



CARDIAC ANESTHESIA BLOCK

THE ROYAL COLLEGE OF PHYSICIANS AND SURGEONS OF CANADA *Objectives of Training and Specialty Training Requirements in Anesthesia*

Specific Objectives in CanMEDS Format

OVERALL GOALS

Residents completing the cardiac subspecialty rotations should achieve competence in the management of routine anesthetic management of coronary bypass graft patients, valve replacement and/or repair (aortic, mitral), and aortic valve procedures. In addition, they should gain familiarity with complex cardiac cases involving patients with multiple comorbidities.

Clinical Faculty: Cardiac Anesthesiologists & Cardiac Surgeons.

Teaching Techniques: Teaching will be through direct clinical experience with consultant guidance during clinical work load. Residents are also invited to attend morning TEE rounds.

ROTATION OBJECTIVES

At the completion of training, the resident will have acquired the following competencies and will function effectively as:

Medical Expert

- The resident will demonstrate knowledge of the basic sciences as applied to the preoperative, intraoperative, and postoperative periods of cardiac surgery.

A. Physiology and Anatomy

The resident is expected to:

- Describe the normal coronary anatomy and variants, normal cardiac physiology, and the effects of disease states on the normal physiology.
- Describe the anatomy and physiology of cardiac valves, left ventricle, right ventricle, atrial, major cardiac vessels, and circulatory system in both normal and diseased states.
- Describe the normal conduction pathways of the heart and its clinical significance in disease.
- Describe the embryologic circulation, development of the heart, and fetal physiology as it applies to adult congenital heart disease.
- Describe the altered respiratory physiology of the immediately postoperative ventilated patient with significant surgical incisions and pain (sternotomy, large abdominal incision).

- Describe common physiological changes occurring in the postoperative period and the impact these have on end organ function (neurologic, renal, cardiac, hepatic, gastro-intestinal).

B. Pharmacology

The resident should know:

- Commonly prescribed medications for cardiac surgical patients, the implications for disease, and the impact on anesthetic management.
- Commonly used cardiac anesthetics and dosages.
- Heparin, antiplatelet agents, and anesthetic implications.
- Protamine for heparin reversal, along with side effects and complications.
- Antifibrinolytic agents, mechanisms of action, and indications.
- The use of blood products (PRBC, FFP, platelets, cryoprecipitate) and blood alternatives (albumin, starch) as well as transfusion reactions and complications.
- Coagulation drugs currently available (DDAVP, activated factor 7a) their indications, contraindications, dosages, and complications.
- Commonly used vasodilators, vasoconstrictors, inotropic agents, and their indications, dosages, and side effects.
- The appropriate use of pain medications, non-steroidal anti-inflammatory drugs and regional anesthetic techniques in cardiac surgical patients.
- Pharmacology of perioperative risk reduction strategies (lipid lowering agents, β -blocker's, aspirin).

C. Monitoring

The resident will:

- Be able to interpret ECG for ischemia, infarction, arrhythmias, and paced rhythms. They will recognize the limitations and the sensitivity/specificity of ECG as an ischemia monitor.
- Demonstrate principals of non-invasive and invasive BP monitoring and its pitfalls.
- Acquire skills of arterial and central venous cannulation (with ultrasound), peripheral venous cannulation, and pulmonary artery catheterization. Interpret CVP and data from PA catheter (PAP, PCWP, Cardiac output) and know its indications, complications, and management.
- Know basics of introductory TEE, including techniques of probe insertion and several basic views, and its implication and application to the critical care patient.
- Understand laboratory monitoring of the coagulation system (PTT, INR, fibrinogen), as applied to the cardiac patient.

- Have the ability to assess the adequacy of mechanical ventilation using clinical parameters (PT size & weight, peak & plateau ventilatory pressures, mode of ventilation in conjunction with patient LOC, tidal volume, rate) and laboratory arterial blood gas analysis.
- Recognize the parameters used to assess intraoperative blood loss and options to treat blood loss including medical and surgical alternatives.
- Know the significance of temperature management in the intraoperative period, including hypothermic techniques and the importance of normothermia during beating heart procedures.
- Appreciate the indicators of volume status, especially when weaning from bypass, and including the findings from invasive monitors, TEE, and clinical indicators (urine volume).
- Utilize appropriate intraoperative blood work for the management of patient care.
- Have an awareness of new monitoring devices (non-invasive CO, BIS, NIRS) and potential applications during cardiac surgery.

D. Clinical Assessment & Management

The resident will:

- Be able to complete a detailed history, physical exam, order appropriate laboratory and ancillary investigations, and provide a management plan for a cardiac surgical patient.
- Know current indications and recommendations for SBE prophylaxis.
- Be able to manage medical bleeding.
- Be able to correct common derangements in metabolic and electrolyte disturbances in the intraoperative period.
- Know the basic principles of cardiac support devices including IABP and extracorporeal membrane oxygenation.
- Know the common pathophysiology and management of patients with complications of:
 - Coronary artery disease, acute myocardial ischemia and infarction, complications of myocardial infarction and thrombolytic therapy
 - Valvular heart disease and valve replacement or repair
 - Aortic dissection, thoracic and thoracoabdominal aortic aneurysm
 - Shock and the use of volume resuscitation, venodilators/constrictors, inotropes, and lusiotropes
 - Emergencies requiring ACLS
 - Cardiac tamponade, constrictive pericarditis

- Dilated, restrictive and obstructive cardiomyopathy (IHSS), CHF, and diastolic dysfunction
- Aberrant conduction, dysrhythmia, sudden acute and sub-acute ventricular and supra-ventricular arrhythmia
- Pacemakers and the indications for and applications of the various modes of temporary pacing
- Pneumothorax
- Pulmonary edema, Pneumonia, CHF
- COPD, asthma, sleep apnea in the ventilated patient
- Heparin induced thrombocytopenia and heparin resistance
- Neurologic risk stratification during CPB procedures
- Renal failure and its management
- Diabetes and endocrine control, and the implications of hyperglycemia

Communicator

The resident will:

- Demonstrate effective communication with patients and families (description of procedures, informed consent, anesthetic options and risks).
- Demonstrate effective communication with OR team (cardiac surgeons, nurses and perfusionists) and postoperative team (CSRU). Particularly during the initiation conduct and removal of cardiopulmonary bypass.
- Provide clear and concise written consultation and anesthetic records.

Collaborator

The resident will:

- Recognize the need to utilize other specialists for the care and management of the critical patient.
- Foster healthy team relationships.

Leader

The resident will:

- Manage OR time by efficiently conducting the anesthetic, continuing education, and personal activities.
- Make effective use of health care resources.



Health Advocate

The resident will:

- Demonstrate the use of risk reduction strategies, including use of ultrasound and sterile technique for invasive lines.

Scholar

The resident will:

- Demonstrate commitment to continuing personal education including use of information technology.
- Be able to critically review cardiac anesthesia literature and describe the principles of research relevant to this population.
- Assist in education of other members of the OR team.

Professional

Residents must:

- Always demonstrate respectful and compassionate behavior toward patients, their families, and other health care providers.
- Demonstrate an appropriate sense of responsibility to themselves and their patients.
- Remain calm and organized in stressful or emergency situations.
- Demonstrate appropriate interactions with colleagues and staff.

Evaluation

There will be an individual interview with the block coordinator at the end of the rotation.

Resident feedback is used to improve teaching techniques and rotation specific objectives.

READING LIST

Textbooks:

1. Miller's Text Book of Anesthesia 7th edition. Chapter 60 Churchill Livingstone Elsevier. Philadelphia PA.
2. Barash's, Clinical Anesthesia 6th edition. Chapter 41 Wolters Kluwer Philadelphia PA.
3. Kaplan, 5th edition. Saunders Elsevier. Philadelphia PA. Chapter 5, 11, 14,19, 20, 28,31.

Systematic Reviews:

4. Wang G, Bainbridge D, Martin J, Cheng D. The efficacy of an intraoperative cell saver during cardiac surgery: a meta-analysis of randomized trials. Anesth Analg 2009;109:320-30.
5. Liakopoulos OJ, Choi YH, Kuhn EW, Wittwer T, Borys M, Madershahian N, Wassmer G, Wahlers T. Statins for prevention of atrial fibrillation after cardiac surgery: a systematic literature review. J Thorac Cardiovasc Surg 2009;138:678-86 e1.

6. Griesdale DE, de Souza RJ, van Dam RM, Heyland DK, Cook DJ, Malhotra A, Dhaliwal R, Henderson WR, Chittock DR, Finfer S, Talmor D. Intensive insulin therapy and mortality among critically ill patients: a meta-analysis including NICE-SUGAR study data. *CMAJ* 2009;180:821-7.
7. Wiener RS, Wiener DC, Larson RJ. Benefits and risks of tight glucose control in critically ill adults: a meta-analysis. *JAMA* 2008;300:933-44.
8. Landoni G, Biondi-Zoccai GG, Zangrillo A, Bignami E, D'Avolio S, Marchetti C, Calabro MG, Fochi O, Guarracino F, Tritapepe L, De Hert S, Torri G. Desflurane and sevoflurane in cardiac surgery: a meta-analysis of randomized clinical trials. *J Cardiothorac Vasc Anesth* 2007;21:502-11.
9. Ho KM, Sheridan DJ. Meta-analysis of frusemide to prevent or treat acute renal failure. *Bmj* 2006;333:420.
10. Friedrich JO, Adhikari N, Herridge MS, Beyene J. Meta-analysis: low-dose dopamine increases urine output but does not prevent renal dysfunction or death. *Ann Intern Med* 2005;142:510-24.
11. Fergusson D, Glass KC, Hutton B, Shapiro S. Randomized controlled trials of aprotinin in cardiac surgery: could clinical equipoise have stopped the bleeding? *Clin Trials* 2005;2:218-29; discussion 29-32.
12. Cheng DC, Bainbridge D, Martin JE, Novick RJ. Does Off-pump Coronary Artery Bypass Reduce Mortality, Morbidity, and Resource Utilization When Compared with Conventional Coronary Artery Bypass? A Meta- analysis of Randomized Trials. *Anesthesiology* 2005;102:188-203.

Updated: June 2013, Dr. Granton