

**THE DEPARTMENT OF ANESTHESIOLOGY &
PERIOPERATIVE MEDICINE
FACULTY OF MEDICINE
QUEEN'S UNIVERSITY**

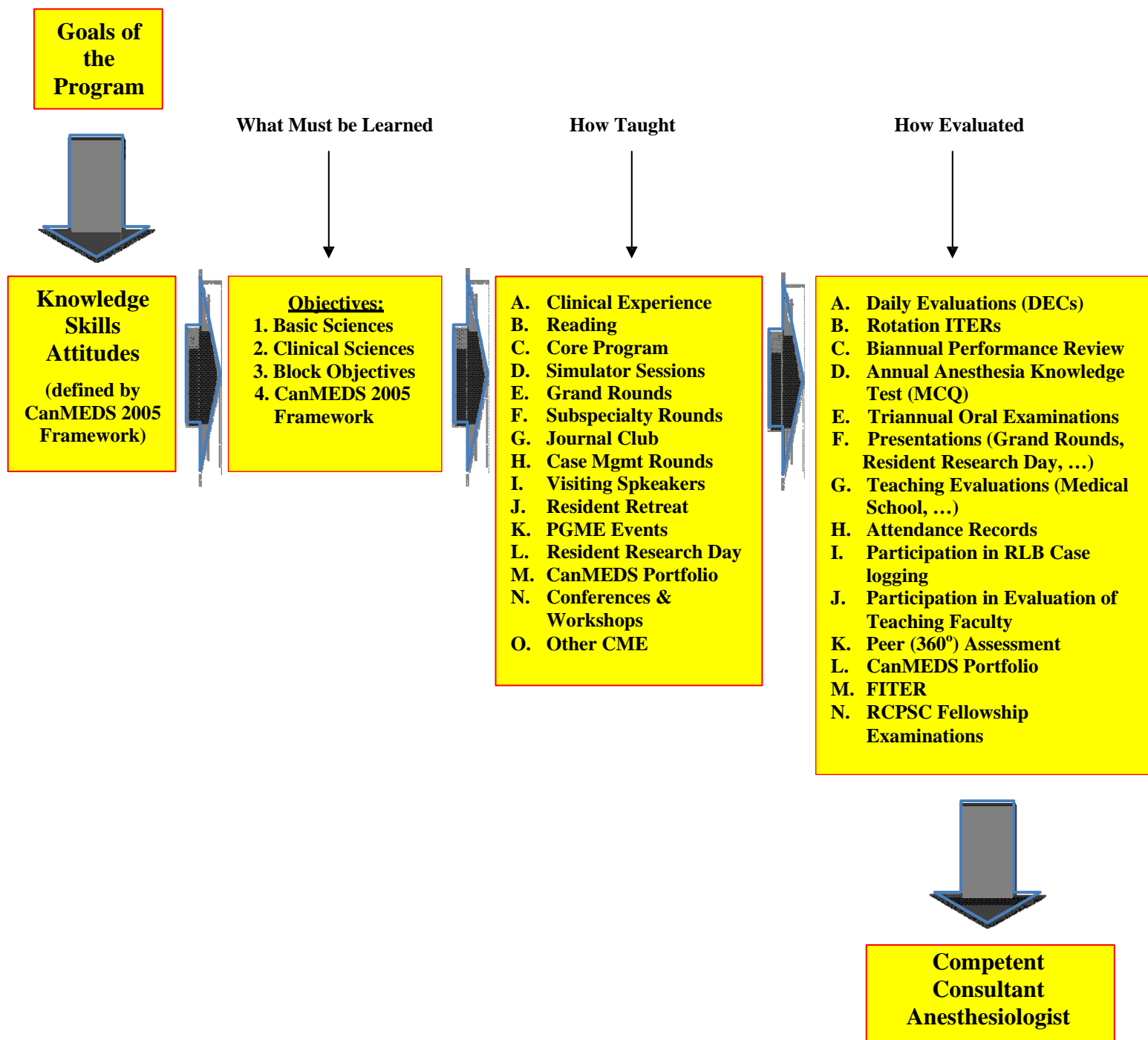
**POSTGRADUATE EDUCATION PROGRAM IN
ANESTHESIOLOGY**

OVERALL GOALS AND OBJECTIVES

**Latest Revision
February 2018**

OVERVIEW OF THE ACADEMIC PROGRAM

Below is a schematic presentation of the components of the academic program in Anesthesiology at Queen's University. In order to become a competent consultant anesthesiologist, a resident must achieve mastery of all the competencies described herein.



GOALS OF THE POSTGRADUATE PROGRAM IN ANESTHESIOLOGY

The mandate of the training program is to train and prepare residents to become successful Consultant Anesthesiologists, whether they choose an academic, administrative or community environment. In doing so, we inevitably focus on meeting the educational requirements of the Royal College Specialty Program in Anesthesiology and success at the specialty examinations.

The Goals of the resident training program are outlined on pages 1 – 4. The Objectives to meet these Goals during the residency are outlined in Sections II through VII. The resident must be familiar with these Goals and Objectives. They can be used as a guide to learning, and form the basis of both the educational curriculum and the criteria by which resident performance is evaluated. The Medical Expert roles of each clinical domain draw heavily upon the National Curriculum document written by the ACUDA Education committee. This document can be found on the Departmental website.

The goals for the postgraduate program in Anesthesiology at Queen's University conform to those Objectives of Training outlined in the green "General Information" booklet distributed by the Royal College of Physicians and Surgeons of Canada.

Terminal goal:

The goal of the Queen's University Postgraduate Anesthesiology program is to incorporate the above goals into the program such that at the end of training the resident will demonstrate excellent skills related to data gathering, use of investigation, clinical judgement and performance of technical procedures.

In brief, given a patient presenting for surgery, the resident will elicit a complete database from history and physical examination. Subsequently, appropriate laboratory tests should be chosen and interpreted correctly. Using this information an appropriate plan of anesthetic management will be developed.

Further, given an emergency situation, the resident will demonstrate not only appropriate intervention but also appropriate speed of intervention.

Once an appropriate plan of management is established, the resident will be able to efficiently and effectively implement that plan in a safe manner, while maintaining vigilance in patient monitoring and adaptability to evolving clinical situations.

In order to effect the anesthetic plan, the resident will demonstrate skills in performing technical procedures as outlined below.

The resident will:

1. Establish venous access in central and peripheral veins. The resident will know the complications and indications associated with each means of venous access. The resident will perform central pressure monitoring using central venous pressure lines and pulmonary artery catheters. The resident will know the indications, contraindications, and complications of each approach. Establish arterial lines knowing the indications, contraindications, and complications of this procedure.
2. Be an expert in endotracheal intubation in the awake or the anaesthetised patient using the oral or nasal approach with both regular laryngoscopes and fiberoptic devices. The resident will know the indications, contraindications, and complications of each means of intubation.
3. Demonstrate expert skills in alternative airway management equipment and techniques, including emergency cricothyroidotomy.
4. Perform spinal and epidural anesthesia, knowing the indications, contraindications, and complications of each.
5. Perform a variety of peripheral nerve blocks, including those of the brachial plexus, cervical plexus blocks, and intercostal and lower extremity nerves. The resident will know the indications and contraindications for each block. The resident will be able to discuss the complications of each type of block.
6. Perform IV anesthetic blocks, knowing the indications, contraindications and complications of this technique.
7. Perform resuscitations on patients of all age groups using the standards adopted in the A.C.L.S., A.T.L.S., and N.R.P. protocols.
8. Be able to evaluate, set up, and trouble-shoot all anesthetic machinery for safe usage.
9. Be able to interpret correctly the data generated from all clinically used physiologic monitoring devices.

GUIDELINES FOR GRADED RESPONSIBILITY FOR ANESTHESIOLOGY ROTATIONS

Graded Responsibility Policy

The primary focus of all our activities is the safe care of our patients. Residents must attain a requisite competency designated by their progression through their requisite stages, as assessed by the Competency Committee. An increase in responsibility is encouraged and is necessary for developing a resident's judgment and confidence. Occasionally, residents who have demonstrated sufficient aptitude will be asked to run a list with increasing levels of independence while an attending staff will be responsible for OR managerial responsibilities, or overseeing a fellow in another room, or two rooms concurrently or in the final stage, attending to nonclinical responsibilities. These assignments are seen as an opportunity for residents to develop the skills in communication, time and resource management required to successfully complete an OR list. OR lists seen as having educational value for each stage of resident development will be assigned with these goals in mind. In conjunction with the advancement of a resident's clinical skills, the resident will assume progressively more responsibility in the Operating Room.

Guidelines for Managerial Coverage Assignment:

Foundations (PGY1-2) residents, who have graduated to independent call, and who have demonstrated a capacity for some independent work may be assigned to work with the OR manager.

1. Manager coverage – a resident is paired with the staff OR manager, who has the additional responsibility of managing the Operating Rooms for the day, which may require more independence of the resident than is usually expected in an assigned room.

Guidelines for Fellow Coverage Assignment:

Core (PGY 2-4) residents, who have demonstrated a capacity for more independent work, may be assigned to increased independent patient care.

2. Fellow coverage - a resident is assigned to one operating room, while a fellow is assigned another operating room. Both operating rooms are assigned to one faculty member.

Guidelines for Concurrent Coverage Assignment:

Senior Core Residents (PGY 3½-4), who have demonstrated a capacity for more independent work, and are consulted to enter a phase of independent patient care, may be assigned to concurrent coverage.

3. Concurrent coverage – two senior core residents are each assigned one operating room. Both operating rooms are assigned to one faculty member.
4. Concurrent coverage is limited to 2 assigned days of concurrent coverage per resident per block for PGY 3½ through PGY 4. PGY 5 residents may be assigned concurrent coverage up to once per week.
5. Residents running concurrent coverage rooms shall be assigned lists within their assigned teaching blocks. Residents shall not be “pulled” from rotations in order to run concurrent coverage rooms.

6. Concurrent coverage cannot limit a resident's availability for scheduled out-of-OR teaching.
7. The Resident Manager shall assign the lists for the residents being concurrently covered in accordance with the Guidelines for Graded Responsibility in Anesthesiology.
 - a. The list assignments for residents as determined by the Resident Manager shall not be changed in order to facilitate concurrent coverage. Rather, residents will remain with their assigned lists and staff coverage shall be arranged to oversee the concurrently covered residents performing the lists assigned by the Resident Manager.
 - b. Residents will not be assigned to a list with pediatric patients while being concurrently covered until they have successfully completed their Pediatric Anesthesia rotation.
 - c. Residents will not be concurrently covered when assigned to Cardiac anesthesia or Neonatal anesthesia.
8. It is optimal for learning when concurrent coverage is scheduled in advance, so that residents may prepare for semi-independent function. It is recognized that unexpected changes to the daily schedule may require concurrent coverage of residents on short notice. This can occur with the following conditions:
 - a. Both residents must be of sufficient seniority (see above) to qualify for concurrent coverage;
 - b. Both residents must be clearly informed of the change in coverage, including who is their direct supervisor and how to reach them immediately if required;
 - c. Both residents are to remain with their originally assigned lists;
 - d. The concurrent coverage must comply with all other listed policies;
 - e. The Program Director must be informed of the change in coverage.

Guidelines for Transition to Practice Coverage Assignment:

Transition to Practice (TP) residents, who have passed their FRCPC examinations, may be regularly assigned to an almost completely independent level of patient care. Both the TP residents and faculty members will be consulted at the appropriateness of the operating room list, their respective comfort level, as well as the frequency of its assignment.

9. Transition to Practice coverage – final year resident having passed their FRCPC examinations are assigned to one operating room and expected to manage completely independently. The faculty member assigned to the OR list is also assigned non-clinical duties, but is still readily available in case of emergency.

Guidelines for Transition to Practice Pre-Anesthetic Clinic Assignment:

Transition to Practice (TP) resident will be assigned their own pre-surgical clinic with a case load of eight patients. There will be a consultant anesthesiologist assigned, for consultation, but the resident is expected to function independently, preparing for the day and following up on all patients in a timely and professional manner. These independent clinics may be assigned at a maximum of twice per block.

Goals and Objectives for Concurrent Coverage:

In order to maximize concurrent coverage rooms as a learning experience, the Anesthesiologist responsible for the two rooms:

1. Should determine prior to the beginning of the day that each resident is prepared to accept the responsibility of running an OR list on their own, according to the criteria for PREPARED Residents.
2. Must always be immediately available for each resident.
 - a. To this end, the assigned staff shall not also be the OR Manager.
 - b. The assigned rooms should ideally be in the same wing of the OR
 - c. The assigned staff cannot be assigned to an OR and a remote location, or two remote locations.
3. Must establish learning objectives for the day with both of the residents prior to the beginning of beginning of each list.
4. Must attempt to provide guidance to meet the learning objectives for the day and feedback to each resident during the day.

Residents who are running concurrent coverage rooms must:

1. Arrive in the OR fully PREPARED to anesthetize each patient on their list with minimal supervision.
2. Be able to discuss their learn objectives for the day with the attending anesthesiologist.

Reviewed and Approved RPC Committee September 2009

Suspended Practice 2015

Reinstated June 2016

Updated, February 2018

BASIC SCIENCE OBJECTIVES OF THE POSTGRADUATE PROGRAM IN ANESTHESIOLOGY

The resident is referred also to the National Curriculum in Anesthesiology – Medical Expert document, which can be found at the Departmental website:

http://meds.queensu.ca/anesthesiology/assets/National_Curriculum_final_v2.pdf

1. Physics:

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

Objectives: The resident will know the common measurement units and their usual values, the physiologic monitoring devices, factors affecting their performance, and reliability.

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_2 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 $ETCO_2$ interpretation
6. pH and Blood Gas Analysis
 - a. pH, pCO_2 , PO_2 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_2 saturation
 - d. transcutaneous O_2 and CO_2 measurement
7. Blood Flow Determination
 - a. Indicator techniques: the Fick principle
 - measurement of O_2 consumption and A- VO_2 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 vapour 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

Objectives:

1. The resident will understand and use as a basis for anesthesia practice the Standards of Practice, as published in the CAS Guidelines.

2. Anaesthetic 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
- neuromuscular blockade monitor
- EEG and evoked potentials
- temperature monitoring

3. Anaesthetic 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 Anaesthetic 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 Anaesthesia

- computerized record keeping

9. Infusion and PCA Pumps

- principles of-function and limitations

10. Cleaning/Sterilization of Equipment

3. Pharmacology

The resident will be able to select pharmacologic agents and delivery systems to achieve therapeutic goals which take into account the patient's pathophysiology, current therapy, and potential interactive toxicities.

Objectives: The resident will study and demonstrate a practical depth of knowledge in the following areas.

General Anesthetics

1. Be familiar with current theories on mechanism of action.

i. General Anaesthetics - 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 N₂O, 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. N₂O
 - 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.
 - 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 anaesthetic depth.

ii. General Anaesthetics – Intravenous

Exhibit detailed knowledge of the following drugs especially in the areas outlined:

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 anaesthesia and as supplement to anaesthesia.
 - 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.
 - Intrathecal and epidural use.
 - d. Use as premedicants vs. general anaesthetics.
 - 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.
1. Butyrophenones - Droperidol
 - a. Major pharmacological action including effect on CNS and CVS systems.
 - b. Use of antiemesis, premedication and supplement to general anaesthesia - appropriate dosage.
 - c. Major organ side effects.
2. 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.
3. Other antiemetics (antihistamines, phenothiazines, metoclopramide).

iii. Local Anaesthetics

Demonstrate knowledge of:

1. Mechanism of Action
 - Effect of ionization, alkalization, heating.
2. Molecular Structure
 - Amide vs. Ester.
 - 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

Demonstrate knowledge of:

1. Classification
 - Depolarizers- Succinylcholine.
 - Non-depolarizers - d-Tubocurarine, 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

Demonstrate knowledge of:

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

Demonstrate knowledge of:

1. Verapamil, Nifedipine, Diltiazem
2. Mechanism of Action
3. Relative Hemodynamic Effects
 - Chronotropic
 - Inotropic
 - Dromotropic

- Vasodilation
4. Interaction with Anaesthetic Agents

viii. Antihypertensives

Demonstrate knowledge of the following characteristics:

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

For the following classes of drugs:

- a. Diuretics.
- b. Adrenergic neurone 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
- g. Direct Vasodilators for Intraoperative Hypotension
 - Hydralazine, Nitroglycerin, Nitroprusside, Trimethopran
 - Indications
 - Dosages
 - Toxicity

ix. Other drugs

Demonstrate knowledge of:

- NSAID's, bronchodilators, aspiration prophylaxis drugs, antinauseants, inotropes and other vasoactive drugs
- Mechanism of Action
 - Dosages
 - Pharmacologic Differences and Clinical Significance
 - Side Effects

x. Toxicology

Demonstrate knowledge of the anaesthetic implications of acute intoxication and chronic abuse of:

Narcotics, EtOH, Cocaine, Amphetamines, Other

4. ANATOMY:

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

Objectives: The resident will be able to describe in detail the anatomic structures outlined below, locate the surface landmarks which guide procedures in these areas, and the presence of significant structures which contribute to complications of the procedure.

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

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.

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.

5. PHYSIOLOGY & PATHOPHYSIOLOGY:

i. Cardiovascular Physiology

The resident will be thoroughly familiar with the anatomy, physiology and common pathophysiology of the cardiovascular system, how it can be manipulated pharmacologically, and how to monitor and intervene in these manipulations.

Objectives: The resident will know and be able to discuss the following topics:

1. Normal Anatomy of the Cardiovascular System (CVS).
 - Heart
 - chambers and valves
 - coronary arteries and veins
 - pericardium
 - surface anatomy and radiological appearance of the heart
2. Embryological Development of the CVS.
 - a. Normal
 - primitive heart tube and the sinus venosus
 - the cardiac loop
 - the aortic arches
 - septation
 - b. Abnormal - congenital defects. Common abnormalities including:
 - atrial septal defects
 - ventricular defects
 - PDA
 - tetralogy
 - dextrocardia
 - coarctation
 - transposition of great vessels
 - IHSS
 - tricuspid atresia
 - Eisenmenger's syndrome
3. Normal Physiology of CVS.
 - a. Electrophysiology
 - pacemaker depolarization
 - electrical transmission
 - atrial
 - A-V nodal
 - ventricular
 - cardiac action potential
 - normal EKG
 - b. Physiology of cardiovascular performance
 - myocardial microstructure and metabolism
 - cardiac output
 - control of heart rate
 - control of stroke volume
 - preload
 - afterload
 - contractility
 - left ventricular wall motion abnormalities
 - cardiac output measurements
 - ventricular function - right and left
 - ventricular function curves
 - systolic and diastolic
 - measurement of myocardial contractility
 - invasive techniques
 - ◇ force velocity curve
 - ◇ Walton-Brodie strain gauge arch
 - ◇ rate of pressure development (dp/dt)
 - ◇ catheter tip flow probes
 - ◇ angiography
 - ◇ ultrasound devices to measure muscle wall thickness

- noninvasive techniques
 - ◇ systolic time intervals
 - ◇ ballistocardiogram
 - ◇ pneumocardiogram
 - ◇ impedance cardiogram
 - ◇ electrocardiogram
 - ◇ echocardiography
 - ◇ nuclear techniques
 - the cardiac cycle
 - ventricular systole
 - isovolumetric contraction phase
 - ventricular ejection phase
 - protodiastolic phase
 - isovolumetric relaxation phase
 - physiology of coronary circulation
 - normal coronary blood flow
 - aortic blood pressure
 - in heart rate
 - local metabolic factors
 - left ventricular end-diastolic pressure alterations
 - neural and neurohumoral factors
 - myocardial oxygen balance
 - pulses
 - arterial wave form
 - arterial pulse contour
 - venous pulse
 - c. Physiology of peripheral circulation
 - haemodynamics and principles of fluid flow
 - microcirculation, lymphatics, blood volume
 - control of the peripheral circulation
 - extrinsic
 - intrinsic
 - autoregulation
 - vasomotor centre
 - d. Normal regulation of blood pressure (physiological)
4. Pathophysiology of the Cardiovascular System.
- a. Congenital defects
 - b. Acquired disorders
 - valvular heart disease
 - ischemic heart
 - dysrhythmias
 - cardiomyopathies
 - hypertension
 - shock
 - electrolyte disturbances
 - autonomic disturbances
 - pericardial disease
 - CHF – left and right ventricular dysfunction
5. Pharmacology of the Cardiovascular System.
- a. Effects of anaesthetics on the CVS system
 - the normal heart and peripheral circulation
 - the abnormal heart and peripheral circulation (see 4a and 4b)
 - the cerebral circulation
 - the coronary circulation
 - interactions with drugs used in therapy of the cardiovascular circulation

- b. Anti-arrhythmics
 - c. Anti-hypertensives
 - d. Sympathomimetic agents
 - e. Therapy of shock
6. Cardiopulmonary Bypass
 - a. Physiology of bypass
 - b. Pharmacology of bypass
 - c. Preparations for beginning cardiopulmonary bypass
 - d. Management of cardiopulmonary bypass
 - e. Principles of postoperative care
7. Monitoring of the cardiovascular system - the principles behind the techniques used; the advantages and disadvantages of each.
 - a. Noninvasive
 - blood pressure cuff
 - effects of size
 - differences in readings using auscultation, oscillotonometry, palpation, pulse monitor
 - mechanical blood pressure cuff
 - pulse monitor
 - electrocardiography
 - usual and augmented leads
 - echocardiography
 - the concept of systolic time intervals, pre-injection period, left ventricular ejection time and their measurement
 - ejection fraction time, and their measurement
 - principles of radionucleotide imaging techniques.
 - b. Invasive monitoring of cardiac function.
 - Filling pressures of right and left heart
 - techniques available for estimation of left ventricular end-diastolic pressures
 - use of C.V.P. monitoring
 - use and interpretation of Swan-Ganz catheter data and situations where use of this data is invalid or questionable.
 - Cardiac output measurements.
 - the principles behind the techniques used
 - the commonest clinical methods in current use
 - when is it desirable to measure cardiac output?
8. Physiology of CPR

ii. Pulmonary Physiology

Respiratory System

Given a patient who presents for an anaesthetic the resident should have a clear understanding of that patient's normal respiratory physiology and how the conduct of the anaesthetic will alter that physiology.

Objectives:

- a. Discuss the gas laws and why they are important in anaesthesia.
 - Boyles
 - Charles
 - Van der Waals
 - Henry's
 - Graham's
 - Dalton's
- b. Discuss the normal dimensions of lung volumes and capacities and how these may be measured. Knowledge of flow

- volume, relationships is important.
- c. Discuss the functional anatomy of the lung.
 - air passages from upper airway to alveolus
 - pulmonary vascular system
 - basic histology of the lung
 - innervation of the airway
 - differences in the paediatric patient
 - d. Discuss the nonrespiratory functions of the lung to include:
 - filtration function
 - protease transport system
 - alteration of hormone levels
 - lipid metabolism
 - immune function
 - e. Discuss in detail the control of breathing as it pertains to:
 - origin of respiratory rhythm
 - motor pathways in breathing
 - chemical control of breathing
 - peripheral chemoreceptors
 - anatomy and innervation
 - effects of CO_2 , O_2 , H^+
 - central chemoreceptors
 - location
 - effects of CO_2 , O_2 , H^+
 - CSF buffering
 - reflex control of breathing
 - baroreceptors
 - pulmonary stretch receptors
 - j and irritant receptors
 - Herring - Breur, Head reflexes
 - cough reflex
 - drug effects
 - altitude effects
 - f. Discuss the role of the lung in acid-base regulation
 - g. Describe the importance of elastic resistance to ventilation as it pertains to:
 - FRC - factors determining FRC and altering FRC
 - elastic recoil of the lungs
 - surfactant
 - LaPlace's law
 - hysteresis
 - time dependence of pulmonary expansion
 - factors affecting lung compliance
 - static and dynamic compliance
 - elastic recoil of the thoracic cage
 - closing capacity
 - h. Resistance to gas flow
 - laminar flow
 - character
 - factors determining resistance to gas flow
 - turbulent flow
 - Reynolds number
 - relationship of pressure gradient to flow rate, density and viscosity
 - causes of increased airway resistance
 - regulation and modulation of bronchomotor tone
 - i. Discuss pulmonary ventilation
 - determinants of minute volume and alveolar ventilation

- causes of inadequate ventilation
- work of breathing
- j. Define respiratory dead space and describe the distribution of inspired gases. This should include a knowledge of anatomic, physiologic, alveolar and apparatus dead space, and the concept of rebreathing.
 - pulmonary blood volume, and West's zones of blood flow
 - pulmonary vascular pressures and vascular resistance
 - Starling forces
 - pulmonary edema (cardiogenic and noncardiogenic)
 - post airway obstruction pulmonary edema
- Discuss the importance of matching pulmonary ventilation with perfusion.
 - define V/Q mismatch and list factors determining the mismatch
 - define venous admixture
 - discuss the concept of pulmonary shunting, to include the knowledge of the shunt equation
- k. Describe diffusion of gases within the lung.
 - factors influencing diffusion
 - diffusion abnormalities
 - methods of measuring diffusing capacity
- l. Discuss Carbon Dioxide with respect to:
 - carriage in blood.
 - CO₂ stores
 - apneic mass movement oxygenation
 - adverse effects of hyper/hypo capnea
 - methods of measurement of PaCO₂
 - CO₂ absorption in anaesthesia circuits
- m. Blood gas interpretation to include:
 - acute respiratory and metabolic disorders
 - chronic respiratory and metabolic disorders
 - mixed disorders
 - determination of A-a gradient for O₂
 - prediction of anticipated increase in PaO₂ with various means of supplying supplement oxygen
- n. Discuss the role of pulmonary function testing to include:
 - methods of determining lung volume abnormalities
 - methods of determining flow abnormalities
 - methods of determining diffusion abnormalities
 - methods of determining unilateral pulmonary function
 - recognition of abnormal values for the above
- o. Discuss the indications for and the mechanism of action of the following forms of inhalational therapy:
 - Oxygen
 - Helium
 - Inhaled bronchodilators
 - Nitric oxide
- p. Mechanical ventilation to include:
 - Indication for, the physiologic effects of, and the mechanics of the various modes of ventilation using mechanical ventilators
 - PEEP, CPAP
 - AutoPEEP

iii. Haematology

Blood Components

1. Discuss the basic physiology of the Red Blood Cell under normal physiological conditions.
 - a. the factors that effect the O₂ disassociation curve.
 - b. Describe the function of the Red Blood Cell with particular reference to its O₂ – carrying capacity.

- c. List Describe red cell production:
 - Area of the body that produces the Red Blood Cell.
 - An outline of the development of the mature Red Blood Cell from the stem cell.
 - Regulation of the red blood cell production, i.e., tissue oxygenation, erythropoietin.
 - Vitamins and minerals needed for red cell
 - production. d. Discuss the basic steps in the synthesis of normal haemoglobin:
 - Heme complexes, globin, iron.
 - Relate the importance of iron metabolism.
 - Relate the importance of its structure to O₂ carrying capacity.
 - e. Outline the normal destruction of red blood cells, and the subsequent catabolism of haemoglobin.
- I.
2. The resident should be able to describe the various types of anaemia seen in clinical practice.
 - a. Define anaemia.
 - b. Give an etiological classification of anaemia.
 - c. Discuss the various types of anaemia including:
 - Anaemia due to acute or chronic blood loss.
 - Anaemia due to deficiencies in factors concerned with erythropoiesis such as iron, Vitamin B12, folio acid.
 - Anaemia due to bone marrow failure.
 - Haemolytic anemias.
 - Anaemia due to defective haemoglobin synthesis.
 - d. Outline the physiological changes that occur in the body secondary to anaemia.
 - e. Differentiate methemoglobinemia, carboxyhemoglobinemia and sulfhemoglobinemia.
 3. The resident should be able to demonstrate the knowledge and understanding of polycythemia.
 - a. Define polycythemia.
 - b. Discuss secondary polycythemia.
 - c. Discuss polycythemia rubra vera.
 - d. Describe the effect of polycythemia on the circulatory system.
 4. The resident should demonstrate knowledge and understanding of the role of leukocytes, the tissue macrophage system, and the inflammatory response in man.
 - a. List the special systems for combating different infectious and toxic agents in the body.
 - b. Describe the general characteristics of leukocytes.
 - c. Outline the genesis and life span of leukocytes.
 - d. Discuss the tissue macrophage system (the reticuloendothelial system).
 - e. Describe the process of inflammation.
 - f. Discuss the spleen as to its structure and function.
 5. The resident should demonstrate knowledge of platelets and platelet function.
 - a. Outline the life cycle of the platelet.
 - b. Describe the function of platelets.
 - c. Discuss thrombocytopenia.
 - d. Describe other platelet disorders.

Hemostasis

1. The resident should have a good understanding of normal hemostatic mechanisms, with particular emphasis on the sequence of events required to achieve hemostasis after vessel injury.
 - a. Define hemostasis.
 - b. List factors preventing haemorrhage.
 - c. List factors controlling haemorrhage and describe their interaction.
2. In addition to a basic knowledge of the coagulation cascade, the resident should have an appreciation of how it interacts with other hemostatic mechanisms.

- a. Diagram the coagulation cascade.
- b. Describe the roles of calcium and platelet phospholipid.
- c. Describe activation of:
 - the extrinsic system
 - the intrinsic system
- d. Discuss the relative importance of the two systems in the prevention and control of bleeding.
- e. Describe the role of thrombin.
- f. Discuss the importance of factor XII to the Kallikrein system and plasmin generation, and their effects on the coagulation cascade.
- g. Discuss the function of fibrinolysis, and pharmacology of agents that inhibit fibrinolysis.
- h. Describe how clotting factors are protected from plasmin.
- i. Know from where plasminogen activators come.
- j. Summarize the normal stimulation of fibrinolysis, and diagram the steps in the process.
- k. Know the rationale and dangers of fibrinolytic therapy (streptokinase, tissue plasminogen activator).

Coagulopathy

1. The resident should have an organized approach to disorders causing excessive bleeding and detailed knowledge of the pathophysiology of the common ones.
 - a. Categorize the causes of abnormal bleeding.
 - b. Describe the bleeding pattern of vascular disorders.
 - c. Know the most common inherited hemorrhagic disorder of a vascular nature, and describe it.
 - d. List causes of acquired vascular defects.
 - e. Divide bleeding disorders caused by platelets into two functional groups.
 - f. Describe the life cycle of the platelet.
 - g. Describe normal platelet function in response to vessel trauma.
 - h. List categories of thrombocytopenia and give the common causes of each.
 - i. Know why chronic immune thrombocytopenia is affected by:
 - immuno-suppressive drugs, i.e., cyclophosphamide
 - splenectomy
 - corticosteroids
 - j. Describe the pathogenesis of drug-induced immune thrombocytopenia.
 - k. Divide the disorders of platelet function into groups according to defect.
 - l. List the mechanisms of production of coagulation factor defects.
 - m. Know where clotting factors are made.
 - n. Know which are the common inherited clotting factor abnormalities, the defect in each, and how they are transmitted.
 - o. Describe the function of circulating antibodies to the coagulation factors.
 - p. List the common acquired coagulation disorders.
 - q. Know the approximate half-lives of the clotting factors, and how long they remain in banked blood.
 - r. Discuss the massive transfusion syndrome.
 - s. Discuss the role of vitamin K on coagulation factor synthesis.
 - t. Discuss pathological fibrinolysis including:
 - the role of tissue activator
 - factors contributing to the defect

Thrombin and Emboli; Anticoagulants

1. The resident should have a clear idea of the causes, treatment and prevention of thrombus formation.
 - a. Discuss the differences between arterial, venous, capillary and cardiac thrombi including:
 - structure
 - location
 - cause
 - route and importance of embolization

- b. List the mechanisms that prevent thrombus formation.
- c. Discuss the differences between a hemostatic plug and a thrombus.
- d. Discuss:
 - the anticoagulant drugs heparin, and the vitamin K antagonists
 - the antiplatelet drugs aspirin, dipyridamole and sulpha pyrazine
 - the fibrinolytic drugs streptokinase and urokinase

With respect to:

- site of action
 - time course of action
 - route and method of action
 - method of monitoring effect
 - antidote
 - indications
 - contraindications
- e. Outline other embolic syndromes: fat emboli, septic embolic, paradoxical emboli, air emboli, catheter emboli.

Blood Coagulation Tests

1. The resident should be knowledgeable about the laboratory available to monitor haematologic function.
 - a. Discuss each of the common tests of bleeding disorders including:
 - the logic behind the test
 - what it does and does not measure
 - how it is performed
 - the sensitivity and specificity of the test
 This should include:
 - tourniquet test
 - bleeding time
 - blood film
 - platelet count
 - thrombin time
 - prothrombin time & INR
 - partial thromboplastin time + ACT
 - b. Know what other investigations are available for use in particular problems. This should include:
 - factor assays
 - drug assays
 - platelet function tests
 - measurement of fibrin split products
 - other

Disseminate Intravascular Coagulation

1. A complete knowledge of DIC is mandatory.
 - a. Define DIC.
 - b. Describe its effects on:
 - clotting factors
 - platelets
 - fibrinogen
 - c. List the possible initiating mechanisms.
 - d. Describe the effects on the fibrinolytic systems.
 - e. Know the complications of DIC from:
 - haemorrhage

- thrombosis
- f. List the laboratory investigations used to detect DIC, and the expected results of them.
- g. Discuss the role of heparin in DIC.

Blood Groups, Transfusion and Transplantation

1. The resident will know the major blood typing system and how blood is prepared for transfusion.
 - a. Draw up a table of the ABO blood group system indicating the antigens and isohemagglutinins found in each of the groups A, B, O and AB. List other blood group systems.
 - b. Describe the phenomenon of Rh sus incompatibility and how the consequences can be avoided.
 - c. Define "Universal Donor."
 - d. Describe the antiglobulin test and outline the components of a complete cross matching.
2. The resident will know which blood groups may be transfused and the possible complications of transfusion.
 - With the ABO-Rh systems list the blood groups a recipient may be transfused. Include whole blood, platelets and fresh froze plasma.
 - List the immunologically mediated complications of blood transfusion.
 - List the non-immunologically mediated complications of blood transfusions.
 - Outline the consequences of leucocyte incompatibility in transfusion.
 - Outline the diagnosis and treatment of a transfusion reaction.
3. The resident will know the main immunological factors concerned with transplantation of tissues and organs.
 - a. Define the terms Xenogenic (heterogenic); Allogenic (homologous) and Autologous.
 - b. Briefly outline the strong (I-HA) + (ABH) and weak this to compatibility systems found in man and used for immune typing.
 - c. Define 'first set' and 'second set' graft rejection.
 - d. Outline the role of lymphocytes and humoral antibody in graft rejection.
 - e. Outline the pharmacological approach to immune suppression and its complications.
4. The resident will know the blood products, artificial blood and volume expanders that are available along with their characteristics.
 - a. List the components that a unit of whole blood can yield.
 - b. Discuss how red blood cells are stored and the problems associated with storage.
 - c. Discuss the storage problems associated with granulocytes, platelets and the coagulation factors.
 - d. List the types of artificial blood that have been formulated giving their advantages and disadvantages over red blood cells.
 - e. List the artificial volume expanders that are available and their characteristics.
 - f. List the infective agents that may be transmitted via blood product transfusion.

iv. Immunity and Allergy

1. The resident will be knowledgeable of the innate, non-specific immune mechanisms that are effective against infective agents, play a role in transplantation medicine, and subserve ARDS, MSOF and SIRS.
 - a. Define Innate Immunity.
 - b. List the determinants of Innate Immunity and its mechanisms of action.
 - c. Define phagocytosis. Give examples of intracellular killing mechanisms.
 - d. Define opsonin.
 - e. Outline complement activation by the classical and alternate pathways and give examples of the biological activities of complement activation products.
 - f. Describe the three main features of an inflammatory response and give examples of endogenous mediators of inflammation.
2. The resident will know the mechanisms of acquired immunity.
 - a. Describe the two forms of adaptive immunity-humoral and cell mediated.
 - b. Differentiate active and passive immunity.

- c. Discuss briefly the development of cells of the immune system and their function. briefly the role of the thymus in the immune response.
 - d. Differentiate primary from secondary immune response.
 - e. Define immune tolerance.
 - f. List the lymphocyte activation products (lymphokines) and describe their role in immunity.
 - g. Outline the investigations used in evaluating the immune response.
 - h. Distinguish the role of T and B-lymphocytes in the immune reaction.
3. The resident will know the basic characteristics of antigens and antibodies.
 - Define immunogen and hapten.
 - Outline the determinants of antigen specificity; list the molecular requirements of immunogenicity.
 - List in the form of a table the five classes of immunoglobulins and their characteristic properties.
 - Draw a schematic diagram of the structure of the IgG molecule and describe the function of the individual domains.
 4. The resident will know the five types of immune responses causing tissue injury.
 - Distinguish between delayed and immediate type hypersensitivity reactions.
 - Describe anaphylactic (type 1) reactions and the pharmacological mediators involved. Distinguish between on anaphylactoid reaction.
 - Describe cytotoxic (type 2) reactions and antibody-dependent cell mediated cytotoxicity.
 - Describe toxic complex (type 3) reactions and provide an example.
 - Outline the lymphocyte mediated delayed (type 4) reaction and list two common inducing agents.
 - Describe stimulatory (type 5) reactions and list two examples.
 - Differentiate two categories of immuno-deficiency state.

v. Neurophysiology

1. To understand the basic anatomy and physiology of a neuron.

Be familiar with:

 - a. The structure of a spinal motor and peripheral sensory neuron.
 - b. Axoplasmic transport
 - c. Excitation and impulse propagation, resting membrane and action potential, saltatory conduction.
 - d. The different types of nerve fibre: A, B, C and subgroups.
 - e. The effects of local anaesthetics on nerve fibres.
2. To understand the structure and function of skeletal muscle and smooth muscle.

Be familiar with:

 - a. The organization of muscle fibres, striations, sarcotubular system and different muscle types.
 - b. The electrical characteristics and contractile mechanism.
 - c. The energy sources and utilization, oxygen debt and heat production.
 - d. The effects of denervation, EMG responses.
 - e. Neuronal and muscle diseases pertinent to anaesthesia:
 - motor neuron disease
 - demyelinating disease
 - muscular dystrophies
 - familial periodic paralysis
 - glycogen storage diseases
 - tetanus
 - malignant hyperthermia syndrome
 - myasthenia gravis and myasthenic syndrome
3. To understand synaptic transmission.
 - a. Synaptic, presynaptic and postsynaptic junctions, different types of receptors.
 - b. Electrical events: excitatory postsynaptic potential CEPSP), inhibitory postsynaptic potential (IPSP), synaptic delay.
 - c. Chemical transmitters: acetylcholine, norepinephrine, dopamine, epinephrine, SHT, glycine, gamma-amino-butyric acid, etc.

- d. Drugs affecting the chemical transmitters including anaesthetic agents.
 - e. Facilitation and inhibition, post-tetanic potentiation.
4. To understand neuromuscular transmission.
 - a. To anatomy of the myoneural junction: terminal axon, motor end plate, acetylcholine receptor.
 - b. Normal sequence of events during transmission of impulses, end-plate potential, action potential, quantal releases.
 - c. Denervation effects and hypersensitivity.
 - d. Effects of muscle relaxants and reversal agents on neuromuscular transmission.
 - e. The characteristics of a nerve stimulator and the response to twitch, train-of-four and tetanic stimulation in normal muscle and that under the influence of different muscle relaxants.
 5. To understand the reticular activating system, thalamus and cerebral cortex.
 - a. The anatomic organization of the R.A.S., thalamus and cortex.
 - b. Effect of general anaesthetics on the CNS, theories of anaesthesia.
 - c. Electrophysiologic monitoring: electroencephalogram, cerebral function monitor, spectral array analysis, evoked potentials.
 - d. The effects of anaesthetic agents on the above electrophysiology.
 - e. Types and mechanisms of seizures, antiepileptic drugs.
 - f. Sleep and its stages, differences compared to anaesthesia.
 6. To understand cerebral circulation and metabolism.
 - a. The blood supply to the brain, main vessels, capillary junctions, blood-brain barrier.
 - b. Formation and absorption of CSF, effects of anaesthetics and drugs (acetazolamide, steroids).
 - c. The measurement of cerebral blood flow: Kety-Schmidt, inert gas, hydrogen, microspheres.
 - d. The regulation of cerebral blood flow, effects of anaesthetic agents, critical levels.
 - e. Cerebral metabolism: CMRO₂, glucose, ketones, effect of drugs, PET scanning (position emission tomography).
 - f. Intracranial pressure and its measurement by extradural, subdural or intraventricular devices, causes of raised I.C.P. methods of reducing.
 - g. Cerebral perfusion pressure, brain compliance.
 - h. The causes of coma.
 - i. Pertinent neurologic diseases: stroke, subdural, extradural, trauma, tumours, aneurysm, cerebral insufficiency, "neurogenic pulmonary oedema".
 7. To understand the principles of neurodiagnostic methods.
 - Cerebral angiography, digital subtraction venography, CT scan, nuclear magnetic resonance (NMR) scan, positron mission tomography (PET) scan, ultrasound.
 8. To understand the basics of posture and movement.

Be familiar with:

 - a. The pyramidal and extrapyramidal systems.
 - b. Spinal integration and transection, spinal shock and progression to stable chronic state, mass reflex.
 - c. Physiology of decerebration and decortication.
 - d. Basal ganglia function, Parkinson's disease, L-dopa.
 - e. Basic cerebellar function.
 9. To understand the autonomic nervous system.

Be familiar with:

 - a. The anatomic organization, sympathetic and parasympathetic, ganglia and connecting fibres.
 - b. Chemical transmitters at synaptic junctions, muscarinic and nicotinic receptors, formation and release, reuptake, metabolism.
 - c. Adrenergic discharge, receptor types and function.
 - d. The effects of α and β agonist and antagonist drugs.
 - e. Diseases of the autonomic nervous system: familial dysautonomia (Riley-Day), Shy-Drager,
 - f. Autonomic hyperreflexia.
 10. To understand the vomiting mechanism.

Be familiar with:

 - a. The organization of the co-ordinated process of vomiting.

- b. The anatomic location and connections of the vomiting centre and the chemoreceptor trigger zone.
 - c. The factors which can induce nausea and vomiting.
 - d. The actions of antiemetic drugs.
11. To understand the basic actions and pathology of the hypothalamus, pituitary and limbic system.
- Be familiar with:
- a. The anatomic location and connections of the hypothalamic-pituitary axis, anterior and posterior pituitary, portal vessels, neurosecretion, hypothalamic centres.
 - a. Hypothalamic regulator mechanisms: of pituitary, thirst, hunger, sexual, fear, autonomic, temperature. (leave pituitary mechanisms for endocrine)
 - b. The details of temperature regulation, cycles, temperature gradients; heat production, loss and conservation, hyper- and hypothermia.
 - e. Diabetes insipidus and the syndrome of inappropriate ADH secretion.
 - f. The role of the limbic system in behaviour and emotions.

vi. Endocrine and Metabolism

Be familiar with the preoperative, intraoperative, and postoperative management of the following conditions:

- a. Diabetes Mellitus
- b. Hyper and hypofunction of adrenal gland
- c. Hyper and hypofunction of Pituitary gland and hypothalamus
- d. Hyper and hypofunction of Thyroid and Parathyroid
- e. DI, SIADH
- f. Calcium, Phosphate, and Magnesium homeostasis
- g. Carcinoid syndrome
- h. Malignant hyperthermia
- i. Surgery, anaesthesia and stress response
- j. Thermoregulation

vii. Hepatic Physiology

Be familiar with and able to describe:

- a. Hepatic Circulation
- b. Liver Function
- c. Tests of Liver Function
- d. Effects of anaesthesia and surgery on liver function
- e. Pathophysiologic states:
- f. Hepatitis - acute and chronic
- g. End-stage liver disease
 - porphyria
 - hepatotoxins
 - postoperative jaundice
 - portal hypertension

viii. Renal Physiology

Be able to describe the following:

- a. Renal Function Tests
- b. Effects of anaesthesia and surgery on renal function
- c. Acid-base control
- d. Fluid and Electrolyte Balance
- e. Pathophysiologic States
- f. Acute and Chronic Renal Failure
- g. Principles of Dialysis
- h. Nephrotoxins

CLINICAL SCIENCE OBJECTIVES OF THE POSTGRADUATE PROGRAM IN ANESTHESIOLOGY

The resident is referred also to the National Curriculum in Anesthesiology – Medical Expert document, which can be found at the Departmental website:

http://meds.queensu.ca/anesthesiology/assets/National_Curriculum_final_v2.pdf

A. Cardiac and Vascular Anaesthesia

Goals and objectives for this rotation are built upon the basic science objectives for pharmacology and the clinical objectives for the Cardiology rotation.

The resident will be able to conduct a patient assessment, formulate an anesthetic plan of management, institute appropriate monitoring, and provide a safe anesthetic for patients with severe cardiovascular disease. The resident will be able to provide appropriate ICU care postoperatively, and transfer this care with a concise and accurate summary.

Specific Objectives:

1. The resident will assess the anesthetic risk of patients with cardiac or vascular disease understanding and using the appropriate investigations. The resident will be able to describe various risk stratification protocols.
2. Preoperatively, the resident will prepare the patient psychologically, pharmacologically and physiologically for cardiac and vascular surgery.
3. The resident will know, understand, and be able to select and apply appropriate monitoring techniques.
4. The resident will be able to:
 - cannulate peripheral arteries
 - gain access to the central venous circulation
 - insert pulmonary artery flotation catheters
 - be familiar with the usage of Transesophageal Echocardiography (TEE)

The resident will be aware of the complications of these techniques, pitfalls in their interpretation, preventative measures to reduce complications, and the management of these complications.

5. The resident will recognize that these patients are often critically ill, they and their families psychologically stressed, and close cooperation and clear communication amongst medical, surgical, anesthetic and nursing staff is essential.
6. The resident will conduct a safe anesthetic induction, maintenance and emergence for patients with severely compromised cardiac function:
 - CAD
 - CHF – Right and Left ventricular dysfunction
 - Hypertension
 - Cardiomyopathies
 - Tamponade
 - Valvular Disease
 - Dysrhythmias
 - Pacer, Defibrillator
 - Prior Cardiac Transplant
 - Congenital Heart Disease

7. The resident will be able to describe the pathophysiology and management of cardiopulmonary bypass and Ventricular Assist Devices.

8. The resident will have and implement a management plan for common problems causing low cardiac output states post bypass, including use of inotropes and vasoactive agents, intra-aortic balloon pumps.
9. The resident will diagnose and treat all cardiac arrhythmias.
10. The resident will have a differential diagnosis, investigation, prevention and management plan for excessive bleeding post bypass surgery. The resident will be conversant with the benefits of antifibrinolytic therapy.
11. The resident will understand the hemodynamic profiles consistent with optimal cardiac function in valvular heart disease.
12. The resident will be able to describe the anesthetic management of thoracic aortic surgery.
13. The resident will be able to safely anaesthetize patient for the following operations:
 - carotid endarterectomy
 - abdominal aortic surgery
 - peripheral vascular surgery.
 - implanted cardiac defibrillator.
 - ASD and VSD repair
 - restrictive pericardial disease
 - cardiac tumors (myxomas)
 - cardioversions
 - Minimally Invasive CABG
 - CABG requiring CPB
14. The resident will be able to plan for appropriate postoperative pain management for these patients.

B. Thoracic Anaesthesia:

Goal:

The resident will be able to provide a complete preoperative evaluation and implement an appropriate anesthetic plan of management for patients presenting with thoracic disease requiring surgery.

Objectives:

The Perioperative Period

1. The resident will be able to do a complete history and physical examination to assess the extent of pulmonary disease. The resident will be able to stratify the risk assessment of the patient.
2. The resident will be able to select appropriate pulmonary function tests and will be able to discuss the use of whole-lung and split-lung function tests to predict postoperative risk.
3. The resident will be able to recognize the effects of pulmonary disease on right ventricular function and will be able to describe the physical signs and laboratory investigation of patients who have right ventricular dysfunction.
4. The resident will recognize that patients who present for surgery may not be in optimal physical condition. The resident will be able to define specific measures to optimize the patient's condition.
5. The resident will be able to describe preoperative preparation for patients with chronic obstructive pulmonary disease.
6. The resident will be able to describe the specific considerations for assessing patients with
 - pulmonary malignancies
 - asthma
 - COPD
 - Cystic fibrosis
 - Pulmonary fibrosis
 - Pulmonary hypertension

The Intraoperative Period

Monitoring requirements.

1. The resident will be able to describe the mode of operation of the commonly used monitors for thoracic surgery.
2. The resident will be able to select these monitors appropriately depending upon the patient's planned surgery and medical condition.

Choice of anaesthesia.

- 1 The resident will be able to select anesthetic agents appropriate for the perioperative management of the specific patient. In particular, the resident will know the anesthetic considerations for the following conditions:
 - Bronchoscopy
 - Mediastinoscopy
 - Lobectomy
 - Pneumonectomy
 - Tracheal resection
 - Thoroscopic surgery
 - Airway laser surgery
 - Esophageal surgery
- 2 The resident will be able to describe in detail the physiology of the lateral decubitus position specifically its effects on distribution of ventilation and perfusion.
- 3 The resident will be able to describe the physiology of the open chest including mediastinal shift and paradoxical respiration.
- 4 The resident will be able to describe the physiological changes that occur during the onset of one-lung anaesthesia.
- 5 The resident will be able to describe the various clinically used techniques of producing differential lung ventilation.
- 6 The resident will be able to describe three absolute and three relative indications for one-lung anaesthesia.
- 7 The resident will be able to describe a systematic technique to ensure proper functioning of left-sided double lumen endotracheal tube.
- 8 The resident will be able to list the common complications of the use of double lumen endotracheal tubes.
- 9 The resident will be able to describe the ventilatory management of one-lung anaesthesia.
- 10 The resident will be able to formulate and enact a plan of management for hypoxemia that occurs during one-lung ventilation.
- 11 The resident will be able to manage the following specific problems:
 - Mediastinal mass
 - Bronchopleural fistula
 - Pulmonary Hemorrhage
 - Bullae
 - Pneumothorax
12. The resident will be able to describe the physiological considerations relevant to Thoroscopic surgery.

Postoperative Period

1. The resident will be able to diagnose and treat
 - massive hemorrhage
 - blowout of bronchial stump
 - herniation of the heart through the pericardium

- acute right-sided heart failure following pulmonary resection.
2. The resident will be able to discuss and use current techniques for administering postoperative analgesia.
 3. The resident will be able to provide a safe anesthetic plan for following specific procedures:
 - mediastinoscopy
 - thoracoscopy
 - massive pulmonary hemorrhage
 - superior vena caval syndrome
 - giant bullous emphysema
 - bronchopleural fistula
 - tracheal resection
 - unilateral bronchopulmonary lavage

C. Neuroanaesthesia

The basic sciences for this rotation are found in the pharmacology, pediatric and neuroanaesthesia portions of Section III.

Goal:

The resident will provide a safe anesthetic for all common neurosurgical problems. The resident will discuss the neurophysiologic changes induced by anesthetic agents. The resident will be familiar with all currently used monitoring techniques.

Objectives:

1. For general neuroanaesthesia considerations, the resident will:
 - state the determinants and normal values for cerebral blood flow.
 - describe the measurement of cerebral blood flow
 - discuss the determinants of cerebral metabolic rate
 - outline the secretion and circulation of cerebral spinal fluid.
 - know the determinants of intracranial pressure.
 - state the factors affecting intracranial compliance.
2. The resident will be able to order the appropriate ancillary investigations and therapy to optimize the patient preoperatively.
3. The resident will be familiar with the effects of inhalational anesthetic agents on cerebral blood flow and metabolism.
4. The resident will state the effects of intravenously given drugs on cerebral blood flow and metabolism, specifically:
 - the barbiturates
 - propofol
 - benzodiazepines
 - opioids
 - neuroleptics
 - ketamine
 - mannitol
 - neuromuscular blocking agents
 - vasodilators
5. The resident will be familiar with the basic techniques and, where applicable, the normal wave patterns for the following:
 - EEG
 - Evoked Potentials
 - ICP
 - Transcranial Doppler

6. The resident will be able to describe the effect of anesthetic agents on the above monitoring modalities.
7. The resident will state strategies to afford cerebral protection in situations of raised intracranial pressure and global or focal cerebral ischemia.
8. The resident will state the definition of the "inverse steal" phenomenon.
9. The resident will outline the assessment of patients for evidence of raised intracranial pressure, the acute interventions to stabilize these patients, and the principles of intensive care management of these patients postoperatively.
10. The resident will identify the neuroendocrine problems associated with neurosurgical patients, their investigation and therapy.
11. The resident will state the significance of positioning in neurosurgical patients including monitoring for and treating venous air embolism.
12. The resident will state and implement an anesthetic plan of management for each of the following circumstances from preoperative assessment, preparation, induction, monitoring, maintenance, emergence and postoperative care in PARR or the neurosurgical ICU:
 - intracranial aneurysms
 - Ischemic cerebrovascular disease
 - mass lesions especially the posterior fossa
 - transphenoidal hypophysectomy
 - acute head injury
 - acute spinal cord injury
 - the patient requiring neuroradiologic procedures
 - the patient with cervical spine disease or injury
 - the patient for awake craniotomy (epilepsy or stereotactic surgery)
13. The resident will be aware of the associated complications of neurosurgical patients, in particular:
 - Coagulopathy
 - cranial nerve dysfunction postoperatively
 - neurogenic pulmonary edema
 - the need for deliberate hypotension.
 - SIADH
 - Air embolism
 - Intracranial Hypertension
14. The resident will know the clinical criteria for declaring brain death in a patient.

D. Obstetrical Anaesthesia

Goals:

At end of the obstetrical anaesthesia rotation the resident will assess a healthy pregnant mother and be able to develop a plan of management for anaesthesia and analgesia during labour. The resident will assess factors that may alter neonatal risk. The resident will also assess mothers who may have systemic illness. The resident will be able to alter the plan of management to compensate for these illnesses.

Objectives

Mother and Fetus

1. The resident will know the common maternal physiologic alterations during pregnancy. These will include the primary physiologic events including altered hormonal activity, metabolic activity, uterine size, and vascularity.
2. The resident will be familiar with the organ system changes especially those for cardiovascular, hematological, respiratory, gastrointestinal, renal, skin and mucous membrane, central nervous and musculoskeletal systems.

3. The resident will know the cardiovascular and respiratory changes that occur in the intrapartum period.
4. The resident will be familiar with the postpartum changes in the cardiovascular, haematologic, respiratory and gastrointestinal systems.
5. The resident will describe the effects of these altered physiologic systems on the administration of anaesthesia.
6. The resident will be able to describe the indications for fetal HR monitoring. The resident will recognize abnormal patterns, their possible causes and the need for intervention.
7. The resident will be able to list the clinically use methods of evaluating fetal well-being. They will know the clinical implications of a positive NST, OCT, and biophysical profile.

Perinatal Pharmacology

1. The resident will describe the anatomy of the normal maternal placental fetal unit.
2. The resident will understand the physiology of the circulation in the maternal placental fetal unit.
3. The resident will understand the mechanism of drug transfer across the placenta.
4. Effects of maternally administered drugs on the fetus and newborn.
5. The resident will describe the common methods of evaluation of neurobehavioral status.
6. The resident will discuss the advantages and disadvantages of the common methods of pain relief during labour.
7. The resident will be able to describe the effects of anesthesia/analgesia on uterine blood flow and uterine activity.
8. The resident will be familiar with the chemical structure, mechanism of action, effect on the nerve cell membrane, the pharmacologic basis of action, the systemic toxicity of the local anesthetic agents.

Epidural and Subarachnoid Narcotics

1. The resident will be familiar with the mechanism of action of epidural and intrathecal narcotics and understand the potential side effects of agents used in this fashion.

Nonpharmacologic pain relief

1. The resident will discuss the current role of prepared childbirth in the normal delivery:
 - hypnosis;
 - acupuncture;
 - transcutaneous electrical nerve stimulation.

Drug interactions

1. The resident will describe the general pharmacology and pharmacologic effects of the following agents: oxytocics, prostaglandins, magnesium sulphate, and tocolytics.

General anaesthesia

1. The resident will understand the current indications in the use of inhalational agents for analgesia during labour.
2. The resident will be familiar with the current techniques of administration of inhalational anesthetics.

Regional Anaesthesia

1. The resident will be familiar with the pain pathways in parturition.
2. The resident will be familiar with the mechanism of action, technique of administration, indications and contraindication of the use of epidural anaesthesia.
3. Residents will be familiar with the methods of providing continuous lumbar epidural infusions.
4. The resident will understand the advantages, disadvantages and current techniques of providing caudal analgesia during labour. The resident will be familiar with the techniques, advantages and disadvantages of spinal analgesia and anaesthesia for cesarean section and labour. The resident will describe the indications and technique of pudendal nerve block. The resident will also describe the common problems associated with pudendal nerve block.
5. The resident will describe the treatment of unintentional intravascular injections: unintentional subarachnoid injection; and the complication of any of the above techniques.

Cesarean Section

1. The resident will describe and perform spinal, epidural and general anaesthesia for cesarean sections. The resident will fully understand the complications and treatment of complications for any of these techniques.

Agents affecting uterine tone:

Residents will be able to:

1. Describe the effects of potent inhalation anesthetics and ketamine on uterine tone.

2. List drugs used clinically for tocolysis and their systemic side effects.
3. Describe the indications for the use of GTN, indicating the dose, route of administration, maternal and fetal effects.

Specific Conditions

1. The resident will be able to demonstrate the appropriate preoperative assessment and management of:
 - Preterm Labour
 - Prolapsed cord
 - Pre-eclampsia, Eclampsia, HELLP Syndrome
 - Multiple Gestations
 - Abnormal Presentations, Shoulder dystocia
 - Pre and Post-partum Hemorrhage, Uterine Dehiscence, Uterine Inversion, Amniotic Fluid Embolism
 - Operative vaginal delivery
 - Cesarean Section

Other conditions

1. The resident will be familiar with the particular considerations associated with:
2. Non-obstetrical Surgery in the Pregnant Patient
3. CPR in the Pregnant Patient
4. Neonatal Resuscitation

The high risk parturient:

1. The resident will explain which factors should be considered in diagnosing a pregnant woman as high risk.
2. The resident will describe how the risk factors adjust the considerations for analgesia and anaesthesia
3. The resident will describe and perform anesthetic techniques for patients with prepartum hemorrhage, toxemia, diabetes mellitus, cardiac disorder, neurologic disorders, respiratory disorders, renal disorder, haematologic disorders, endocrine disorder.

Complications of Regional Anaesthesia:

1. The resident will describe how patients having regional analgesia or anaesthesia should be properly monitored.
2. The resident will diagnose and treat the following complications: Hypotension; systemic toxic reaction; headache, late neurologic sequela.

Anaesthesia and surgery during pregnancy:

1. The resident will discuss drug induced fetal effects.
2. The resident will describe methods to avoid intrauterine asphyxia
3. The resident will describe factors that may affect the onset of premature labour.
4. The resident will describe the current recommendations for anaesthesia during pregnancy.

Anaesthesia for the postpartum period:

1. The resident will be familiar with the physiology of the postpartum period.
2. The resident will describe anesthetic techniques for elective surgery in the postpartum period.
3. The resident will describe the anesthetic technique used for emergency surgery in the postpartum period.
4. The resident will describe, diagnose and treat the syndrome of DIC.

Resuscitation of the newborn

1. The resident will describe the physiologic changes that occur at birth.
2. The resident will recognize the limited and diverse mechanisms by which the neonate maintains body temperature.
3. The resident will describe the usual delivery room care of the healthy newborn
4. The resident will discuss and anticipate causes neonatal depression.
5. The resident will be familiar with the principles of resuscitation of the newborn.
6. The resident will indicate the importance of the Apgar Score to the technique used for the resuscitation.
7. The resident will describe the equipment and drugs necessary for resuscitation for the newborn.
8. The resident will describe the currently recommended management for meconium aspiration.

Differential diagnosis of the newborn in distress:

1. The resident will discuss the common cause of neonatal distress.
2. The resident will diagnose and treat the following specific conditions:

- airway obstruction due to choanal atresia
- respiratory distress syndrome
- meconium aspiration
- pneumothorax
- diaphragmatic hernia
- tracheoesophageal fistula
- congenital heart disease
- persistent fetal circulation
- hypovolemia
- immature respiratory center
- hypoglycemia
- myasthenia gravis.

Maternal mortality:

1. The resident will understand the cause of maternal mortality
2. The resident will understand the anesthetic contribution to maternal mortality.

E. Paediatric Anaesthesia

Goals:

Given a pediatric patient presenting for any type of surgery, the resident will outline a plan of management and institute a safe anesthetic for that patient which will encompass an awareness of the psychological impact of the experience for the child and its family.

Objectives:

13. The resident will outline the difference between adult and pediatric anatomy and physiology in relationship to anaesthesia including the perioperative fluid and electrolyte, and temperature management of surgical paediatric patients.
14. The resident will be able to use a variety of approaches in dealing with children of all ages in their preparation for anaesthesia and surgery.
15. The resident will develop criteria for accepting children for anaesthesia.
16. The resident will learn the principles of using paediatric anaesthesia circuits and equipment and will be able to choose the appropriate equipment for any case.
17. The resident will understand the altered pharmacodynamics in the newborn infant.
18. The resident will describe the anesthetic implications of common pediatric disorders. These will include:
 - haematologic disorders including anemia, sickle cell states, thalassemia, ITP, hemophilia
 - atypical plasma cholinesterases
 - diabetes mellitus
 - malignant diseases
 - noncardiac surgery in children with congenital heart diseases
 - Down's Syndrome
 - malignant hyperpyrexia
 - cystic fibrosis
19. The resident will understand the anesthetic implications of pediatric syndromes and unusual disorders to the depth described in Stewart's Manual of Pediatric Anaesthesia.
20. The resident will describe the special considerations of the premature infant coming for surgery and also will understand the longer term problems of providing anesthetic care to patients who were born prematurely but present for surgery at a later date.

21. The resident will describe the anesthetic management of patients presenting for common neurosurgical procedures. These will include:
 - patients with hydrocephalus
 - increased intracranial pressure
 - intracranial hematomas
 - craniosynostosis
 - myelomeningocele
 - encephalocele
 - spinal cord tumors
 - intracranial tumors.
 - common neuroradiologic techniques.
13. The resident will describe the anesthetic management and potential complications of patients presenting for common ophthalmologic procedures.
14. The resident will describe the common problems and accepted anesthetic management of patients presenting for dental surgery.
15. The resident will be familiar with the anesthetic management for common elective ENT procedures.
16. The resident will discuss, diagnose and treat the more common forms of pediatric lung disease. In the newborn, the resident will discuss the importance of pulmonary surfactant; respiratory distress syndrome of the newborn; and abnormal breathing patterns. In the older child the resident will diagnose and treat croup, bronchiolitis, cystic fibrosis and epiglottitis. The resident will describe in detail the anesthetic management of upper airway obstruction in a child.
17. The resident will describe the anesthetic considerations for repair of cleft lip and palate.
21. The resident will describe the anesthetic management of common congenital defects that may require surgery during the neonatal period. As a minimum the resident will describe the management of:
 - congenital lobar emphysema
 - congenital diaphragmatic hernia
 - tracheoesophageal fistula and esophageal atresia
 - congenital hypertrophic pyloric stenosis
 - omphalocele and gastroschisis
 - biliary atresia.
22. The resident will describe the anesthetic technique used in management of common closed heart operations including patent ductus arteriosus, resection of aortic coarctation, palliative surgery to increase pulmonary blood flow, palliative surgery to increase intra-atrial mixing, palliative surgery to decrease pulmonary blood flow. The resident will describe an acceptable technique of preoperative assessment of patients with congenital heart disease. The resident will describe a plan of management for patient presenting for noncardiac surgery who has congenital heart disease.
23. The resident will be familiar with the perioperative management of children with common paediatric cardiovascular anomalies including: Tetralogy of Fallot, patent ductus arteriosus, aortic coarctation, atrial septal defects and ventricular septal defects.
24. The resident will develop a plan to deal with children who have renal insufficiency or failure.
25. The resident will describe the anesthetic implications of surgery for kyphoscoliosis.
26. The resident will describe the anesthetic implications of acute burns.
27. The resident will utilize the appropriate regional anesthetic techniques in pediatric anaesthesia and pediatric analgesia.

28. During anaesthesia rotations at CHEO and during the residency in Kingston, the resident will be expected to provide anaesthesia in the following cases:
- circumcision
 - common hernia repair
 - pyloric stenosis
 - neonatal surgery (including TE fistula)
 - reimplantation of ureters
 - ex-premature child
 - cystoscopy
 - orchidopexy
 - cranioplasty
 - posterior fossa surgery
 - cleft lip and palate repair
 - burns
 - foreign body in the airway
 - controlled hypotension
 - difficult airway
 - patent ductus arteriosus
 - non-open heart cyanotic congenital heart disease
 - bronchoscopy
 - tonsillectomy
 - myringotomy and tubes
 - Harrington rod insertion
 - rapid sequence of induction
 - child with a recent URTI
 - malignant hyperpyrexia muscle biopsy
29. The resident will know the rationale for the development of the fasting guidelines for his/her hospital.
30. The resident will be familiar with the practical aspects of providing anaesthesia for children outside of the OR including anaesthesia for MRI, CT scan, other investigative procedures

F. General Surgery, Endoscopic Surgery, Laser Surgery

Objectives:

- 1 Residents will be able to perform thorough preoperative evaluations of the patient considering the necessary preparation and premedications for the patient. The patient concomitant disease will be taken into consideration.
- 2 The resident will be able to outline the necessary considerations and demonstrate competency in delivering anesthetics for patients needing:
 - Cholecystectomy
 - Appendectomy
 - Bowel Obstruction and Perforation
 - Bowel Resection
 - Acute Gastrointestinal Bleeding
 - Splenectomy
 - Pancreatic Resection
 - Hepatic Resection
 - Portal Shunting Procedures
 - Anorectal Surgery
- 3 The resident will be able to provide suitable postoperative management in the recovery room and will provide postoperative analgesia by a number of techniques including epidural narcotic pain relief when appropriate.
- 4 The resident will be able to discuss the effects of abdominal surgery on pulmonary function postoperatively.

- 5 The resident will be able to describe the following potential complications:
 - Pulmonary Complications
 - Postoperative Intestinal Dysfunction
- 6 The resident will be able to decide which patients are appropriate for consideration of endoscopic surgical techniques.
- 7 The resident will be cognizant of the relative and absolute contraindications, and the risks/benefits of endoscopic surgery.
- 8 The resident will be able to describe the physiologic implications of endoscopic abdominal surgery including the effects of:
 - Positioning
 - CO₂ Pneumoperitoneum
- 9 The resident will describe the indications for conversion to an open procedure.
- 10 The resident will be able to describe the various types of lasers and their uses in surgery.
- 11 The resident will be cognizant of the hazards of laser surgery and will know the appropriate precautions.
- 12 The resident will be able to describe the management of an airway fire.

G. Anaesthesia for Orthopedic Surgery and Trauma

Objectives:

15. The resident will be able to perform a detailed preoperative assessment and preparation of the patient for Orthopedic Surgery including the appropriate management of a patient's:
 - Concomitant Disease
 - DVT prophylaxis
16. The resident will be able to outline the pros and cons of various anesthetic techniques. The resident will know the Risks/Benefits of GA vs Regional
17. The resident will be able to outline the anesthetic considerations in:
 - major lower extremity arthroplasty surgery
 - spinal surgery
 - shoulder surgery
 - fractures
 - surgery under tourniquet
 - cement implantation syndrome
18. The resident will be able to select and perform the necessary procedures for appropriate postop pain management.
19. The resident will be able to recognize and treat postop complications such as:
 - fat embolism
 - pulmonary embolism
 - compartment syndrome
20. The resident will know the ATLS Trauma Protocol and the role of anaesthesia in the assessment and initial stabilization of the trauma patient.
21. The resident will know the assessment and management principles in Acute Trauma for the following problems:
 - Blunt Trauma

- Penetrating Trauma
 - Airway Trauma/Airway Management
 - Head and Spinal Cord Injury
 - Thoracic Trauma
 - CVS Trauma
 - Abdominal Trauma
 - Major Orthopedic Trauma
 - Hypotension in the trauma patient
22. The resident will have a plan for the management of the acutely traumatized patient in the OR.
 23. The resident will be able to coordinate the management of the trauma patient who returns to the OR for repeated surgical procedures.

H. Regional Anaesthesia / Acute Pain Management Rotation

The goals and objectives of this rotation are built upon the core program lectures in pharmacology and regional anesthesia. There will be clinical correlation with rotations in obstetrical, paediatric, ophthalmic anaesthesia rotations as well as the chronic pain rotation.

Goals:

1. The resident will understand the clinical pharmacology of local anesthetic drugs.
2. The resident will appreciate the indications and contraindications of regional anaesthesia for a variety of surgical conditions.
3. The resident will demonstrate clinical acumen in the selection and preparation of patients for regional anaesthesia, skill in the performance of the block and in the conduct of the remaining time of the anesthetic.
4. The resident will be able to recognize, investigate and treat common acute problems arising from nerve blocks. The resident will recognize, treat and organize a management plan to deal with late complications of regional blockade.

Objectives:

1. The resident will know the pharmacology of commonly used local anesthetics (LA) with regard to toxicities, clinical dosages, duration of action, metabolism and implications of additives.
2. The resident will know the anatomy required for safe neuraxial blockade, the physiologic affects of these blocks, measures to prevent patient injury, and the recognition and treatment of common and life threatening complications.
3. The resident will know the indications, contraindications and complications of various approaches to blocks of the brachial plexus, lumbosacral plexus, sacral plexus and coeliac plexus.
4. The resident will show competence in peripheral nerve blocks, as well as strategies to minimize complications from these blocks.
5. The resident will be able to select an agent for and perform a safe intravenous regional block, will understand the risks and be able to treat complications.

Acute Pain Management:

1. The resident will be able to describe the anatomy and physiology of pain pathways

2. The resident will state the neuroendocrine response to acute pain and its effects of major organ systems.
3. The resident will have knowledge of the clinical pharmacology of the opioid and non-opioid (tricyclics, NSAIDs, alpha agonists, anticonvulsants) treatment of acute pain including the use of:
 - systemic opioids
 - non-opioid analgesics
 - PCA
 - Regional techniques including nerve blocks
4. The resident will be able to outline the advantages of one pain relief delivery system over another, and give specific doses, rates and details of these delivery systems.
5. The resident will describe and treat common and life threatening adverse reactions to medications used to treat acute pain.
6. The resident will 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.
7. The resident will communicate clearly with the patient and other members of health care team as to the expectations and strategies of individual pain management.

I. Anaesthesia for Genitourinary Surgery

Objectives:

1. The resident will be able to perform an appropriate preoperative evaluation, and suitably prepare and premedicate a patient for this type of surgery as well as take into account any concomitant disease.
2. The resident will be able to describe the anesthetic considerations for:
 - nephrectomy
 - lithotripsy
 - prostate surgery
 - percutaneous nephrolithotomy
3. The resident will know how to manage postoperative complications such as:
 - TURP syndrome
 - Pain

J. Ambulatory Anaesthesia

Objectives:

7. The resident will be familiar with and able to demonstrate the appropriate preoperative assessment, preparation and premedication in an ambulatory setting to include consideration of:
 - NPO status
 - Drugs that reduce the risk of aspiration
 - Postoperative nausea treated preoperatively
 - Anxiolytics, sedatives, and opioids
 - Chronic medications
8. The resident will be able to appropriately select patients suitable for ambulatory anaesthesia including the following considerations:
 - Length of surgery

- Need for transfusion
 - Concomitant disease
 - Extremities of age
9. The resident will be familiar with the salient features of the design and management of a facility catering to efficient ambulatory anesthesia.
 10. The resident will be able to describe appropriate anesthetic techniques for ambulatory anaesthesia including:
 11. Appropriate selection of general, regional, sedation, or local anaesthesia
 - Intraoperative consideration of postoperative problems
 - Pain
 - Time in PACU
 - Nausea/vomiting
 - Appropriate selection of :
 - Muscle relaxants, narcotics, local anesthetics
 - Airway intervention
 - Considerations for regional techniques
 - Postoperative arrangements following central neuraxial blocks and plexus blocks
 - Monitored anaesthesia care techniques
 12. The resident will be able to describe:
 - Discharge criteria and patient instruction
 - Criteria for hospital admission
 13. The resident will have a plan for postoperative complications.

K. Anaesthesia for ENT Surgery

Objectives:

1. The resident will be able to describe the basic anatomy of the larynx.
2. The resident will understand the hazards, scientific principles, and anesthetic approaches to laser surgery on the larynx.
3. The resident will list the anesthetic problems anticipated in a patient presenting for tracheostomy.
4. The resident will discuss the determinants of pressure in the middle ear and will be able to list the effects of N₂O.
5. The resident will manage patients with a variety of upper airway pathology. This must include:
 - congenital anomalies affecting the upper airway (for example, Treacher Collins and Pierre Robin syndrome)
 - epiglottitis
 - croup
 - cancer affecting the upper airway
 - post tonsillectomy bleeding
 - tonsillar abscess
 - trismus
6. The resident will be able to describe the anesthetic considerations for the following surgery:
 - nasal surgery
 - tonsillectomy/adenoidectomy

- laryngoscopy/laryngeal surgery
- bronchoscopy
- ENT tumors
- ENT infections
- facial trauma
- tracheostomy
- induced hypotension

7. The resident will have a plan for the postoperative pain management for patients having ENT surgery.

L. Anaesthesia for Plastic Surgery

Objectives:

2. The resident will be able to list the anesthetic considerations in:
- Burn patients
 - Quadriplegic patients
 - Major reimplantation surgery
 - Cosmetic surgery

M. Ophthalmologic Anaesthesia

Objectives:

9. The resident will be familiar with the preoperative assessment and preparation necessary for these patients. In particular the resident will be familiar with:
- concomitant diseases
 - considerations re: intraocular pressure
 - effects of ophthalmologic medications
10. The resident will develop the communication skills necessary to engage and secure the cooperation of the elderly ambulatory care patient.
11. The resident will be familiar with the anatomy, technique of and complications of Retrobulbar and Peribulbar Blocks.
12. The resident will know the implications and cardiovascular management of the oculocardiac reflex.
13. The resident will be able to list the anesthetic considerations in:
- Open eye injuries
 - Cataract Surgery
 - Retinal Surgery
 - Strabismus Surgery
14. The resident will be able to recognize manage and formulate therapy for common PARR ocular injuries.

N. Anaesthesia in Remote Locations

Objectives:

4. The resident will be familiar with the special considerations associated with the location and personnel available in locations outside the OR.

5. The resident will be familiar with issues such as:
 - Appropriate patient selection
 - monitoring
 - transport
 - recovery
6. The resident will be able to list the considerations in anaesthesia for:
 - radiologic procedures - MRI, CT, Angiography
 - cardioversion
 - Emergency room procedures
 - ECT

O. Dental & Orofacial Surgery

Objectives:

2. The resident will be able to list the anesthetic considerations in:
 - Maxillary / Mandibular surgery
 - Anaesthesia in a dental office
 - Dental surgery in an uncooperative patient

P. Geriatric Anaesthesia

Objectives:

1. The resident will be able to discuss:
 - Physiologic effects of aging, especially:
 - CNS
 - Respiratory System
 - Cardiovascular System
 - Pharmacologic Considerations
 - Drug Distribution / Metabolism / Pharmacodynamics in the elderly
 - Patient Medications
 - Effects of Anaesthesia interacting with the patients medications
2. The resident will be able to discuss and will demonstrate knowledge of such anesthetic considerations as:
 - Positioning
 - Temperature Control
3. The resident will provide a plan of postoperative management for:
 - hypoxemia
 - confusion
 - placement

Q. Anaesthesia for Patients with Systemic Disease

Objectives:

The resident will be able to describe the anesthetic considerations for patients with:

1. Endocrine Disease
 - Diabetes
 - Insulin dependent
 - Diabetic Ketoacidosis
 - Nonketotic hyperglycemic coma
 - Thyroid Disease
 - Hypo- and Hyper-thyroidism
 - Parathyroid Disease
 - Hypo- and Hyper-parathyroidism
 - Pituitary Disease
 - Adrenal Disease / Pheochromocytoma
 - Conn's syndrome
 - Cushing's Disease
 - Carcinoid
2. Renal Disease
 - Evaluation of renal function
 - Effects of renal disease on pharmacokinetics
 - Physiology of the anephric patient
 - Renal transplantation
 - TURP
 - Minor urologic surgery
 - Strategies for preservation of renal function during anaesthesia
3. Liver Diseases
 - Cirrhosis
 - Hepatic coma
 - Malnutrition and the parenterally nourished patient
 - Viral Hepatitis
4. Collagen Vascular & Neuromuscular Disease
 - Rheumatoid Arthritis
 - SLE, scleroderma, Ankylosing Spondylitis
 - Myopathies, Myasthenia Gravis, Myotonia, Muscular Dystrophy
 - MH
 - Guillain Barre
 - Parkinson's Disease
5. Haematologic Disease
 - Hemoglobinopathies
 - Hemolytic Anaemias
 - Hemophilia
 - Von Willebrand's Disease
6. Malignancy
 - Paraneoplastic Syndromes
 - Effects of Chemotherapeutic Agents
7. Genetic Disorders
 - Turner's Syndrome
 - Trisomy 21

8. Infectious Diseases
 - AIDS
 - Concurrent URTI
 - Other Systemic Infection / Sepsis
9. Substance Abuse
 - Acute intoxication
 - Chronic addiction
10. Morbid Obesity

R. PACU

Objectives:

1. The resident will understand and be able to describe:
 - Necessary Facilities and Staffing
 - Monitoring Standards
2. The resident will know when to transfer patients to PACU and what monitoring is necessary for this
3. The resident will write PACU orders.
4. The resident will be able to list PACU Discharge Criteria.
5. The resident will be able to treat the following complications in the PACU:
 - PONV
 - respiratory problems
 - CVS
 - CNS
 - pain
 - hypo/hyperthermia

S. Chronic Pain Management

Goal:

At the end of the rotation the resident will be able to obtain a complete pain history and perform a directed physical examination. The resident will then formulate a comprehensive pain diagnosis as to the pain syndrome, anatomic origin of the pain, and the pathophysiologic etiology. Based on these, the resident will outline a multidisciplinary approach to pain management including treatment of the underlying cause as well as nonpharmacologic and pharmacologic analgesic interventions.

Objectives:

1. The resident will obtain a pain history, and perform a pain physical examination including diagnostic provocative maneuvers.
2. Based on the information from the patient's history and the physician's examination, the resident will formulate a differential diagnosis of the pain.

3. The resident will outline a diagnostic plan appropriate to establish the diagnosis consistent with an understanding of the principles of chronic pain management and utilizing such modalities as:
 - Medications
 - Psychological Support
 - Physiatric and Orthotic techniques
 - Regional techniques, nerve blocks
 - Neuroablative techniques
 - Neuroaugmentative techniques
 - spinal cord stimulation
 - TENS
 - Acupuncture
4. The resident will discuss pharmacologic interventions including:
 - opioid administration and selection of an appropriate delivery system
 - definition of a failed trial of opioid therapy and its management
 - adjuvant analgesic agents and non-opioids
5. The resident will characterize the following pain syndromes and formulate an appropriate assessment and treatment strategy for each:
 - bone pain
 - visceral pain
 - neuropathic pain
 - dysesthetic
 - neuralgic
 - nociceptive
 - incident pain
 - chronic non-malignant pain
 - fibromyalgia
 - failed back pain
 - abdominal wall pain
6. The resident will be able to discuss the principles associated with the organization of a multi-disciplinary pain service.

T. Cardiopulmonary Resuscitation

Objectives:

1. The resident will know:
 - Physiology of CPR
 - ACLS Protocol
 - Specific Algorithms
 - Current Controversies
 - Pharmacology of Resuscitation Drugs
 - Neonatal and Paediatric Resuscitation

U. Airway Management

The goals and objectives for this rotation are built upon the basic and clinical science objectives outlined for the Pulmonary Block lectures, and the Pulmonary Medicine rotation. Educational experiences for the resident will

include hands on skill, reading, and use of instructional videos. These opportunities may require residents to be more intentional in requesting room assignments from the OR Managers.

Goal:

The resident will be able assess the airway in the clinical spectrum of emergent and non-emergent situations, and have a variety of techniques to secure and protect it. The resident will show mastery in the decision and ability to secure the airway safely prior to inducing anaesthesia. The resident will know the ASA Airway Management Algorithm and use it as template to guide decisions in airway management.

Objectives:

1. The resident will know the anatomy of the airway (including the sensory and motor innervation), from the naso-hypopharynx to the third bronchial division. The resident will know in all age groups the typical distances from the nares to carina, incisors to carina, length of the trachea from glottis to carina, and the length of the mainstem bronchi.
2. The resident will describe the relevant anatomical considerations in performing nerve blocks of the airway, their safe administration and effects.
3. The resident will describe the physiologic responses to tracheal intubation and know strategies to attenuate these responses.
4. The resident will describe the pathophysiologic process of laryngospasm, be able to list the predisposing factors, and know how to deal with this situation when it arises.
5. The resident will indicate the physiologic consequences of converting from negative pressure to positive pressure ventilation.
6. The resident will know the anatomic and pathophysiologic conditions that predict difficulty in securing an airway and providing adequate ventilation. Given this clinical determination the resident will outline what further diagnostic modalities will define this perceived risk further.
7. The resident will know the common (Mallampati, Mallampati-Samsoon) scoring systems for grading difficult intubation, their weaknesses, limitations and predictive power.
8. The resident will recognize the clinical signs of airway obstruction in a spontaneously ventilating patient, state the complications of this, and outline a plan of management to relieve the obstruction.
9. The resident will understand and have strategies to address the risk of pulmonary aspiration to the airway and tracheobronchial tree, outline the pathophysiologic consequences of pulmonary aspiration, and state the treatment of acute and chronic pulmonary aspiration syndromes.
10. The resident will outline methods to confirm successful endotracheal intubation, and state the situations that compromise the reliability of each method.
11. The resident will describe the indications, contraindications and problems associated with the following common airway procurement strategies:
 - oral intubation
 - nasotracheal intubation
 - fibreoptic intubation
 - laryngeal mask and other airway assists
 - esophageal obturator airways
 - tracheostomies
 - jet ventilation (transtracheal and translaryngeal)
12. The resident will identify the common laryngoscope blades by name, their potential uses and limitations.

13. The resident will identify and select by size appropriate airway equipment including the commonly used tracheal and endobronchial tubes and blockers.
14. The resident will identify common adjunctive devices that can be used to assist in securing the difficult airway.
15. The resident will be knowledgeable with the following aspects of fiberoptic devices:
 - the physics involved in fiberoptic instruments
 - their design, construction and maintenance
 - preparation of the patient (psychological and pharmacologic) and fiberoptic device for intubation.
16. The resident will know how to assemble, insert and effectively ventilate via a transtracheal jet ventilation system and be aware of complications of this technique.
17. The resident will discuss the components of the rapid sequence induction, its contraindications and indications.
18. The resident will demonstrate correct use of and continued practice with:
 - oral and nasal intubation
 - COPA
 - insertion and use of the laryngeal mask airway
 - insertion of double lumen tubes
 - blind intubation techniques
 - inhalational inductions
 - techniques to secure the airway with the patient awake.
19. The resident will know when and how to manage extubation of the patient.
20. The resident will have knowledge of the different classifications of breathing circuits and will understand the flow characteristics necessary in ventilated and spontaneously breathing patients.
21. The resident will know how to manage an anesthetic for Laser surgery to the airway.

V. Community Anaesthesia

At the present time, community learning experiences may be set up in variety of locations. To meet the guidelines of the RCPS, clear objectives must be stated prior to individual site acceptance. In general the following objectives apply:

Objectives:

1. The resident will learn decision making in the absence of tertiary care technological resources.
2. The resident will practice autonomy with independent decision making in the absence of other medical specialty resource personnel.
3. The resident will be exposed to the evolution of common disease processes.
4. The resident will manage the diagnosis, treatment and outcome analysis of patients not normally seen in the tertiary care environment.
5. The resident will experience different departmental procedures, practices and policies.

W. Acute Problem Management and Emergency Procedures

Goal:

Given a patient who develops an acute anesthetic problem in the perioperative period, the resident will give a concise differential diagnosis and start appropriate therapy. The resident will provide appropriate follow up care.

Objectives:

The resident will manage:

- perioperative hypertension or hypotension
- perioperative cardiac arrhythmias
- anaphylaxis or anaphylactoid reactions
- laryngospasm
- regurgitation and aspiration of gastric contents
- malignant hyperthermia
- unrecognized difficult intubation
- perioperative hypoxemia and or hypercapnia
- perioperative oliguria or polyuria
- perioperative bronchospasm
- transfusion reactions
- disseminated bleeding
- air embolism
- coma
- complications of regional anaesthesia (including inadvertent intravascular or subarachnoid injections and postoperative neurological deficits)
- full stomach

The following examples outline the scope of the expected knowledge, skill and attitudes in some emergency situations.

1. Establishing and Maintenance of Airways

Example #1:

Goal:

Given a 65-year-old-male in the hospital for cholecystectomy who suddenly stops breathing and is cyanotic, the resident will establish and maintain an airway, recognize the cause, and restore normal respiratory function, if possible.

Objectives:

1. Describe the normal anatomy and physiology of the respiratory tract and respiration.
2. List three common causes of obstruction of the oropharynx, trachea, and larynx.
3. List the one most common cause of bronchial obstruction.
4. List four common causes of obstruction occurring in the bronchioles and alveoli.
5. List five clinical findings associated with respiratory arrest.
6. List the three critical clinical findings of respiratory obstruction.
7. List four categories of causes of respiratory arrest.
8. List, in order, the corrective steps for the treatment of acute respiratory obstruction.
9. Demonstrate ability to relieve respiratory obstruction, establish breathing with and without mechanical aids, and take corrective measures in the treatment of respiratory arrest.
10. Outline the further diagnostic studies indicated for evaluation of respiratory arrest.

Example #2:

Goals:

Given a 32-year-old patient, who, on the fourth postoperative day following a radical hysterectomy, complains of sudden onset of chest pain and dyspnea, the resident will be able to evaluate the patient properly to determine the diagnosis or differential diagnosis, provide immediate supportive care, institute further diagnostic measures, and carry out a plan for long-term management.

Objectives:

1. List the conditions or states that place a patient at high risk for the development of thromboembolism.
2. List the five most common symptoms associated with pulmonary embolism.
3. Discuss the common physical findings in patients with pulmonary embolism.
4. Discuss the usual findings of arterial blood gases, chest x-ray, ECG, lung scan, and pulmonary arteriogram in patients with pulmonary embolism.
5. Discuss the value of ultrasound and labeled fibrinogen scanning in localizing sites of thrombus formation.
6. List at least four other conditions that have clinical presentations similar to pulmonary embolism and discuss the differentiation of these conditions from one another.
7. Outline the necessary initial life-supporting measures to be employed in patients with pulmonary embolism.
8. Outline a program of long-term management of patients with pulmonary embolism, and describe methods of evaluating the patient's progress.
9. Discuss the indications for pulmonary embolectomy and for inferior vena cava ligation or placcation.
10. Describe the clinical and laboratory findings of pulmonary edema.
11. Outline a plan of initial and long-term management for a patient with pulmonary edema.
12. Describe the factors predisposing a patient to the development of pulmonary edema and discuss preventative measures that might be employed.
13. Differentiate between pulmonary thromboembolism and amniotic fluid embolism in terms of (a) patients at risk, (b) clinical presentation, (c) indicated diagnostic measures, (d) initial therapy, and (e) long-term management.

2. Cardiac Arrhythmias

Goal:

Given a patient who is suddenly pulseless or has an irregular pulse and chest pain or dyspnea, the resident will diagnose the problem and initiate appropriate emergency treatment.

Objectives:

1. Discuss the anatomy and physiology of SA and AV nodal activity, cardiac conduction mechanism, pumping action, oxygenation, elimination of CO₂, and central and peripheral nervous system control of respiration, blood pressure, and blood flow.
2. Discuss the use of the following drugs in cardiac emergencies, including indication, contraindication, side effects, dosages, and route of administration: lidocaine, atropine, epinephrine, sodium bicarbonate, digitalis, isoproterenol, calcium gluconate, and propranolol.
3. List the dangerous and potentially lethal cardiac arrhythmias, and demonstrate ability to diagnose each of them from ECG rhythm strip.
4. Discuss the use of mechanical and electrical aids to the circulatory system, including indications, technique, and mode of action for each.
5. Outline in flow-chart fashion the steps in cardiopulmonary resuscitation.
6. Discuss the indicated further studies to determine etiology of cardiac arrhythmias and life threats.
7. Demonstrate ability to diagnose acute myocardial infarction from ECG.

3. Coma

Goal:

Given a comatose patient, the resident will perform an appropriate physical examination, establish a working diagnosis, and initiate emergency treatment.

Objectives:

1. List five of the most common causes of coma.
2. Discuss the important historic, physical, and laboratory findings associated with each of the above causes of coma.

3. List the pertinent laboratory and other studies that should be obtained for evaluation of coma of unknown cause.
4. Outline the emergency treatment of each of the above causes of coma;
5. Demonstrate ability to establish appropriate life-support systems for the comatose patient.

4. Allergic Emergencies.

Goal:

Given a patient who has just received 5 million units of penicillin intravenously for treatment of pelvic abscess, and who shortly thereafter is noted to have a rash on the arms and face and difficulty in breathing, the resident will recognize the life-threatening aspects of this situation and institute therapeutic measures to treat this condition.

Objectives:

1. Define anaphylaxis and list the common clinical manifestations.
2. List the other associated alterations in physiology, for example, the effects on blood pressure, pulse, respirations, and circulation.
3. List the five most common causes of anaphylaxis.
4. Discuss the spectrum of allergic reactions, from the mildest to the life-threatening forms.
5. Differentiate anaphylactic shock from shock due to ruptured tuboovarian abscess and due to pulmonary embolism.
6. State the two most likely causes of death in such a patient.
7. List in order of importance the necessary steps in the management of this patient.
8. List three preventive measures that should be employed to reduce the likelihood of anaphylaxis.
9. List the three most commonly used drugs in the management of anaphylaxis, the indication for their use, the mechanism of action of each, dosage of each, side effects, and contraindications.

5. Drug Problems

Goal:

Given a 26 year-old gravida 2 para 1 female at approximately six months' gestation who arrives in the labor and delivery suite appearing alternately sedated, agitated, and disoriented, the resident will recognize and treat any life-threatening conditions, determine the etiology of the problem, and carry out acute and long-term treatment.

Objectives:

1. List five commonly abused classes of drugs and their effects on respiration, circulation, behavior, and the fetus. Include the variations of the same drug in different patients.
2. Describe the clinical syndrome of the newborn infant of a heroin addict.
3. List two medical conditions that may be confused with drug abuse and discuss the differentiation of these.
4. List in order of importance five life-threatening aspects of drug abuse.
5. Describe the evaluation of a drug-abuse patient.
6. Outline a treatment plan for drug abuse, including the known drug antagonists.

6. Emergency Procedures

Goal:

The resident will demonstrate competence in the performance and understanding of the emergency procedures listed below and list the indications, and contraindications for each. (Where patients are not available, simulation models are acceptable.)

- closed-chest massage
- endotracheal intubation
- cardiac electroconversion
- insertion of oropharyngeal airway
- intracardiac injection
- ECG rhythm strip interpretation
- venous cutdown
- bag and mask ventilation

- mouth-to-mouth resuscitation

X. Complications of Anaesthesia

Objectives:

The resident will know how to diagnose and manage anaesthesia complications such as:

1. CNS
 - awareness under anaesthesia
 - acute postoperative confusional state
 - CVA
 - hypoxic encephalopathy
2. Respiratory
 - upper airway
 - dental trauma
 - laryngospasm, laryngeal trauma, laryngeal edema
 - esophageal perforation
 - aspiration
 - negative pressure pulmonary edema
 - pneumothorax
3. CVS
 - myocardial ischemia and infarction
 - dysrhythmias
 - congestive heart failure
4. Miscellaneous
 - anaphylaxis
 - MH
 - halothane hepatitis
 - complications of positioning

Y. Crisis Resource Management

Objectives:

1. The resident will know:
 - Minimal monitoring standards
 - Anticipation of problems according to procedure, patient condition
2. The resident will be able to define the difference between emergent, urgent and elective cases, and communicate this.
3. The resident will be aware of the utilization of resources available in and outside OR
4. The resident will be aware of at least one model (eg. SRK model) of crisis resource management

Z. Consults and the Pre-anaesthesia Assessment Clinic (PAC)

General Objectives:

The resident will learn to:

7. Reduce patient perioperative morbidity by screening patient data and initiating further patient encounters / investigations as appropriate.
8. Perform preoperative anesthetic assessments with accurate assessments of the airway and cardiorespiratory systems.
9. Know the common anesthetic classification systems (i.e.) ASA status, NYHA, Mallampati, etc.
10. Address patient inquiries as to pertinent complications and risks of anaesthesia.
11. Appreciate the costs involved for preoperative consultation, testing and preparation for anaesthesia and be able to describe the key factors in the organization of an anaesthesia consult clinic..
12. Maintain a consultant and professional profile in the medical and public domains.

Specific Objectives:

The resident will:

15. Become proficient in airway evaluation including familiarity with common diagnostic imaging of the airway.
16. Improve skills at directed history and physical examination.
17. Develop communication skills in preoperative consultation to benefit the patient, the referring physician, and the consultant.
18. Identify patients who require further necessary preoperative preparation, consultant or investigation.
19. Appreciate the role of specialized cardiac investigation, their basic principles of interpretation and limitations, their cost and benefit.
20. Learn effective outpatient preparation strategies for surgical patients presenting with common medical problems such as asthma, diabetes mellitus, ischemic heart disease, etc.
21. Recognize the difficulties and limitations of screening patient problems.
22. Develop anesthetic management plans with consultant anaesthetists.
23. Inform patients as to the pain management services available to them.
24. Address the role and indications for common preoperative therapies (anxiolytics, bronchodilators, antisialagogues, steroids).
25. The resident will know the following when writing consultation notes:
 - appropriate organization
 - dissemination of information
 - advice/recommendations
 - format, length

Reviewed/Updated: February 2018

APPENDIX A: ANCILLARY OBJECTIVES OF THE POSTGRADUATE PROGRAM IN ANESTHESIOLOGY

Statistics

Given the ongoing nature of professional development, the resident will understand the basic concepts of statistical analysis and clinical design in order to assess and critically review the anesthetic literature.

Objectives

Gain an understanding of the basic concepts and methodology of statistical analysis and clinical study design.

The resident will assess and critically review clinical studies related to anesthesia:

- Achieve fluency with the concepts of:
 - Total population vs. sample population.
 - Types of clinical data: continuous, nominal, ordinal.
- Understand the meaning of:
 - central tendency - mean, median, mode
 - range, variance, standard deviation
 - sensitivity, specificity, incidence, prevalence
 - positive predictive value, negative predictive value, odds ratio, sample size analysis
 - Experimental Design: prospective, retrospective, randomization, protocol development
- Understand the derivation and limitations of simple probability statements.
- Appreciate the normal (Gaussian) distribution curve and:
 - Factors influencing its shape
 - central limit theorem
 - confidence intervals
 - standard error of the mean
- Study design.
 - concept of randomization
 - single and double blind studies
 - selection bias
 - confounding variables
 - null hypothesis
 - P-values
- Significance testing
 - T-test
 - chi-square tests
 - the appropriate tests as related to type of data
 - one-tail vs. two-tail testing
- linear regression and correlation

Critical Appraisal

The resident will develop skills to facilitate the critical review and acquisition of new information, and acquire the habit of continuous study.

Objectives

- evaluate one's own capabilities and limitations.
- demonstrate a desire for continuous improvement in areas of limitations.
- maintain an inquisitive attitude.
- appreciate the need for investing time and effort to expand knowledge and skills constantly.
- accept responsibility for participation in activities which further good patient care and are necessary for administration of patient care facilities.

The resident will have knowledge of the purpose of research and familiarity with the use of reference material in managing clinical problems.

Objectives

- list those parts of a journal article that should be skimmed to determine whether study in depth is appropriate.
- list indications for detailed study of the 'methods' section of a journal article.
- demonstrate ability for finding answers to questions via literature search and review.
- demonstrate ability to formulate a research plan to answer questions.

The resident will have a basic knowledge of statistics sufficient to draw appropriate inferences from presented data (e.g., journal articles).

Objectives

- define and differentiate between hypothetical and proven relationships among measurable variables.
- discriminate between measurable variables that are correlated and those that are causally linked, and give examples.
- explain what is meant by false correlation by virtue of mutually correlated variables.
- list and define measures of central tendency and variability.
- distinguish between continuous and discontinuous variable, and given an appropriate statistical test of significant difference for each type.
- discuss the of level of significance (p) and its proper use.

Ethics

Objectives

The resident will have sufficient knowledge of ethics to be able to discuss the basic principles of:

- Autonomy
- Beneficence
- Non-maleficence
- Justice

The resident will be able to define the following terms:

- Teleological
- Deontological

The resident will be able to discuss how to best resolve issues created when there is a conflict of interest between different ethical systems based on different cultural and religious values.

The resident will be able to discuss:

- the approach to discussing/framing an ethical argument.
- common areas of ethical conflict in anaesthesia such as:
 - duty to report colleagues
 - Informed consent
 - Surgical/anaesthetic patient refusal
 - Limited consent (models of autonomy vs beneficence) age (children) mental competence, substitute decision making
 - coercion vs persuasion
- Duty of Care:
 - the physician-patient "contract"
 - the patient dangerous to the physician (AIDS, Hep B, violence)
 - confidentiality
- Allocation of resource issues
- End of Life concerns:
 - Brain death
 - with-holding/withdrawing treatment
 - Advance Directives/Living Wills
 - no blood
 - DNR

- Research Ethics
 - Informed consent

Legal issues

Objectives

The resident will know the legal requirements concerning:

- Informed consent
 - Disclosure of risk
 - Laws re: consent
 - Substitute decision makers

The resident will understand what constitutes malpractice in Torts law. This will include the concept of duty of care and the definition of negligence.

The resident will know how to avoid law suits and how to handle the threat of a law suit including information about

- how CMPA works on a doctor's behalf
- the usual course of a law suit
- responsibility of the resident vs the staff anaesthetist
- what to do when the resident disagrees with the actions of the staff person

The resident will know the legal concerns re:

- Confidentiality
- Hospital bylaws
- Statutory reporting of diseases or malpractice

The resident will be familiar with the main concerns of the Coroners Act

Continuous quality improvement

Given a Department of Anaesthesia with no formal quality assurance/quality improvement programme, the resident will be able to create a system of quality monitoring and improvement for the department.

Objectives

The resident will define the components of Quality Assurance (Structure, Process and Outcome) and give specific examples of each.

The resident will be able to describe the applicability, advantages and disadvantages of the following methods of quality assurance: medical audit, utilization studies, post-mortem studies and peer review.

The resident will define the principles behind the terms Quality Improvement and Total Quality Management and will differentiate between these and Quality Assurance.

The resident will understand the reasons for failure of quality programmes and common problems associated with such programmes.

During his/her residency, the resident will have demonstrated first hand experience with two of the above methods (either as a Resident Day project or at Department Rounds).

The resident will describe the methods of technical Quality Control required in a large hospital anaesthetic department.

The resident will be able to describe the structure of a hospital QI plan, the function of the QI committee, the role of department head, and the role of individual department members.

Teaching and communication skills

Objectives: Teaching and Learning skills

Residents will participate in the TIPS course to learn how to improve their presentation skills while giving rounds (& larger lectures). They will be able to use Objectives and prepare better slides & overheads.

Residents will acquire knowledge of teaching principles through TIPS and by observation of the teaching techniques of the staff such that they can undertake one-to-one teaching with students and junior housestaff. Residents should gain experience with teaching small groups as well as learn how to give feedback. Residents are encouraged to begin to understand some of the principles of evaluation.

Learning skills must be developed during the residency that will lead to continuous learning (ongoing CME) after finishing a residency.

Residents must be familiar with the current efforts to show continued competence through programs administered by RCPSC and CPSO.

Residents should demonstrate an organized study pattern involving regular organized study & reading.

Residents should be familiar with conducting their own computerized literature searches.

Objectives: Communication skills

Residents should demonstrate during their daily interaction with patients that they are effective at communication with both patients and families. Residents should demonstrate effective interviewing techniques and information-giving skills.

Residents should be sensitive to determining how information is received when breaking bad news to patients.

The resident should be able to communicate effectively with colleagues, nurses, hospital employees and when necessary, convey a sense of urgency without causing a decompensating increase in tension in an urgent situation.

Residents should be able to manage disagreement when it exists between colleagues and co-workers by the effective use of feedback and communication skills.

Personal Attitudes and Ethics for the Resident and Practicing Anesthesiologist

The following objectives further clarify desirable attitudes and ethical stances found in anesthesiologists during their training and subsequently as independently practicing physicians.

Personal Feelings

The resident will relate to surgical patients in an understanding and empathic manner, respect their dignity and individuality, and accept them as participants in decisions regarding their medical care.

Objectives

- Identify any hostile or punitive feelings toward patients.
- Inquire about and recognize any personal reactions that may be detrimental to the doctor-patient relationship.
- Recognize that personal feelings may alter patient management.
- Explore and accept willingly possible ways of changing detrimental feelings.
- Be aware of one's own values and biases.
- Attempt to be objective and not impose personal biases and values on patients.

The resident will have an awareness of his own identity, capability and responsibility. This awareness will include the personal basis for career choice, rationale for future planning, both professionally and personally, and the significance of family obligation in those choices.

Professional Growth

The resident will accept personal responsibility for continued professional growth, develop skills to facilitate the critical review and acquisition of new information, and acquire the habit of continuous study.

Objectives

- Evaluate one's own capabilities and limitations.
- Demonstrate a desire for continuous improvement in areas of limitations.
- Maintain an inquisitive attitude.

- Appreciate the need for investing time and effort to expand knowledge and skills constantly.
- Accept responsibility for participation in activities which further good patient care and are necessary for administration of patient care facilities.

The resident will have knowledge of the purpose of research and familiarity with the use of reference material in managing clinical problems.

Objectives

- List those parts of a journal article that should be skimmed to determine whether study in depth is appropriate.
- List indications for detailed study of the "methods" section of a journal article.
- Demonstrate ability to find answers to questions via literature search and review.
- Demonstrate ability to formulate a research plan to answer questions.

The resident will have a basic knowledge of statistics sufficient to draw appropriate inferences from presented data (e.g., journal articles).

Objectives

- Define and differentiate between hypothetical and proven relationships among measurable variables.
- Differentiate between measurable variables that are correlated and those that are causally linked, and give examples.
- Explain what is meant by false correlation by virtue of mutually correlated variables.
- List and define measures of central tendency and variability.
- Distinguish between continuous and discontinuous variables, and give an appropriate statistical test of significant difference for each type.
- Discuss the meaning of level of significance (p) and its proper use.

Teaching Responsibilities

The resident will assume responsibility for teaching colleagues, including medical students and allied health personnel.

Objectives

- Accept the responsibilities of a teacher.
- Strive continuously to improve teaching skills.
- Use appropriate teaching methods.
- Maintain up-to-date medical information.

Interpersonal Communication Skills

The resident will establish effective interpersonal relationships with the patient, the patient's family, and other health personnel.

Objectives

- Establish and maintain rapport with patients and other involved persons by:
 - accepting diverse personalities, interests, and values;
 - taking time to listen, hear, and understand what the patient is feeling as well as what is being said;
 - being nonjudgmental concerning actions, plans and values that are different from one's own;
 - avoiding condescending and superior behaviours
- Be sensitive to patients' fears, anxieties, and needs for privacy.
- Explain in a clear and concise way:
 - diagnosis and management to the patient and family in language they understand;
 - management plans in a manner that motivates and facilitates patients' willing participation;
 - management plans to nurses and other members of the health care team in such a way as to insure their effective participation;
 - steps necessary for managing problems when serving as a consultant to another physician.

Ethics

The resident will demonstrate responsibility to the community to improve medicine through a personal example of professional excellence, self-discipline, and human concern, even at personal sacrifice.

Objectives

- Demonstrate personal responsibility to patients by availability, confidentiality, and respect for the patient's physical and emotional comfort.
- Demonstrate adherence to the best available practice, including referral to other qualified practitioners.
- Discuss the ethics of human experimentation, and discuss the resolution of conflict between research and the patient's interests.
- Demonstrate meticulous accuracy in reporting clinical and scientific information.
- Pursue measures to develop the highest quality of medical care commensurate with the circumstances of the environment.

The resident will state his position on an issue of medical ethics, explaining the physician's responsibilities as a passive observer of potential unethical practice or behavior, and explaining the physician's responsibilities when personally and directly involved in such a situation.

Objectives

- the aging physician and changing competence
- Discuss each of the following ethical situations with regard to the above statements:
 - the disabled physician
 - the incompetent anaesthetist

Team Participation

The resident will be aware that effective health care delivery requires the collaborative efforts of many health care professionals, including nurses, respiratory therapists, pharmacists, and support staff.

Objectives

- Demonstrate an understanding and respect for the roles and capabilities of other health care personnel in providing optimum medical care.
- Request and provide consultation when appropriate.
- Maintain open communication when appropriate.
- Function effectively as a team leader or team member, as the situation warrants.

Record System

The resident will develop a record-keeping system to assist with diagnosing medical problems, managing treatment, and assessing quality of care.

Objectives

- Demonstrate ability to record concisely significant findings on history and physical exam.
- Demonstrate clarity in problem formulation and planning management.
- Relate in the record the clinical rationale for requested laboratory procedures.
- Maintain a clear set of therapeutic objectives for the use of other members of the health care team.
- Demonstrate promptness in completing the record, including immediate dictation of operative and clinical discharge summaries.
- Recognize the importance of determining priority of effort with respect to a series of problems.
- Maintain an individual record of patient care and procedures for self evaluation and assistance in maintaining continuity of care.
- Use flow sheets and data summaries in complex multiple system problems.

Reviewed/Updated: February 2018