MODULE 5
Anaesthesia for Cardiac, Thoracic and Vascular Surgery

Duration required: A minimum 50 sessions (½ days) of cardiothoracic and 20 sessions of vascular anaesthesia experience is required — TE10 (2003) Recommendations for Vocational Training Programs

Trainee’s Aims

In Module 5 clinical experience is gained from anaesthesia for cardiac, thoracic and vascular surgery.

The aim of Module 5 is for Trainees to acquire a series of clinical abilities and skills in the perioperative care of patients undergoing such surgery. These include conducting or assisting in anaesthesia and perioperative care for:

• Surgery on the heart, coronary arteries and cardiac valves
• Surgery on great vessels
• Procedures requiring anaesthesia in cardiac catheterisation labs (paediatric and adult)
• Cardioversion
• Bronchoscopy
• Surgery on the lung, mediastinum, oesophagus and trachea
• Peripheral vascular surgery

Learning Objectives

These are what the Trainee needs to learn. They are presented as:

• Knowledge
• Clinical management (“knows how”) that applies knowledge and clinical skills to manage the patient
• Skills (clinical and technical)
• Attitudes and behaviours

Knowledge — Basic Sciences

Trainees are required to revise the relevant subjects in the Basic Sciences as set out in the ANZCA document Syllabus for the Basic Sciences in Anaesthesia and Intensive Care (1st edition 1995), and as updated on the ANZCA website. Trainees are expected to apply Basic Science principles in clinical practice.

Basic science subjects relevant to this Module include the following.

Respiratory Physiology

- Anatomy of the respiratory system
- Control of respiration
- Mechanics of breathing
- Pulmonary gas volumes and ventilation
- Diffusive transfer of respiratory gases
- Ventilation - perfusion inequalities
- Gas transport in the blood
- Pulmonary circulation
Cardiovascular Physiology

- Structure and function of the heart
- Electrical properties of the heart
- Determinants and control of cardiac output
- Peripheral vascular system
- Control of circulation
- Regional circulation

Anatomy of the Heart

Anatomy of the Great Vessels

Pharmacology of Cardiovascular Drugs

Effects of Anaesthetic Drugs on the Cardiovascular and Respiratory Systems

Knowledge — Clinical Measurement, Monitoring and Special Devices

Trainees are required to review relevant clinical measurement subjects in Module 1, understand the principles involved in the measurement of cardiac variables, and equipment and monitoring in cardiac, thoracic and vascular anaesthesia. Knowledge is expected in the principles, role, complications and function of:

- Cardiac pacemakers, internal and external
- Circulatory assist devices
- Intra-aortic balloon counter pulsation
- Cardiac output measurement
- Myocardial ischaemia monitoring
- Central venous pressure measurement
- Pulmonary artery pressure measurement
- Direct intra-arterial pressure measurements
- Trans-oesophageal echo examinations
- Cardiopulmonary bypass and extracorporeal membrane oxygenation (ECMO)
- Cardiac defibrillators, including implant devices

Knowledge — Education and Self-Development

Trainees are required to understand the education and self development principles learned during Modules 1, 2 and 3, especially those of adult learning, self directed learning, and lifelong learning and maintain their Learning Portfolio.

Clinical Management

Trainees are expected to understand relevant principles, apply knowledge in practice, and demonstrate abilities in cardiac, thoracic and vascular anaesthesia. These include the following.

Professional Practice

- Compliance with relevant policies, recommendations, and guidelines in professional practice as contained in ANZCA professional documents (see Appendix)
- Understanding of the organisation of an anaesthesia service for cardiothoracic surgery
Cardiac Evaluation

- Assessment for cardiac and non-cardiac surgery
- Pathophysiology, investigation, diagnosis, anaesthesia implications, and management of:
  - Ischaemic heart disease
  - Congenital heart disease

Anaesthesia and Perioperative Care (including Analgesia) for Patients with Cardiac and Vascular Disease for Non-cardiac Surgery

- Understanding the principles of anaesthesia and perioperative care for patients with:
  - Recent myocardial infarction
  - Ischaemic heart disease
  - Cardiac valvular lesions
  - Congenital heart disease, corrected and uncorrected
  - Hypertensive disease
  - Cardiac arrhythmias
  - Other acquired diseases, eg, myxomas, cardiomyopathies
  - Cerebrovascular disease
  - Peripheral vascular disease

Anaesthesia for Cardiac Surgery

- Understanding the anaesthesia, complications and perioperative care (including analgesia) of:
  - Coronary revascularisation with/without cardiopulmonary bypass
  - Valvular repair or replacement
  - Emergency cardiac surgery
  - Cardioversion
  - Procedures in the cardiac catheterisation laboratory
  - Electrophysiological procedures
  - Congenital heart disease surgery (paediatric and adult)
  - Procedures on the great vessels, eg, for aortic dissection
  - Heart or heart/lung transplantation

Anaesthesia for Vascular Surgery

- Understanding the anaesthesia, complications and perioperative care (including analgesia) of:
  - Surgery on the vessels supplying the head and neck
  - Surgery on the abdominal vessels
  - Surgery on the limb vessels
  - Minimally invasive procedures on the vessels (eg, intraluminal stenting)
  - Procedures on the vessels (eg, intraluminal stenting)

- Myocardial protection
- Cerebral protection
- Spinal cord protection
- Blood coagulation and anticoagulation
- Perioperative arrhythmias
- Poor cardiac output states
- Temperature management (including deep hypothermic circulatory arrest)
- Cardiopulmonary bypass including weaning from bypass and ECMO
- Cross-clamping of the aorta
Anaesthesia for Organ Transplantation

- Anaesthesia for organ transplantation including:
  - Legal and ethical considerations of organ harvesting and transplantation

Anaesthesia for Patients with Pulmonary Disease

- Reviewing and integrating with patient care:
  - Respiratory physiology
  - Chronic respiratory disease, pathophysiology, diagnosis and management

Anaesthesia and Perioperative Care (including Analgesia) for Thoracic Surgery

- Preoperative assessment for fitness for lung surgery and one-lung ventilation
- Understanding the principles, applied basic sciences, and management of anaesthesia and perioperative care for:
  - Thoracotomy and
    - Lung resection, including pneumonectomy and lung reduction surgery
    - Mediastinal mass resection
    - Oesophageal surgery
    - Surgery on the thoracic aorta
  - One-lung anaesthesia, including management of hypoxia and ventilation
  - Differential lung ventilation
  - Tracheal and bronchial surgery (including use of lasers and stents)
  - Thoracoscopic procedures
- Management of problems or critical events such as:
  - Bronchoscopy, including removal of foreign body
  - Mediastinoscopy
  - Lung or heart/lung transplantation
  - Fluid management post-pneumonectomy
  - Cardiac herniation post-pneumonectomy
  - Bronchopleural fistula
  - Lung bullae and cysts
  - Tension pneumothorax
  - Superior vena cava obstruction
  - Empyema
  - Understanding the types and uses of endotracheal, double-lumen, and endobronchial tubes and bronchial blockers
  - Understanding chest tube drainage systems and suction
Skills — Clinical Skills

In this Module, Trainees will provide safe anaesthesia for cardiac, thoracic and vascular surgery. Trainees will revise pre-assessment skills, including taking an appropriate history and performing an appropriate physical examination (including airway assessment, cardiovascular, respiratory and neurological examinations) to assess the patient’s status.

Technical skills in which Trainees should be competent include the following.

- Skills learned in Modules 1 and 2
- Fibreoptic bronchoscopy
- Placement and use of vascular monitoring lines (arterial, central venous, pulmonary artery, and femoral and neck vessels)
- Basic trans-oesophageal echo examinations (subject to local practices)
- Use of cardiac pacemakers
- Use of epidural analgesia, intercostal nerve blocks and other regional techniques for managing postoperative pain
- Placement of endobronchial tubes and blockers
- Use of bougies and tube exchangers
- Interpretation of ECGs and ECG monitoring
- Interpretation of chest x-rays and common chest CT and MRI imaging films
- Assistance with cardiopulmonary bypass
- Placement and care of chest drains and appropriate use of suction

Skills — Educational Skills

Trainees are expected to build on the educational skills in Modules 1 to 3 and develop the following:

- A review of their personal learning plan as specified in their Learning Portfolio
- Identification of the factors that lead to deviation from the original learning plan
- A learning plan in the Learning Portfolio in which basic science teaching is linked to clinical practice

The Trainee should acquire the following core skills.

During Basic Training

- Maintaining a Learning Portfolio
- Developing a study plan for the rest of the training period
- Reviewing study plans and correcting for deviations (e.g., catching up on deficient knowledge or experience)
- Reflecting on previous learning experiences with the aid of the Learning Portfolio
- Linking basic science teaching with clinical practice
- Studying effectively
- Participating in small-group learning and educational activities
- Being aware of decision-making processes
- Managing time effectively for study, work and home/leisure
- Giving and receiving feedback
- Developing insight into personal limitations
- Using the Internet including email
- Conducting and appraising literature searches
- Appraising journal articles including the application of statistics
- Carrying out oral presentations and professional communication. Specific skills in communication are outlined in Modules 2, 11 and 12
During Advanced Training

- Reviewing study plans and correcting for deviations (e.g., catching up on deficient knowledge or experience)
- Reflecting on previous learning experiences with the aid of the Learning Portfolio
- Comprehending how decisions are made
- Determining what information should be accepted or rejected in decision-making
- Determining the value of information from various sources and the importance of cross validation
- Assessing professional performance
- Conducting and appraising literature searches
- Appraising journal articles including the application of statistics
- Applying the principles of evidence-based medicine to clinical practice
- Carrying out oral presentations and professional communication. Specific skills in communication are outlined in Modules 2, 11 and 12
- Presenting quality assurance exercises or projects
- Developing facilitation skills, such as tutoring in small-group learning and conducting small-group meetings

Attitudes and Behaviours

Trainees are expected to develop the attitudes and behaviours which are obligatory in specialist medical practice.

Core attitudes and behaviours that Trainees must cultivate during the whole period of FANZCA training include the following.

Specialist Practice

- To attain the attributes of a specialist as a:
  - Medical expert
  - Communicator
  - Collaborator
  - Manager
  - Health advocate
  - Scholar and teacher
  - Professional
- To practise good communication with colleagues, patients and others
- To work as a member of a team, but to assume responsibilities and/or delegate duties as a team leader when necessary
- To commit to, and believe in, a culture of safety and ethical, high quality care
- To accept that medical knowledge and skills are not the only requirements of specialist practice
- To be aware of medicolegal obligations relating to medical practice
- To have insight into one’s own limitations, abilities and areas of expertise
- To commit to lifelong continuing professional development

Professionalism and Ethics

To commit to, and believe in the ethical and professional principles of:

- Altruism: the best care for the patient must be the principal driving force of practice
- Patient autonomy: patients’ ability to determine their treatment
- Beneficence: the principle of “doing good” to patients
- Non-maleficence: the principle of not doing harm to patients
• Fidelity: faithfulness to one's duties and obligations. This principle underlies excellence in patient care, confidentiality, telling the truth, a commitment to continuing professional development and lifelong learning, and not to neglect patient care
• Social justice: the right of all patients to be fairly treated
• Utility: the principle of doing the most good for the greatest number of people
• Duty to oneself in terms of personal health care and maintenance of competence to practise
• Accountability: the anaesthetist is responsible for his/her actions
• Honour and integrity in all conduct, including the generation and use of resources
• Respect for others, including a responsibility to work as a team and to practise conflict resolution
• Appropriate response to clinical error

Patient Considerations
To commit to, and believe in, the rights of patients with respect to:
• Autonomy
• Confidentiality of the doctor-patient relationship
• Appropriate, excellent clinical care, including preoperative assessment
• Informed consent
• Comprehension of the risks of anaesthesia techniques
• Appropriate care irrespective of race, culture, gender and socio-economic status

Research Considerations
• To value rigorous educational and scientific processes
• To distinguish between practice with a sound scientific basis and that which requires further objective assessment
• To commit to the ethical principles of research

Assessment
The Module 5 Supervisor will validate the Trainee’s completion of the module in accordance with the process outlined in College Professional Document TE2. This will involve the Trainee assessing whether she/he has achieved the core aims (Trainee’s aims) of the module and fulfilled the minimum clinical experience. The Module 5 Supervisor will review the Trainee’s Learning Portfolio as part of this assessment.

The Supervisor of Training and other Consultants will evaluate the Trainee’s overall performance in the In-Training Assessment (ITA) process. Aspects of clinical performance, education skills and attitudes will be reviewed. The ITA will remain a formative assessment conducted every six months, independent of Module assessment.

The Primary and Final Examinations will be summative assessments of the Trainee. Knowledge of basic sciences, clinical measurement and monitoring in Module 5 will be assessed in the Primary Examination. Clinical management and clinical skills in this Module will be assessed in the Final Examination.

The Learning Portfolio is an integral tool for self-assessment (as well as for recording clinical experience and developing study plans). The Trainee is expected to self-evaluate his/her education skills and learning experience from the Learning Portfolio. For example, the Learning Portfolio should show the Trainee’s progress through the Module, as records of clinical experience (sessions), technical skills learned, topics reviewed and oral presentations delivered.