anesthesia and other medical records.

## **c. Specific Attitudes**

Specialist practice

- Trainees are expected to develop and attain attributes in the 5 roles a specialist in anesthesiology: Medical expert; Communicator /team expert; Manager; Scholar; Professional
- To work as a team member but to assume responsibilities and to delegate duties as a team leader when necessary
- To accept that medical knowledge and skills are not only the requirements of specialists practice
- Critical appraisal: to have insight into one's own limitations, abilities and areas of expertise
- To commit to lifelong continuing professional education and to maintain an inquisitive attitude

Professionalism, Ethics and the Law

- To be aware act according to medicolegal obligations relating to medical practice
- To commit and believe in the four main ethical principles and in professional values such as altruism, fidelity, social justice, honor and integrity, and accountability

Patient considerations

- To commit and believe in the rights of patients to autonomy, confidentiality, informed consent, comprehension of the risks of anesthesia techniques
- To appropriately care for patients irrespectively of race, culture, gender, sexual orientation, and socio-economic status
- To commit to ethical principles of research

## Domain 1.9: Education, Self-directed Learning, Research

During the course of their training, anesthesia residents must acquire an understanding of the scientific basis of anesthesia practice including basic statistical concepts, ethics and economics. They must be able to assess the benefit of applying results of research to clinical practice with regards to ethical and economical aspects. Trainees will also be required to develop competences in education and are required to show an attitude towards self motivated learning.

	<u>Competence statement</u>	1st phase	2nd phase
1.9.1	Demonstrates perpetual refreshment of his knowledge through participation to lectures, refresher courses, personal reading; demonstrates knowledge of the principles of quality assurance programs and critical incident reporting	B	D
1.9.2	Contributes actively to education of both trainees and members of the anesthetic staff	A	C
1.9.3	Demonstrates knowledge of basic statistics, criteria for a good clinical study; and critical reading of an article	C	D
1.9.4	Demonstrates basic knowledge in ethics and economics in health care	B	C
1.9.5	Participates in clinical or basic science research leading to peer-reviewed publications	B	C

### Learning Objectives:

#### a. Knowledge

- Basic concepts of evidence based medicine
- Statistical Methods:
  1. Data collection:
    - defining outcome measures and the uncertainty of measuring them
  2. Descriptive statistics:
    - types of data and their representation
    - normal distribution: an example of parametric distribution
    - indices of central tendency and variability
  3. Deductive and inferential statistics:
    - simple probability theory / relation to confidence intervals
    - the null hypothesis
    - type I and type II errors
- Scientific basis of clinical practice
- Methodology and processes of clinical research including:
  - o importance of study design in clinical research
  - o importance of statistical analyses
  - o ethical considerations related to research
- Audit cycle and critical incident reporting: purpose, methods
- Basic concepts related to economics in health care and research
- Basic concepts in ethics

#### b. Skills

- Ability to locate published research in a systematic manner
- Critical interpretation and evaluation of the value of published clinical research



- Planning and preparation of presentations to a live audience
- Participation in a basic science or clinical research project

**c. Specific Attitudes**

- Achieve and maintain a questioning approach to clinical practice
- Maintain a Learning Portfolio ; reflect on previous learning experiences with the aid of the Learning Portfolio
- Develop an informed critical approach to the scientific literature; conduct and appraise literature searches
- Cultivate an evidence based practice of anesthesia; appraise journal articles including the application of statistics
- Demonstrate a constant willingness to teach and learn
- Develop a readiness to both listen and learn
- Carry out oral presentations and professional communication

## Part 2: Specific Core Competencies

### Domain 2.1: Obstetrics

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of pregnant women and fetus or neonate. These include the following competencies:

	<u>Competence statement</u>	1st phase	2nd phase
2.1.1	Masters anatomy, physiology, pathophysiology and pharmacology of pregnancy and labor	A	D
2.1.2	Masters fetal physiology, ante partum and intra partum fetal assessment	A	D
2.1.3	Masters techniques, indications and contraindications for labor analgesia	B	D
2.1.4	Masters the anesthetic management of cesarean section and other operative deliveries under regional or general anesthesia	B	D
2.1.5	Prevents and treat specific anesthetic complications, including parturient resuscitation	B	C
2.1.6	Manages the high -risk obstetric situations	B	C
2.1.7	Manages the anesthetic of non obstetric surgery during pregnancy	B	D
2.1.8	Performs neonatal assessment and resuscitation	B	C

### Learning Objectives:

#### a. Knowledge

- Basic knowledge in obstetrics:
  - o Alterations in anatomy and physiology during pregnancy and their implications for anesthesia
  - o Placental development and physiology, fetal development and physiology
  - o Neonatal physiology and adaptation to extra-uterine life
  - o Physiology of normal labor and delivery
  - o Fetal and maternal assessment during labor
- High-risk conditions in the pregnant women:
  - o General:
    - Diabetes
    - Obesity
    - Cardiopathies
    - Thromboembolic diseases
  - o Specific:
    - Pre-eclampsia and its complications (HELLP syndrome, eclampsia); other hypertensive diseases
    - Abnormalities of placenta (praevia, accreta /increta/ percreta)
    - Pre-, intra- and post-partum causes of hemorrhage: risk factors and possible causes according to the term of pregnancy (ectopic pregnancy included) and main steps of their prevention and treatment
    - Multiple pregnancy
    - Breech presentation
    - Prematurity
- In utero fetal death

- Pharmacology during pregnancy: modification of pharmacodynamics and kinetics of currently used anesthetic drugs during pregnancy, placental transfer of drugs and their effect on the gravid uterus and/or fetus, specific obstetrics and post-partum drugs (tocolytics, uterotonics)
- Basic principles of neonatal assessment and resuscitation
- Indications and contra-indications to various methods for labor analgesia (epidural, continuous spinal-epidural, iv analgesia); choice of local anesthetic, adjuvant or iv drug
- Knowledge of the potential complications of regional analgesia for labor and C-section (unsatisfactory analgesia or anesthesia, neurological complications, postdural puncture headaches, toxicity of local anesthetics, high block)
- Knowledge of the possible indications for C-sections and their level of emergency
- Anesthetic techniques for C-section: spinal, epidural (uploading of a pre-existing catheter), continuous spinal-epidural, general anesthesia (and choice of appropriate drugs with regards to each situation)
- Knowledge of the potential complications of general anesthesia for C-section: difficult airway management, pulmonary aspiration, awareness

## **b. Skills**

### **Clinical and case management skills**

- C-section anesthesia for simple cases
- Rapid sequence induction with specific consideration for difficult airway in the pregnant patient
- Management of anesthesia for non obstetric surgery during pregnancy
- Management of obstetric hemorrhage
- Labor analgesia for simple obstetric patients
- Management of specific complications of regional anesthesia/analgesia
  - o Postdural puncture headache
  - o Neurological complications
  - o Systemic toxicity of local anesthetics
  - o Unsatisfactory analgesia during labor
  - o Unsatisfactory anesthesia during C-section (spinal or epidural)
- Management of a patient with pre-eclampsia (mild to severe and its complications)
- Management of basic neonatal resuscitation
- Trauma management in the pregnant women

### **Drills**

- CPR
- Neonatal resuscitation

## **c. Specific attitudes**

- Multidisciplinary work and effective communication in labor room
- The place and respect to give to the father
- Communication and attitude in the context of fetal death or late abortions

## Domain 2.2: Airway surgery and management

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of patients with surgery concerning the airway and its surrounding structures. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
2.2.1	Appropriately manages anesthesia of the shared airway	B	D
2.2.2	Manages airway in patients with both expected and unexpected difficult airway, including use of different devices and techniques and proper application of existing algorithms; manages the airway in trauma situations	B	D
2.2.3	Safely provides anesthesia for laryngeal surgery, tracheotomy and laryngoscopy/bronchoscopy including in pediatric patients	A	C
2.2.4	Manages the anesthetic for laser surgery in the airway, including jet-ventilation	A	C
2.2.5	Manages difficult and delayed extubation after airway interventions	A	C
2.2.6	Provides adequate anesthetic techniques specific for ear surgery	B	C

### Learning Objectives:

#### a. Knowledge

- Anatomy of the head and neck and face including important abnormalities (i.e., facial syndromes, cleft palate, etc...)
- Anatomy of the airway, nasal passages, larynx, pharynx and middle ear (c.f. syllabus)
- Physics of gases in closed body cavities
- Principles of monitoring nerve function during head and neck surgery
- Pharmacology of local anesthetic agents and local vasoconstrictors (c.f. syllabus)
- Effects of surgery and radiation on the airway
- General principles for the management of a normal and a difficult airway
  - o Airway devices and types of tracheal tubes
  - o Algorithm for the management of the difficult airway
  - o Equipment for difficult tracheal intubation
  - o Surgical and percutaneous tracheostomy
  - o Equipment for jet ventilation
  - o Laser: types, uses in surgery, complications, precautions

#### b. Skills

##### Technical skills:

- Tracheal intubation
  - o Oral and nasal intubation
  - o Use of special tubes
  - o Placement and removal of packs
- Securing the difficult airway
  - o Recognizing the high-risk airway
  - o Use of stylets and bougies
  - o Fiberoptic intubation (sleeping and awake)
  - o Laryngeal mask airway intubation

- Failed intubation or ventilation drill
- Needle and surgical cricothyroidotomy
- Managing the extubation of the difficult airway patient
- Management of postoperative facial and airway swelling

**Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Assessment of the airway of patients undergoing ENT and maxillofacial surgery and development of a airway management plan
- Partial airway obstruction including: Epiglottitis, foreign bodies, laryngeal and oropharyngeal tumors, cysts and abscesses
- Anesthesia for major maxillofacial surgery involving prolonged anesthesia, major blood loss, hypothermia and multiple procedures
- Anesthesia for facial trauma in the emergency and semi-elective setting
- Dental procedures on the mentally handicapped
- Establishing, maintaining and protecting an airway in the face of abnormal anatomy and simultaneous surgical intervention
- Postoperative care of patients with airway surgery and/or difficult airway

**c. Specific Attitudes**

- Establishing effective cooperation and communication with the surgeon in situations with a shared airway
- Strategies to anticipate difficult airway situation and to establish safe anesthetic management plans

## Domain 2.3: Thoracic and Cardiac Anesthesia

During the course of their training, anesthesia residents must acquire knowledge and skills relevant to the anesthetic and perioperative care of thoracic and cardiac surgery patients. This includes the following:

	<u>Competence statement</u>	1st phase	2nd phase
2.3.1	Evaluates operability for lung resection and selects patients who need preoperative preparation and treatment	B	C
2.3.2	Describes the anesthetic aspects of one lung ventilation	A	B
2.3.3	Is aware of the perioperative risk factors and the specific postoperative complications of thoracic surgery		B
2.3.4	Describes principles of acute and chronic pain management for thoracic surgery including epidural, paravertebral and intercostal blocks		B
2.3.5	Is able to describe some emergencies in cardiac or thoracic procedures and their management	B	C
2.3.6	Possesses anesthetic basic knowledge of cardiopulmonary bypass		B
2.3.7	Can describe principles of invasive monitoring for cardiac surgery including pulmonary artery catheter and transoesophageal echocardiography	A	B
2.3.8	Can describe the basic principles of anesthetic and therapeutic techniques used for severely compromised cardiac function in high risk patients, for previous cardiac or lung transplanted patients, congenital heart disease patients, and those with implanted pacing or cardioversion devices		B
2.3.9	Manages anesthesia for major vascular surgery, including emergency procedures	A	C

### Thoracic Learning Objectives:

#### a. Knowledge (syllabus)

- Anatomy of upper airways, tracheobronchial tree, intrathoracic structures and their relationship
- Physiology of lung perfusion and ventilation in various patient positions (i.e., lateral decubitus)
- Physiology of one-lung ventilation and principles of hypoxic pulmonary vasoconstriction
- Various techniques of lung separation and control of tube positioning
- Differences in anesthetic management regarding surgery (thoracotomy-thoracoscopy-mediastinoscopy)
- Common surgical procedures
  - o Segmentectomy-lobectomy-pneumonectomy-lung metastasectomy
  - o Pleurodesis, pleural decortication
  - o Oesophageal surgery
  - o Thymectomy
- Specific respiratory evaluation with regards to planned surgery (assessment of operability)
- Frequent or particular comorbid conditions associated to thoracic surgery:
  - o COPD

- Previous chemotherapy with pulmonary toxicity (bleomycin)
- Pulmonary hypertension
- Myasthenia gravis
- Anterior mediastinal mass
- Postoperative pain control, including risk factor evaluation for postthoracotomy chronic pain (thoracic epidural analgesia and alternatives)
- Specific intra- and postoperative complications

## **b. Skills**

### **Technical skills:**

- Performance of lung separation techniques
  - Double lumen tracheal intubation
  - Bronchial blockers
  - Clinical and fiberoptic control of tube positioning
  - Lung separation in difficult airway patients (including tube exchange devices)
- Correct placement of thoracic epidural catheters
- Correct patient positioning, particularly in the lateral decubitus position

### **Clinical and case management skills:**

- Assessment of patients undergoing thoracic surgery and development of an anesthetic management plan
- Understanding the principles, applied basic sciences, and management of anesthesia and perioperative care for
  - Thoracotomy and:
    - Lung resection, including pneumonectomy and lung reduction surgery
    - Mediastinal mass resection
    - Oesophageal surgery
    - Surgery on the thoracic aorta
  - Tracheal and bronchial surgery (including use of lasers and stents)
  - Thoracoscopic procedures
  - Mediastinoscopy
- Management of hypoxia and ventilation during one-lung anesthesia
- Recognition, differential diagnosis and management of postoperative respiratory distress
- Understanding chest tube drainage systems and suction
- Evaluation and management of postoperative pain

## **Cardiovascular Learning Objectives:**

### **a. Knowledge (syllabus)**

- Cardiovascular anatomy
- Physiology of respiration, circulation, fluid balance and thermoregulation
- Pharmacology of cardiovascular drugs, cardiovascular effects of anesthetic agents
- General principles of perioperative anesthetic and surgical management relevant to cardiac surgery patients emphasizing:
  - Etiology, pathophysiology and clinical presentation of cardiovascular diseases requiring cardiac surgery
  - Hemodynamic monitoring including cardiac output measurement, detection of ischemia
  - Specialized equipments such as cardiac pacemakers, defibrillators, intra-aortic balloon pump, cardio-pulmonary bypass or extracorporeal membrane oxygenation

## **b. Skills**

### **Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Evaluation of patients undergoing cardiac surgery and development of a anesthetic management plan
- Anesthetic management of pacemaker implantation
- Perform cardioversion

### **c. Specific Attitudes**

- Learn to establish effective communication with the surgical team during critical phases of the surgical procedure (for example: chest opening, on/off-pump, lung separation, etc...)
- Recognizing psychological issues relevant to patients scheduled for cardiac surgery



## Domain 2.4: Neuroanesthesia

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of patients with surgery and interventions concerning intracranial, spinal and surrounding structures. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
2.4.1	Masters the basics of pre- and postoperative neurological assessments	A	C
2.4.2	Appropriately manages the anesthetics of patients with raised intracranial pressure	A	C
2.4.3	Applies strategies for the prevention of secondary brain injury	A	C
2.4.4	Masters anesthetic aspects of positioning for neurosurgical procedures including monitoring and therapy of pulmonary air embolism during the sitting position	A	C
2.4.5	Uses monitoring techniques for brain perfusion and function	A	C
2.4.6	Manages the anesthetic of patients with CNS and spine bleeding or injury, with non-surgical neurological disorders (stroke, seizures,...) and those undergoing diagnostic interventions	A	C

### Learning Objectives:

#### a. Knowledge

- Neuroanatomy: central nervous system, spinal cord and blood supply, ventricular system and flow of CSF, cranium and spinal column
- Cerebral blood flow, blood volume, blood-brain barrier, intracranial pressure and cerebral vasospasm
- Pathophysiology of normal and abnormal metabolism of the brain and spinal cord, water and electrolyte homeostasis, temperature regulation
- Pharmacology: Influence of anesthetic agents and techniques on cerebral function, hemodynamics, metabolism and intracranial pressure, as well as drugs interacting with neuromuscular disorders
- Physical principles involved with modalities for neuro-monitoring: transcranial Doppler (TCD), intracranial pressure (ICP), electrophysiological monitoring (somato-sensory (SSEP), motor (MEP) and brain stem auditory evoked potentials (BAEP), electroencephalogram (EEG)
- General principles for the management of
  - o cerebral protection, intracranial hypertension and cerebral vasospasm
  - o hemodynamic stability, fluid homeostasis, sedation and ventilatory support
  - o intra and extra cerebral vascular surgery
  - o supratentorial, posterior fossa, pituitary and epilepsy surgery
  - o emergency spinal cord decompression and spinal column injury
  - o brain trauma damage control
  - o intracranial bleeding
  - o imaging and interventional radiological procedures
  - o patients with neurological/neuromuscular diseases
  - o neuroradiology and stereotaxic surgery
  - o positioning in neurosurgery
  - o air embolism

## **b. Skills**

### **Technical skills:**

- Positioning of neurosurgical patients

### **Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Assessment of the airway of patients undergoing neurosurgical procedures
- To monitor and reduce raised ICP
- To monitor and treat intraoperative air embolism
- To perform the initial management of head and spine injured patient, and provide anesthesia for urgent surgery in these patients, including interventions to minimize cerebral and spinal cord damage
- Handling the handicapped and/or uncooperative patient and those with altered conscious states
- Postoperative care of neurosurgical patients

### **c. Specific Attitudes**

- Establishing effective cooperation, communication and an action plan with the surgeon in emergency situations of head and/or spine injured patients
- Strategies to anticipate difficulties with raised ICP, difficult airway situation and the uncooperative patient to establish safe anesthetic management plan
- Empathic participation in debriefing sessions after emergencies and brain death
- Rapid response to changing patient conditions and team approach

## Domain 2.5: Pediatric Anesthesia

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic and perioperative care of pediatric patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
2.5.1	Masters pediatric aspects of monitoring and equipment, including vascular access	A	C
2.5.2	Anticipates, recognizes, and understands the implications pediatric specificities including airway management, anatomy, physiology, and pharmacology	A	C
2.5.3	Provides a safe induction, maintenance and emergence of general anesthesia in children, including clinical aspects of homeostasis and fluid management	A	C
2.5.4	Assesses and manages pain in pediatric patients (including regional anesthesia)	A	C
2.5.5	Can describe the basic principles of anesthetic care in neonate diseases		A

### Learning Objectives:

#### a. Knowledge

- Anatomy relevant to airway management and breathing
- Physiology of respiration, circulation, fluid balance and thermoregulation
- Pharmacology of anesthetic agents, analgesics and common pediatric medications and their variations with the child age
- Stages of development of the normal child
- General principles of perioperative management relevant to children emphasizing:
  - o common childhood illnesses and their influence on anesthesia and surgery
  - o fasting guidelines
  - o fluid and electrolyte replacement
  - o temperature control
  - o specialized equipments
  - o perioperative monitoring
  - o dosage and administration of emergency drugs
  - o postoperative apnea detection and management
  - o acute and chronic pain management
- Relevant features of important childhood conditions, in particular:
  - o respiratory infections
  - o asthma
  - o prematurity and its complications
  - o facial anomalies affecting the airway
  - o neonatal emergencies (respiratory distress; tracheo-oesophageal fistula; diaphragmatic hernia; abdominal wall defects)
  - o congenital cardiac disease (ASD,; VSD; tetralogy of Fallot)
  - o cerebral palsy and seizures
  - o chronic diseases (cystic fibrosis; muscular dystrophy)
  - o congenital syndromes (Down's; Pierre-Robin)

- malignancy and their treatments.

## **b. Skills**

### **Technical skills:**

- airway management (ventilation, laryngeal mask and intubation)
- peripheral vascular access
- intra-osseous access
- caudal anesthesia

### **Clinical and case management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and case management in the following areas:

- Applying principles of pediatric anesthesia for some of the following surgery: General surgery; Abdominal surgery; Urology; Orthopedic surgery; Otolaryngology; Ophthalmology; Dental surgery; Plastic and reconstructive; Trauma and burns.
- Management of airway and breathing problems such as: Hypoxia, bronchospasm; apnea; upper airway obstruction; upper airway infections; inhaled foreign body; laryngospasm; stridor; aspiration of gastric contents; seizures.
- Perform drills such as pediatric advanced life support to manage emergencies conditions (see above plus: bradycardia, cardiac arrest; hypovolemia; fluid management; neurological compromise)

## **c. Specific Attitudes**

- Establishing effective communication and interaction with children at different ages and with their carers
- Recognizing psychological issues relevant to hospitalized children
- Strategies to provide informed consent and disclosure of risk when consulting with children and carers

## Domain 2.6: Medical and Perioperative Care of the Critically ill (ICU)

During the course of their training, anesthesia residents must acquire clinical knowledge of medical and surgical conditions and skills for the management of critically ill patients. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
2.6.1	Defines clinical problems, develops diagnostic and specific management plans primarily of the surgical critically ill patient	A	C
2.6.2	Develops adequate responses to life-threatening problems	A	C
2.6.3	Recognizes and masters specific aspects of monitoring and equipment, including respirator therapy and hemofiltration	A	C
2.5.4	Acquires and applies knowledge of aspects of internal medicine, general surgery, obstetrics and anesthesia relevant to critically ill patients	A	C
2.5.5	Can describe the basic principles of ICU care to cardiac surgery and pediatric patients, understands medical disorders requiring specific ICU treatment		A

### Learning Objectives:

#### a. Knowledge

- Organization of Intensive Care Units and ICU standards
- General principles of ICU management:
  - o Basic and advanced life support
  - o Airway management and respiratory support including non-invasive techniques
  - o Hemodynamic management including advanced cardiovascular monitoring and inotropic therapy
  - o Fluid and electrolyte support including relevant aspects of blood product transfusion
  - o Renal replacement therapy
  - o Neurological management
  - o Enteral and parenteral nutritional support
  - o Antibiotic therapy
  - o Prevention of complications such as thromboembolism, ventilator associated injuries, stress ulceration, renal failure and nosocomial infection
  - o Transportation
  - o Sedation and pain management of the critically ill patient
- Etiology, pathophysiology, diagnosis and treatment plans according to international standards of specific critical conditions:
  - o Acute circulatory failure
    - Shock
    - Cardio-respiratory arrest
    - Cardiac arrhythmias
    - Ischemic heart disease
    - Valvular heart disease including endocarditis

- Pulmonary embolism
- Anaphylaxis
- Respiratory failure
  - Pulmonary edema and ARDS
  - Airway obstruction and stenosis
  - Pneumothorax
  - Aspiration
  - Pneumonia
  - COLD and Asthma
- Renal failure
  - Chronic and acute (RIFLE)
- Gastrointestinal failure
  - Bleeding
  - Ileus
  - Peritonitis
  - Pancreatitis
  - Liver failure
- Neurological failure
  - Delirium and Coma
  - Cerebrovascular and bleeding diseases
  - Cerebral edema
  - Increased intracranial pressure including monitoring
  - Brain stem death
  - Seizures
  - Guillain Barré syndrome and Myasthenia gravis
- Trauma
  - Head/Face injury and spine injury
  - Airway and chest injuries
  - Aortic injuries
  - Abdominal trauma
  - Pelvic and long bone injuries
  - Massive transfusion
  - Burns and electrocution
  - Near-drowning
- Infectious diseases
  - Sepsis including sepsis bundle strategy
  - Severe community acquired infections (e.g. meningitis)
  - Severe nosocomial infections (e.g. MRSA)
- Endocrine and metabolic disorders
  - Diabetes mellitus and insipidus
  - Addison's disease, Cushing and Conn syndrome
  - Thyroid disorders
  - Pheochromocytoma
  - Metabolic stress syndrome
  - Malnutrition
- Coagulation disorders
  - DIC
  - Transfusion reaction
- Obstetric complications
  - Pre-eclampsia, Eclampsia
  - Septic abortion

- Amniotic fluid embolism
- Intoxications
- Organ donor

## **b. Skills**

### **Technical skills:**

- Respiratory
  - Intubation under emergency situations
  - Bronchoscopy
  - Percutaneous tracheostomy
  - Pleural drainage
- Cardiovascular
  - Basic and advanced life support
  - Central vascular access
  - Arterial access

### **Clinical management skills:**

Trainees are expected to understand relevant principles, apply knowledge in practice and to demonstrate clinical skills and management in the following areas grouped by organ systems:

- General
  - Proper and clear documentation including list of differential diagnosis and priorities
  - Transportation of the critically ill patients
- Cardiovascular
  - Basic and advanced life support including resuscitation decisions
  - Use of vasoactive drugs
  - Management of arrhythmias including pacemaker and cardioversion
  - Application of advanced hemodynamic monitoring (i.e. pulmonary artery catheter, less invasive monitoring)
  - Prevention of thromboembolism
- Respiratory
  - CPAP
  - NIV
  - Mechanical ventilation
  - Blood gas analysis
  - Prevention of lung injuries associated with mechanical ventilation
  - Prevention of aspiration
- Renal
  - Application of renal replacement therapy
  - Prevention of renal function deterioration
- Neurological
  - Maintenance of cerebral perfusion
  - Management of the unconscious patient
  - Management of brain stem death
  - Management of organ donation
- Gastrointestinal
  - Nutritional support
  - Prevention of stress ulceration
    - Trauma
  - Systematic priority-based approach to severe trauma
  - Control of bleeding and management of complications

**c. Specific Attitudes**

- Establishing effective communication and interaction with ICU colleagues and other specialists
- Establishing effective communication and interaction with ICU patients and their relatives.
- Recognizing psychological issues relevant to ICU patients and their relatives.
- Strategies to provide informed consent and disclosure of risk when consulting with ICU patients and their relatives.



## Domain 2.7: Anesthesia outside the operating room (OR)

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the anesthetic care of patients managed outside the OR.

These include the following competencies:

	<u>Competence statement</u>	1st phase	2nd phase
2.7.1	Anticipates, recognizes and adequately manages problems and organizational aspects associated with anesthesia in an isolated site as well as in an office-based setting	A	C
2.7.2	Applies principles of safety during x-ray, MRI and other minimally invasive diagnostic or therapeutic procedures	A	C
2.7.3	Applies standards of the SGAR for safe practice of anesthesia outside the OR and in an office-based structure	A	C

### Learning Objectives:

#### a. Knowledge

- Procedures requiring anesthetic management outside the OR e.g., radiology, nuclear medicine, endoscopy, cardiology, dentistry, ECT, other office-based settings
- Appropriate anesthetic techniques for adults and children managed outside the OR : sedation (monitored anesthesia care), general anesthesia, regional anesthesia
- Safety standards required for practice of anesthesia in remote locations
- Safety standards required for transport of patients to and from remote locations
- Typical clinical and organizational problems associated with anesthesia outside the OR : distant airway and vascular access, precarious monitoring, non-exhaustive material, distant help
- Specific complications associated with sedation (airway obstruction, apnea)
- Principles of safety during x-ray, nuclear medicine and MRI procedures

#### b. Skills

##### Technical skills

- Preanesthetic preparation of the remote site (anesthesia machine, material, drugs)
- Vascular access with specific consideration for potential distant access
- Airway management with specific consideration for potential difficult airway access

##### Clinical and case management skills

- Appropriate patient evaluation and selection for anesthesia outside the OR
- Safe transport of the patient to and from the remote location
- Appropriate monitoring of the patient with specific consideration for potential distant monitoring (window, camera)
- Use of appropriate anesthetic techniques and agents
- Detection and treatment of potential anesthetic complications, in particular those associated with sedation (airway obstruction, apnea)
- Anesthetic practice in a variety of remote locations :
  - i. Radiology : CT, MRI, angiography, embolization
  - ii. Nuclear medicine : radiation therapy (children)
  - iii. Endoscopy : upper gastro-intestinal endoscopy, colonoscopy, laryngoscopy, bronchoscopy
  - iv. Cardiology : angiography, cardioversion, catheter placement

- v. Dentistry : dental care under general anesthesia (children)
- vi. ECT (electroconvulsive therapy)
- vii. Emergency room
- Self protection (x-ray, nuclear medicine and MRI procedures)

**c. Specific attitudes**

- Organizational aspects and logistics
- Multidisciplinary team work and effective communication

## Domain 2.8: Chronic, palliative, interventional pain management and palliative care

During the course of their training, anesthesia residents must acquire clinical abilities and skills in the care of pain patients. Furthermore, anesthesia residents must acquire clinical abilities and skills in the care of palliative patients, exceeding treatment of palliative pain. These include the following competences:

	<u>Competence statement</u>	1st phase	2nd phase
2.8.1	Applies the knowledge of physiology, pathophysiology, psychological and psychosocial aspects of postoperative persistent, chronic and palliative pain	A	C
2.8.2	Uses appropriate techniques for measurement and documentation of chronic pain	A	C
2.8.3	Identifies patients in the process of pain chronification and knows when multidisciplinary procedures are required	A	C
2.8.4	Applies basics of pharmacological therapies	A	C
2.8.5	Knows and applies strategies for interventional procedures for diagnosis and treatment of chronic pain	A	B
2.8.6	Knows and applies techniques of regional /plexus blocks and catheter techniques used in palliative and chronic pain management	A	D
2.8.7	Knows indications and contraindications for basic neuraxial blocks and catheter techniques (e.g. spinal, peridural, caudal) used in palliative and chronic pain management	A	D
2.8.8	Applies techniques of basic blocks (e.g. spinal, peridural, caudal) used in palliative and chronic pain management	A	D
2.8.9	Knows indication and contraindications for advanced blocks (e.g. medial branch, sympathetic) used in palliative and chronic pain management	A	B
2.8.10	Applies techniques of advanced blocks (e.g. medial branch, sympathetic) used in palliative and chronic pain management	A	B
2.8.11	Applies blocks with aid of additional nerve stimulation and/or ultrasound	A	D
2.8.12	Applies blocks as indicated with aid of X-ray techniques	A	B
2.8.13	Can recognize and describe incidents of interventional procedures and their treatment	A	C
2.8.14	Knows indications and techniques of neuromodulation (peripheral and spinal cord stimulator, intrathecal drug delivery systems)	A	A
2.8.15	Can recognize and evaluate the different dimensions of suffering of palliative patients	A	C
2.8.16	Can evaluate the individual and variable determinants of quality of life of a palliative patient	A	B
2.8.17	Identifies the goals and values of a palliative patient and adapts suggested treatments to these goals	A	C
2.8.18	Identifies patients, who could benefit of multidisciplinary, palliative care	A	C
2.8.19	Knows and applies the understanding of different etiologies of nausea and vomiting	A	C
2.8.20	Can treat nausea and vomiting, according to the etiology	A	C
2.8.21	Applies knowledge of the pathophysiology of anorexia and cachexia when counseling patients and families about nutritional support	A	C

2.8.22	Identifies patients, who could benefit of enteral or parenteral nutrition	A	B
2.8.23	Applies knowledge of the pathophysiology of fatigue and asthenia when counseling patients and families about treatment options	A	B
2.8.24	Can explain the difference between indirect active, passive and active euthanasia (Sterbehilfe), as well as the procedure of assisted suicide to patients and families	A	C
2.8.25	Identifies complex grief reaction in family and relatives of palliative patients	A	C

## Learning Objectives:

### a. Knowledge

- Anatomy, physiology of different pain pathways
- Multidimensional aspects of chronic pain, including the physiological, psychological and environmental factors
- Different tools of pain evaluation (e.g. VAS, NRS and Brief Pain Inventory)
- Principles of treatment of nociceptive and neuropathic pain, including pharmacokinetics, pharmacodynamics, indications and complications of commonly used analgesics and co-analgesics in patient with normal and abnormal organ system function or substance (ab-)use
- Different routes of analgesic drug delivery, including factors governing choice of route, side effects relevant to particular route, principles of additive and synergistic effects when agents are combined
- Indications, potential benefits and complications of common diagnostic, prognostic and therapeutic blocks and of implanted drug administration devices and electrical stimulators
- Understanding the anatomy, technique, indications, contraindications and complications of above mentioned interventions
- Principles of invasive diagnostic procedures, i.e. local anaesthetic blocks and provocative procedures (discography)
- Issue of false positive responses due to placebo effects or unspecific pain provocation, methods to increase the validity of the procedures, e.g. controlled blocks
- Dimensions of suffering, including the physical, physiological, social and spiritual dimensions
- Different tools of evaluation of quality of life
- Assessment instruments for goals and values at the end of life
- Inclusion criteria for specialized, palliative care, according to guidelines of BAG, GDK
- Pathophysiology of nausea and vomiting
- Principles of treatment of nausea and vomiting, including conservative treatment of ileus
- pathophysiology of anorexia and cachexia
- Indications, potential benefits and complications of enteral and parenteral nutrition
- pathophysiology of fatigue and asthenia, including treatment options
- Legal regulations of euthanasia (Sterbehilfe) and assisted suicide in Switzerland
- Forms of grief reaction and corresponding treatment and support

### b. Skills

#### Technical skills:

- Obtaining a specific pain history, including the following factors:
  - o Onset, location, nature, duration, intensity of pain
  - o Physical, psychological and social consequences of pain
  - o Current and past pain treatment
  - o Other relevant history: family history, medical history, substance abuse
- Techniques for pain problem based musculoskeletal and neurological examination
- Techniques of measurement and for documentation of pain

- Competency in patient controlled analgesia (intravenous, peripheral and central blocks)
- Competency in commonly used regional techniques
  - o Peripheral and plexus blocks of the upper and lower limb
  - o Intercostal block and other trunk blocks (i.e. TAP block, Serratus anterior block)
  - o Continuous catheters
- Competency in neuraxial blocks
  - o Thoracic, lumbar and caudal epidural anesthesia
  - o Single shot and continuous spinal anesthesia
- Competency in imaging techniques, like ultrasound and fluoroscopy
- Handling of "port a cath" for parenteral supply of drugs and nutrition
- Insertion of a gastric tube in awake patients
- Techniques to evaluate bowel function (auscultation, physical examination, bowel movement protocols)
- Techniques to ultrasound guided ascites drainage

**c. Specific Attitudes**

- Establishing effective communication and interaction with patients in pain.
- Multidisciplinary work, value and importance of an interdisciplinary and interprofessional approach to pain assessment and treatment
- Being aware of limitations of interventional pain medicine
- Establishing effective communication and interaction in patients with advanced, incurable and progressive disease, as well as their family
- Multidisciplinary work, value and importance of an interdisciplinary approach to care for palliative patients
- Ensuring immediate and written feedback about changes of treatment to the care team

## Appendix: Syllabus of the Postgraduate Program

CAVEAT: this syllabus for the postgraduate training in anesthesiology is only valid and has to build upon the Swiss national learning objective catalogue of pregraduate medical education.

### 1. Physics:

The resident will know the physical laws that affect the delivery and monitoring of anesthetics.

#### i. Measurement

##### 1. Measurement Units

###### a. S.I. units

- base
- derived

###### b. Non S.I. units: i.e. mmHg, standard atmosphere

##### 2. Pressure: Units and Definition (F/A)

###### a. Direct Measurement

- liquid manometers
- bourdon gauge
- aneroid gauge
- electromechanical: catheter-transducer system
  - transducers:
    - wheatstone bridge
    - principles of function
  - catheter-transducer system
    - criteria for accurate reproduction of pressure wave form
    - frequency response: natural frequency
    - resonance and damping

###### b. Indirect Measurement

- Sphygmomanometry with detectors
  - palpation
  - auscultation
  - Doppler
  - oscillotonometry

##### 3. Gas Volumes: Principles and Methods of Application

###### a. Spirometry

###### b. Inert gas dilution

###### c. Plethysmography

##### 4. Gas Flow

###### a. Variable orifice / constant pressure flowmeters

- rotameter
- peak expiratory flow meter

###### b. Variable pressure / constant pressure flowmeters

- pneumotachograph
- bourdon gauge flowmeters

##### 5. Gas Analysis

###### a. Oxygen only i.e. O<sub>2</sub> analysers

- electrochemical
  - galvanic or fuel cell sensor
  - polarographic cell sensor (Clark electrode)
- paramagnetic analysis

- b. Carbon dioxide only i.e. capnometry and capnography - infrared analyser, acoustic resonance, Ramon scattering
  - flow-through devices
  - aspiration devices
- c. anesthetic gas analysers (i.e. ultraviolet)
- d. mass spectrometry
- e. major pitfalls in ETCO<sub>2</sub> interpretation
- 6. pH and Blood Gas Analysis
  - a. pH, pCO<sub>2</sub>, PO<sub>2</sub> electrodes: principles of function
  - b. sources of error in blood gas determination i.e., collection, transportation, storage, temperature corrections.
  - c. oximetry: spectrophotometric measurements of O<sub>2</sub> saturation
  - d. transcutaneous O<sub>2</sub> and CO<sub>2</sub> measurement
- 7. Blood Flow Determination
  - a. Indicator techniques: the Fick principle
    - measurement of O<sub>2</sub> consumption and A-VO<sub>2</sub> content difference to determine cardiac output
    - indicator dilution technique - theoretical basis
      - single injection
      - constant infusion
  - b. Electromagnetic flowmeters
  - c. Ultrasonic flowmeters
- 8. Temperature Measurement
  - a. non-electrical
    - liquid expansion
    - bimetallic thermometers
  - b. electrical
    - resistive wire
    - thermistor
    - thermocouple
- 9. Measurement of Biological Signals
  - a. Brain, i.e. EEG
  - b. Spinal cord, i.e. evoked potentials
  - c. Peripheral nerves
  - d. Myoneural junction (mechanism and EMG response to nerve stimulation)
  - e. Heart (EKG)

## ii. Physics of Gas Laws:

The resident will know the gas laws and their influence on inhalational agents and respiratory therapy.

- 1. Mechanics
  - basic and derived S.I. units
  - concepts of force, pressure, tension, resistance, work, energy, etc.
- 2. Mathematical Concepts
  - Natural exponential functions:
    - time constants
    - half-life
- 3. Gases: Principles and Application of the following:
  - a. Boyle's Charles' law
  - b. Avogadro's hypothesis
  - c. Dalton's law of partial pressures
  - d. Ideal gas law or universal gas constant
  - e. Critical temperature and pressure

- f. Reynold' s numbers
- g. Partition (Ostwald) coefficients
- 4. Vaporization
  - a. Definition
  - b. Concepts of latent heat, boiling point, barometric pressure
  - c. Factors affecting vapor pressure
- 5. Gas solubility: principles and application of:
  - a. Henry's law
  - b. solubility and partition coefficients (Ostwald coefficients)
- 6. Diffusion and osmosis
  - a. Fick's and Graham's law
  - b. osmolality, osmolarity
  - c. osmometry
- 7. Fluid Dynamics
  - a. Laminar flow: Hagen-Poiseuille application
  - b. Turbulent flow: Reynold's number
  - c. Bernoulli effect: principles of the injector or venturi
  - d. Laplace law - surface tension
  - e. Rheological properties of blood
- 8. Heat and Humidification
  - a. Specific and latent heat
  - b. Humidification
    - absolute and relative humidity
    - humidifiers and nebulisers
  - c. Heat loss and gain during anesthesia
- 9. Electricity
  - a. Basic terms: applications
    - AC, DC, Ohm's law, capacitance, inductance, impedance, resistance
  - b. Recording of biologic potentials
    - Amplifiers
    - electrodes

## **2. Monitoring, Equipment and Clinical Measurement**

- 1. SGAR Standards of Practice, as published in the CAS Guidelines.
- 2. Anesthetic Monitors
  - Principles of function and sources of error
    - pulse oximetry
    - capnography and gas analysis
    - invasive and noninvasive blood pressure monitoring
    - ECG
    - CVP, PA catheter
    - TEE
    - EEG and evoked potentials
    - temperature monitoring
    - neuromuscular blockade monitor
- 3. Anesthetic Gases, Storage and Piping
  - Physics
  - Safety standards and organization
  - Oxygen delivery systems
- 4. Electricity
  - Principles of electrical safety



- Hazards to the patient and anesthesiologist
- 5. The Anesthetic Machine
  - Principles of operations - flowmeters, vaporizers, and ventilators
  - Malfunctions
  - Safety features – alarms
- 6. Ventilators
  - Types
  - Principles of operation
  - Modes of ventilation
- 7. Circuits
  - Physiology and techniques of humidification
  - Types of circuits - advantages, disadvantages
  - Mapleson Classification of circuits
- 8. Computers and Anesthesia
  - computerized record keeping
- 9. Infusion and PCA Pumps
  - principles of function and limitations
- 10. Cleaning/Sterilization of Equipment

### 3. Pharmacology

#### i. General Anesthetics - Inhalational

1. Be familiar with these concepts and demonstrate knowledge of:
  - a. Uptake and distribution.
    - Alveolar concentration vs. inspired concentration.
    - Blood-gas partition coefficients.
    - Influence of changes in ventilation, cardiac output, intrapulmonary shunting.
    - Tissue-blood partition coefficients and time constants.
    - Factors influencing rate of recovery.
  - b. Minimal Alveolar Concentration (MAC)
    - Value of concept.
    - Factors affecting its value.
  - c. Side effects and specific toxicities.
    - Relationship to metabolism.
2. Agents no longer generally used clinically (diethyl ether, chloroform, and cyclopropane).
  - Knowledge of historical development, basic pharmacology and why not currently used.
3. Currently used agents. These include N<sub>2</sub>O, alkanes (Halothane) and ethers (Methoxyflurane, Enflurane Isoflurane, sevoflurane and desflurane).
  - Knowledge of basic pharmacology and specific major organ system side effects / toxicity. This would include:
    - a. Halothane (?Enflurane) - hepatotoxicity (effects on hepatic blood flow).
    - b. Methoxyflurane - nephrotoxicity (effects on renal blood flow).
    - c. N<sub>2</sub>O
      - Reasons for current malignment of this long-used agent.
      - Problem of diffusion into closed body cavities.
    - d. Enflurane - ? cerebral toxicity.
    - e. Cardiovascular system effects.
      - Myocardial vs. peripheral.
      - Arrhythmogenicity and "safe" dosage of epinephrine.

- Affects on conduction system, coronary circulation, and pulmonary and systemic vascular resistance.
- f. Respiratory system effects.
  - Including effects on VQ, hypoxic pulmonary vasoconstriction and ventilatory responses to hypoxia / Hypercarbia, effects on bronchial reactivity.
- g. Neuromuscular system effects.
  - Interaction with muscle relaxants.
  - Precipitation of malignant hyperthermia.
- h. CNS effects.
  - Cerebral blood flow, ICP effect on autoregulation.
  - EEG correlation with anesthetic depth.

## ii. General Anesthetics – Intravenous

1. Barbiturates - Thiopental, Methohexital.
  - a. Basic molecular structure as relates to activity.
  - b. Uptake, distribution, metabolism.
  - c. Major organ side effects.
    - Cerebral
    - Cardiovascular
    - Respiratory
  - d. Contraindications - relative and absolute.
2. Benzodiazepines - Diazepam, Lorazepam, Midazolam.
  - a. Use of sedation, induction of anesthesia and as supplement to anesthesia.
  - b. Uptake, distribution, metabolism, major organ side effects.
  - c. Interaction with other drugs.
  - d. Flumazenil.
3. Propofol
  - a. Basic molecular structure.
  - b. Volume of distribution.
  - c. Metabolism.
  - d. Side effects (CNS).
4. Narcotics
  - a. Established agents - Meperidine, Morphine, and Fentanyl.
  - b. New agents - Alfentanil, Sufentanil, Remifentanil
  - c. Methadone in pain management.
    - use.
  - d. Use as premedicants vs. general anesthetics.
  - e. Uptake, distribution, metabolism, duration of action, clinical effect as relates to blood levels.
  - f. Major differences between agents, particularly in relation to undesirable side effects.
  - g. Major organ side effects (CNS, CVS, Neuromuscular).
  - h. Advantages and disadvantages vs. inhalational agents.
  - i. Reversal by narcotic antagonists including side effects of the latter.
  - j. Intrathecal and epidural morphine / opioids, opioids.
    - Indications
    - Side effects
  - k. Legal controls on narcotic distribution, use storage and handling.
5. Butyrophenones - Droperidol
  - a. Major pharmacological action including effect on CNS and CVS systems.
  - b. Use of antiemesis, premedication and supplement to general anesthesia - appropriate dosage.
  - c. Major organ side effects.
6. Ketamine

- a. Cerebral mechanism of action.
  - b. Uptake with I.V. vs. I.M. administration, appropriate dosages.
  - c. Indications for clinical use.
  - d. Major organ side effects.
    - Respiratory
    - CVS - ? safe agent in hypovolemia.
    - CNS - emergence phenomena - incidence and factors that may lessen them.
7. Other antiemetics (5-HT<sub>3</sub> antagonists, antihistamines, phenothiazines, metoclopramide, haloperidol).

### iii. Local Anesthetics

1. Mechanism of Action
  - Effect of ionization, alkalization, heating.
2. Molecular Structure
  - Amide vs. Ester.
  - Chlorprocaine, Procaine, Tetracaine, Lidocaine, Bupivacaine, Cocaine.
3. Absorption, Distribution Elimination
4. Cm - Minimal concentration necessary for a nerve block
  - Factors affecting this.
5. Allergic Potential
  - Amide vs. Ester.
6. Toxicity as relates to:
  - Recommended doses of each agent.
  - Central Nervous System.
  - Cardiovascular System (are some LAs more cardiotoxic?)
  - The patient at risk of toxicity.
7. Treatment of Toxicity

### iv. Neuromuscular Blocking Drugs

1. Classification
  - Depolarizers- Succinylcholine.
  - Non-depolarizers - d-Tubocurarine, Atracurium, Cis-atracurium, Mivacurium, Rocuronium, Pancuronium, Gallamine, Metocurine, Vecuronium
2. Mechanism of Action
  - Physiology of neuromuscular junction.
  - Primary principle.
3. Distribution and Termination of Action
4. "Margin of Safety" Concept
5. Factors which may promote difficulty in reversal of relaxant effect.
  - Non-depolarizers.
6. Prolongation of Effect of Succinylcholine
  - Pseudocholinesterase Deficiency (Congenital and acquired).
  - Genetics of congenital, PCE deficiency.
7. Monitoring of NMB
  - Peripheral nerve stimulator.
  - Significance of train-of-four / tetanus / post tetanic facilitation / double burst suppression.
  - Clinical criteria for extubation.

### v. Cholinesterase Inhibition

1. Edrophonium, Neostigmine, Pyridostigmine, 4 - aminopyrine

2. Mechanism of Action
3. Dosages
4. Pharmacologic Differences and Clinical Significance
5. Side Effects

#### **vi. Anticholinergics**

1. Atropine, Glycopyrrolate - intended and other systemic effects
2. Dosages
3. Pharmacologic Differences and Clinical Significance
4. Appropriate Combinations with Cholinesterase Inhibitors
5. Central Anticholinergic Syndrome

#### **vii. Calcium Entry Blockers**

1. Verapamil, Nifedipine, Diltiazem
2. Mechanism of Action
3. Relative Hemodynamic Effects
  - Chronotropic
  - Inotropic
  - Dromotropic
  - Vasodilation
4. Interaction with Anesthetic Agents

#### **viii. Antihypertensives**

1. Mechanism of Action
2. Interaction with Anesthetics
3. Specific Problems Associated with Each Group
  - Abrupt withdrawal of B-blockers.

For the following classes of drugs:

- a. Diuretics.
- b. Adrenergic neuron blocking agents.
  - Reserpine, Guanethidine
- c. Centrally mediated adrenergic inhibitors.
  - Methyldopa, Clonidine
- d. Monoamine - oxidase inhibitors.
  - Pargyline / tranylcypromine
- e. Beta-adrenergic blocking agents.
  - Propranolol, Metoprolol, Esmolol, Sotalol
  - Concept of those with ISA (intrinsic sympathomimetic activity) and / or cardioselectivity.
- f. ACE inhibition and Angiotensin II receptor antagonists
- g. Direct Vasodilators for Intraoperative Hypotension
  - Hydralazine, Nitroglycerin, Nitroprusside, Trimethopran
  - Indications
  - Dosages
  - Toxicity

### **ix. Other drugs**

NSAID's, bronchodilators, aspiration prophylaxis drugs, anti-nauseants, inotropes and other vasoactive drugs, antiplatelet drugs, antiepileptics and antidepressants and anticoagulants.

- Mechanism of Action
- Dosages
- Pharmacologic Differences and Clinical Significance
- Side Effects

### **x. Toxicology**

Demonstrate knowledge of the anesthetic implications of acute intoxication and chronic abuse of: Narcotics, EtOH, Cocaine, Amphetamines, Other

## **4. Anatomy and physiology:**

The resident will know the anatomy and physiology relevant to the performance of the clinical examination, as well as procedures and possible complications arising in the following systems:

### **i. Nervous System**

1. Spinal column
2. Spinal cord and meninges
3. Blood supply to the spinal cord
4. Formation of spinal nerves
5. Dermatomal distribution of spinal nerves
6. Autonomic nerves
  - Parasympathetic nerves to viscera
  - Sympathetic nerves, their origin and distribution
    - Stellate ganglion
    - Coeliac ganglion
    - Lumbar ganglion
7. Cranial nerves
  - Trigeminal
  - Vagus
  - Spinal accessory
8. Peripheral nerves
  - Cervical plexus (superficial and deep)
  - Brachial plexus and its main branches
  - Intercostal nerves
  - Lumbar plexus and its main branches
  - Sacral plexus and its main branches
9. Neurophysiology including:
  - a. Cerebral blood flow
  - b. Cerebral blood volume
  - c. Cerebral metabolism
  - d. Cerebrospinal fluid dynamics and physiology
  - e. Intracranial pressure
  - f. Blood-brain barrier
  - g. Physiology and metabolism of normal and abnormal brain and spinal cord
  - h. Physiological and metabolic effects of anesthesia on brain and spinal cord
  - i. Abnormal water and sodium homeostasis
  - j. Nociception
  - k. Temperature and CNS function

## **ii. Cardiovascular System**

1. Surface anatomy of the heart and great vessels in health and disease.
2. Radiological anatomy of the heart, pericardium and great vessels in health and disease.
3. Gross anatomy of the pericardium, heart, and its blood supply.
4. Nerve supply of the heart.
5. Relationship of vascular structures in the neck and thoracic inlet.
6. Venous anatomy in the upper limb with special attention to the relationship in the ante-cubital fossa.
7. Arterial anatomy of the wrist, hand and foot.
8. Cardiovascular physiology including:
  - a. Structure and function of the heart
  - b. Electrical properties of the heart
  - c. Determinants and control of cardiac output
  - d. Peripheral vascular system
  - e. Control of circulation
  - f. Regional circulation

## **iii. Respiratory System**

1. Surface anatomy of the lung and its divisions.
2. Radiological anatomy of the lung and its division.
3. Gross anatomy of the lung and tracheobronchial tree and its correlation with the surface and radiological anatomy.
4. Laryngeal anatomy in general with specific reference to the nerve supply and function of the larynx.
5. Oro- and nasopharyngeal anatomy with the aim of intubation.
6. Endoscopic anatomy of the airway from the external nares or lips to the segmental bronchi.
7. The intercostal bundle and innervation of the thorax.
8. Respiratory physiology including:
  - a. Control of respiration
  - b. Mechanics of breathing
  - c. Pulmonary gas volumes and ventilation
  - d. Diffusive transfer of respiratory gases
  - e. Ventilation - perfusion inequalities
  - f. Gas transport in the blood
  - g. Pulmonary circulation

## **iv. Mother and Fetus**

1. Anatomy of the normal maternal placental fetal unit
2. Physiology of the circulation in the maternal placental fetal unit
3. Common maternal physiologic alterations during pregnancy; including altered hormonal activity, metabolic activity, uterine size, and vascularity.
4. Organ system changes (especially cardiovascular, hematological, respiratory, gastrointestinal, renal, skin and mucous membrane, central nervous and musculoskeletal systems).
5. Cardiovascular and respiratory changes that occur in the intrapartum period.
6. Postpartum changes in the cardiovascular, hematological, respiratory and gastrointestinal systems.
7. Mechanism of drug transfer across the placenta.
8. Effects of maternally administered drugs on the fetus and newborn.
9. Effects of anesthesia/analgesia on uterine blood flow and uterine activity.
10. General pharmacology and pharmacologic effects of the following agents: oxytocics, prostaglandins, magnesium sulphate, and tocolytics

11. Anatomy and physiology of pain pathways in parturition

**V. Physiology and pathophysiology of co-existing medical conditions relevant to anesthesia**

1. Endocrine disorders including pheochromocytoma, hyperthyroidism, hypothyroidism, and diabetes mellitus
2. Disorders of the cardiovascular system (congenital as well as acquired)
3. Disorders of the respiratory system (congenital as well as acquired)
4. Disorders of the nervous system (congenital as well as acquired)
5. Disorders of the liver, biliary tract and gastrointestinal system
6. Renal disorders; Water, electrolyte and acid-base disturbances
7. Hematological disorders, including coagulopathies
8. Skin and musculoskeletal disorders, including rheumatoid arthritis and ankylosing spondylitis
9. Psychiatric disorders and substance abuse
10. Disorders associated with ageing
11. Obesity and other metabolic conditions