



R E G U L A T I O N S

FOR ADMISSION TO THE FELLOWSHIP OF

THE COLLEGE OF CARDIOTHORACIC SURGEONS OF SOUTH AFRICA

FC Cardio(SA)

The examination comprises Primary, Intermediate and Final: The Final must be passed within six years of passing the Intermediate.

1.0 PURPOSE OF ASSESSMENT

This examination tests the candidate's knowledge of the principles and practice of Cardiothoracic Surgery encompassing surgery for acquired cardiovascular disease, surgery for congenital cardiovascular disease and general thoracic surgery including operative surgery and the applied basic sciences in order to determine suitability for autonomous practice as a cardiothoracic surgeon.

The aim of this qualification is to meet the needs for formal examination certification, as well as to set standards, nationally, for such a qualification.

This qualification forms part of a process to accredit medical practitioners, as specialists in Cardiothoracic Surgery. The Health Professions Council of South Africa (HPCSA) stipulates training requirements, including a minimum period of experiential learning. It is usual for the examination to be taken and passed prior to the completion of the required period of supervised learning specified by the HPCSA.

2.0 ADMISSION TO THE EXAMINATION

(read in conjunction with the Instructions for Admission to CMSA Examinations) Website link

2.1 PRIMARY (Extracted from the College of Surgeons(SA))

2.1.1 A candidate for the Primary examination must hold a post-internship qualification to practice medicine which has been registered or is registrable with the Health Professions Council of South Africa

2.1.2 The General Surgical Primary examination is used for candidates wishing to proceed to other surgical specialities. The rules of the other surgical specialties vary and it is incumbent on prospective candidates to check the appropriate college's regulations before applying for admission to the general surgical primary examination.

2.2 INTERMEDIATE (Extracted from College of Surgeons(SA))

A candidate may be admitted to the Intermediate examination having:

- 2.2.1 passed the Primary
- 2.2.2 completed not less than 12 months of approved training, as a registered medical practitioner, in surgery.

Of the 12 months training called for, not less than 6 months must be spent in general surgery, not less than 3 months must be spent in ICU and not less than 3 months in trauma/emergency surgery.

2.2.3 **NOTE:**

3.2.4.1 The Primary and Intermediate examinations may be attempted concurrently with the proviso that if the Primary is failed and the Intermediate passed, no credit will be given for passing the Intermediate which will have to be retaken

3.2.4.2 The CMSA Senate, through its Examinations and Credentials Committee, will review all applications for admission to the examination and may also review the professional and ethical standing of candidates

2.3 **FINAL**

A candidate may be admitted to the Final examination having:

- 2.3.1 Passed the Primary and the Intermediate examinations. Intermediate examinations have an expiry date of 6 years, after which it is invalid and has to be rewritten before a candidate may apply to sit the College Final
- 2.3.2 The completed Fellowship of one of the Colleges with which there is an agreement of reciprocity. In the case of foreign supernumerary registrars, a general surgery fellowship or degree registrable in the candidate's country of origin could be considered as a waiver of the requirement for the primary and intermediate examinations of the College of Surgeons at the discretion of the College of Cardiothoracic Surgeons Council.

This must be applied for and is not automatic.

- 2.3.3 Produced evidence of having
 - 2.3.3.1 been qualified to practice for a period of not less than six years (years of internship and community service NOT to form part of this period)
 - 2.3.3.2 served a period of not less than four years registrar training in cardiothoracic surgery. This period can form part of the six years called for in 3.3.2.1 above, but is additional to the training called for in paragraph 3.2.2
- 2.3.4 All applications (including those from previously unsuccessful candidates) must include a current letter from the Head of the Academic unit to confirm eligibility to sit the FC Cardio(SA) Final examination. Additionally, an updated version of the portfolio of learning must also be appended to each application so that the current convenor can assess it. It is recommended that all candidates entering into their registrar training from 1 January 2019 use the LogBox online portfolio. This is a free service and the app is available in both Apple and Android format. Please register at www.logbox.co.za.¹
- 2.3.5 Candidates applying to write the FC Cardio(SA) Final examination will need to have a minimum of 75 cardiac cases as primary surgeon.² The cases will need to include a reasonable mix of cardiac cases to include coronary artery surgery, valvular heart surgery, congenital heart surgery and other. The convenor and moderator of the relevant examination for which the candidate is applying will evaluate their portfolio, which will be rejected if it reflects insufficient surgical or other experience. In this case the examination fee paid will be refunded or held by the College towards a future examination.

In the interest of allowing candidates to be able to complete their portfolios to the approximate international standards, we are extending the time period for them to reach the standard as per our current regulations. These numbers were first published with effect from 1 January 2014 and therefore candidates who started their training prior to this date will be given leeway to be able to submit their logbooks with the previous minimum of 55 cardiac surgical cases. Candidates who entered into their training after 1 January 2014 will have to meet the minimum requirement of 75 cardiac cases.

All future .../

¹ LogBox recommendation effective for new Registrars – 1 January 2019

² Application rule for candidates starting their registrar training on or after 1 January 2014

All future candidates reapplying for the FC Cardio final exams need to have their logbooks submitted prior to each examination as the logbooks need to be seen again by the next convenor.

2.3.6 Criteria for minimum operative experience in general thoracic surgery for entry to the FC Cardio(SA) Final examination³

Operation/procedure	Assistant	1 st Surgeon
Bronchoscopy (+/- endobronchial procedure)	10	20
Oesophagoscopy (+/- dilation and +/- stent)	10	20
Tracheostomy (includes T tubes)	5	5
Thoracotomy	5	10
Lung resections (15 as 1st surgeon)		
Lobectomy	5	5
Pneumonectomy	5	5
Wedge resections	5	5
Pleural space (30 as 1st surgeon)		
Drainage of empyema or pleural clear out following trauma	5	10
Decortication	5	10
Fenestration	5	10
Pleurectomy (VATS and Open)	5	10
VATS minors (pleural or lung biopsy and pleurodesis)	5	10
Mediastinal masses	5	5
Major oesophageal (oesophagectomy, exteriorisation, repair of rupture)	5	5
Chest wall (resection of primary tumour, reconstruction, pectus)	5	5
Totals (320)	85	135

2.3.7 Training is valid for a period of four (4) years from the date of completion in a numbered speciality training post. In exceptional circumstances candidates who do not successfully complete the examination within this period may motivate, with support from their HOD, to the College of Cardiothoracic Surgeons for a once off extension.⁴

3.0 FORMAT OF THE EXAMINATION

PRIMARY

3.1 Two 3-hour papers of MCQs and/or short written questions on the basic sciences. The multiple-choice questions may include multiple true false, choose the best option and extended matching questions.

3.1.1 The Marking Regulation for the FCS(SA) Primary is:

- None to all the responses/detractors in a MCQ may be correct
- In order to pass the primary examination a candidate must achieve an average of 50% or more for both papers (sub-minimum of 40% for each paper)

INTERMEDIATE.../

³ criteria for minimum requirements for eligibility effective FS 2020

⁴ Expiry of training effective SS 2018

INTERMEDIATE

- 3.2 The examination comprises:
Two 3-hour papers consisting of MCQ questions on the principles of surgery in general and of surgical disciplines respectively. The multiple-choice questions may include, choose the best option and extended matching questions

3.3 **Marking Regulations for the Intermediate examination:**

In order to pass the intermediate examination a candidate must achieve an average of 50%⁵ for each of the two papers. Rounding up of the marks will not be performed. An acceptable internationally referenced standard setting process will be in place, **Effective from the FS 2018**

FINAL3.3 **FORMATIVE (IN-COURSE OR IN-TRAINING) ASSESSMENT**

An evaluation of the training will be held 6 monthly, comprising an oral assessment of theoretical knowledge and clinical acumen as well as a written examination consisting of MCQ's, short questions and an OSCE. The outcome of this assessment will be recorded formally. Skills and attitudes will be observed and noted prospectively during the registrar's training. (There is at present no consensus on the contribution that the formative assessment will make to the Final/Summative examination).

3.4 **SUMMATIVE ASSESSMENT**

This is essentially the Final Fellowship examination for the FC Cardio(SA)

Written Examination:

- 3.4.1 This is an online examination of two 4-hour written papers, each consisting of 3 questions to assess the core knowledge detailed in the syllabus. Each question should be sub-divided into sections that are unrelated.

3.4.1.1 Each paper will be 3 hours and 45 minutes, with a 15 minute comfort break, thus providing the candidate a 4 hour period of time to complete the paper. It is compulsory to answer all questions.

3.4.1.2 The paper will be written on computer and not by hand, and hence the longer time allowance. This intends to eliminate the "rush factor" which does not add anything helpful in written examinations.

3.4.1.3 There will be 4 subsections to each question. Each subsection will count for 10 marks.

- e.g. Question 1
a) 10 marks
b) 10 marks
c) 10 marks
d) 10 marks

3.4.1.4 The questions will be read off the computer screen and no hard paper copies will be provided. The computer program provide the candidate an overall view of the whole paper at the beginning.

3.4.1.5 The format of the short answer questions will be delivered in this format until MCQ's are introduced. *N.B. No MCQ's will be introduced in the 2022 examinations.*

3.4.1.6 The total marks for each paper will be 120 marks. Sub minimums apply, i.e. each paper has to be passed independently in order to be successful in the examination.

3.4.2 **Examination Terminology:**

It is important to understand the meaning of certain key words so as to interpret a question correctly. The following terms are often used in examination papers:

3.4.3 **Name / mention / list**

Only state the facts without describing or discussing them further

3.4.4 **Describe**

Simply record how you see a particular phenomenon

The terms **state, sum-up, review, sketch** have more or less the same meaning as describe but place more emphasis on a brief condensed statement. The instruction give an exposition, is similar to describe except that here a full structure is expected, that is, a point of view

3.4.5.../

⁵ New Pass criteria effective FS 2018

3.4.5 **Discuss**

This is a more comprehensive term than describe and contains 2 elements, namely:

- Describe
- The element of analysis and/or evaluation/judgement

Discuss, therefore, is a comprehensive term and includes terms such as **compare, analyse, explain, motivate, elucidate, justify** and **evaluate**

3.4.6 **Compare**

Here emphasis is placed on 2 phenomena that must be related to one another by highlighting their similarities and differences

3.4.7 **Motivate/justify**

The emphasis is placed here on the reasons for a particular decision or point of view. Once again there should be a certain degree of elaboration, but the main emphasis lies on the analysis of the motives/reasons, why, for example you would use a certain method or why you support or reject a certain viewpoint

3.4.8 **Evaluate**

Here you should judge or assess a statement or problem. You must express an opinion and state reasons substantiating your opinion

3.4.9 **Format of the written examination:**

3.4.9.1 Paper I – Cardiovascular Surgery (4 hours) (sub-minimum 50%)

Question 1 Acquired Cardiovascular Surgery

- a.
- b.
- c.
- d.

Question 2 Acquired Cardiovascular Surgery

- a.
- b.
- c.
- d.

Question 3 Congenital Cardiovascular Surgery

- a.
- b.
- c.
- d.

NB: The terms Acquired and Congenital are used rather than Adult and Paediatric Cardiac Surgery to avoid ambiguity.

3.4.9.2 Paper II – General Thoracic Surgery (4 hours) (sub-minimum 50%)

Question 1, 2, 3 General Thoracic Surgery

- a.
- b.
- c.
- d.

In order to pass the written examination and to be invited to the oral/clinical/practical examination a candidate must concurrently achieve a sub-minimum of 50% in each paper.

3.5 CLINICAL EXAMINATION

In each of these sections each candidate is examined individually by the examination panel.

3.5.1 Clinical presentations / case scenarios

Clinical cases / case scenarios, comprising general thoracic surgery, acquired and congenital cardiovascular surgery.

3.5.2 Chest Radiology:

Radiology, which includes plain chest radiographs, computerised axial tomography or magnetic resonance scans. Images in digital format should be projected onto a screen or examined on a monitor. This should take the form of an OSCE examination.

3.5.3 Cardiovascular Angiography:

Angiograms, which will include a coronary angiogram and a paediatric cardiac catheter study, will be presented to the candidate.

NB: Please note that these time allocations are mere guidelines and will of necessity depend on local logistics eg Candidate numbers.

In each of these sections each candidate is examined individually by the examination panel.

3.5.6 Criteria for marking the FC Cardio(SA) Final:

Paper 1	To be marked out of 120
Paper 2	To be marked out of 120
Clinical Cases	To be marked out of 100
Chest Radiology	To be marked out of 100
Angiography	To be marked out of 100

3.5.7 Weighting of the examination For the FC Cardio (SA) Final

Paper 1	-	15%	Sub-minimum	50%
Paper 2	-	15%	Sub-minimum	50%
Clinical Cases	-	30%	Sub-minimum	50%
Chest Radiology		20%	Sub-minimum	50%
Angiography		20%		

3.5.8 Criteria for failing the Final examination:

A score of less than 50% in either of the written papers of the examination

A score of less than 50% in clinical cases/case scenarios of the examination

A sub-minimum as required (i.e. which must be passed separately with a minimum of 50% of the marks for that particular section, in order for the examination as a whole to be passed) as indicated above

4.0 ADMISSION AS A FELLOW

4.1 Only candidates who have completed training in a CMSA recognised registrar post may be awarded a fellowship if successful in the examination.

4.2 **Candidates who have written the examination as a prerequisite from the HPCSA for inclusion on the specialist register are not eligible to be awarded a Fellowship but will be sent a letter confirming their success in the examinations**

All other candidates will be asked to sign a declaration as below:

I, the undersigned,do solemnly and sincerely declare

that while a member of the CMSA I will at all times do all within my power to promote the objectives of the CMSA and uphold the dignity of the CMSA and its members

that I will observe the provisions of the Memorandum and Articles of Association, By-laws, Regulations and Code of Ethics of the CMSA as in force from time to time

that I will obey every lawful summons issued by order of the Senate of the said CMSA, having no reasonable excuse to the contrary

and I make this solemn declaration faithfully promising to adhere to its terms

Signed at this day of

..... 20

Signature

Witness

(who must be a Founder, Associate Founder, Fellow, Member, Diplomat or Commissioner of Oaths)

4.3 A two-thirds majority of members of the CMSA Senate present at the relevant meeting shall be necessary for the award to any candidate of a Fellowship

4.4 A Fellow shall be entitled to the appropriate form of certificate under the seal of the CMSA

4.5 In the event of a candidate not being awarded the Fellowship (after having passed the examination) the examination fee shall be refunded in full excluding HPCSA candidates who are not entitled to a Fellowship

4.6 The first annual subscription is due one year after registration (statements are rendered annually)

APPENDIX A

1.0 AIMS, OBJECTIVES AND SYLLABUS FOR THE PRIMARY EXAMINATION IN GENERAL SURGERY

- 1.1 The aim of the examination is to ensure that successful candidates are competent to embark on a career in General Surgery or one of its subspecialties. The examination will help refresh existing knowledge and impart new knowledge and competencies to ensure better care of the surgical patient. The competencies required are in the cognitive, psychomotor and affective (interpersonal/attitudinal) domains
- 1.2 Competence is defined as knowledge, skills and attitudes in:
- medical expertise
 - technical expertise
 - judgement – clinical decision making
 - communication
 - collaboration and teamwork
 - management and leadership
 - health advocacy
 - scholarship and teaching
 - professionalism.
- 1.3 Areas of competence that will be assessed in the FCS(SA) Primary examination will include:
- Clinically relevant anatomy and applied embryology
 - Appreciation of three dimensional and cross sectional relevant anatomy
 - Clinically relevant human physiology
 - Pathophysiology in surgical patients
 - General pathology principles and mechanisms of disease
 - The genetic basis of disease
 - Oncological principles in surgery
 - Immunology
 - Principles of microbiology relevant to general surgical practice
 - Asepsis and antisepsis
 - Pharmacological principles relevant to surgery
 - Pharmacology of drugs commonly used in surgery
 - Blood constituents, clotting mechanisms and blood product transfusion principles
 - Fluid requirements and fluid management in the surgical patient
 - Acid–base problems in the surgical patient
 - Applied medical statistics
 - Critical appraisal of the literature
 - Evidence based literature
 - Searching the literature
 - Informed consent
 - HPCSA regulations pertaining to surgical practice
 - Basic clinical skills
 - Basic procedural skills
 - Counselling of patients and relatives
 - Safety in the operating room
 - Principles of audit
 - Principles of patient documentation
 - Principles of continuity of care
 - The content of the Basic Surgical Skills course manual
 - Learning in medicine is a continual process. Although general and specific objectives have been set, any aspect of medicine that is deemed to be surgically relevant may be included in the assessment

- As a guide, the Specialty of Surgery (General Surgery) covers the following areas:
 - Alimentary tract
 - The abdomen and its contents
 - Breast, skin and soft tissue
 - Endocrine system
 - Head and neck surgery
 - Vascular surgery
 - Paediatric surgery
 - Trauma surgery/burns
 - Surgical critical care
 - Surgical oncology

2.0 SPECIFIC/LEARNING OBJECTIVES

2.1 Clinically relevant anatomy and applied embryology:

- 2.1.1 Detailed knowledge of anatomy is required. Clinically relevant anatomy should be concentrated on. The anatomy of the whole body should be known in some detail. It is expected however that the candidate should concentrate on the anatomy, surface anatomy, applied anatomy and embryology of:
- Those structures commonly affected by disease encountered by the general surgeon
 - Those anatomical structures and their anatomical relationships which are important in general surgical operations
- 2.1.2 Anatomical variations are common and often pose challenges to the practising surgeons. The anatomical variations that impact on presentation of disease and /or surgical exposure should be known in detail, as should the embryological basis of the variation
- 2.1.3 The embryological origin of organs should be known. Emphasis will be placed on common anatomical variations/abnormalities that have an embryological origin
- 2.1.4 The following areas of applied gross anatomy should be concentrated on:
- Brain and skull with emphasis on areas affected by trauma and space occupying lesions
 - The cranial nerves
 - The face
 - Bony structures of the sinuses, orbit, jaw
 - The tongue and pharynx
 - Salivary glands
 - The neck
 - The chest
 - The mediastinum
 - The thoracic inlet and outlet, the brachial plexus
 - The axilla
 - The muscles of the neck and back
 - The peripheral vascular system
 - The lymphatic system
 - The heart
 - The diaphragm
 - The abdominal wall
 - The abdominal contents
 - The retroperitoneum
 - The pelvis (its contents and foramina, the pelvic floor)
 - The pelvic bones
 - The anus and continence mechanisms
 - The peripheral nervous system
 - The autonomic nervous system
 - The spine
 - The spinal cord and its neuroanatomy
 - The cubital fossa
 - The popliteal fossa
 - The gluteal area

- The perineum
- Female genitalia (internal and external)
- Male genitalia
- The extremities. Emphasis to be placed on vital structures (nerves, blood vessels), major muscle groups, compartments, vital structures in the joints, relationship of vital structures to bones
- The hand, with emphasis on vital structures, function and areas prone to infection

2.2 Appreciation of three dimensional and cross sectional relevant anatomy:

- 2.2.1 Current imaging with CT and MRI is cross sectional, but more and more axial and saggital scanning is being performed. In addition, three dimensional reconstruction is common. The candidate would be expected to be able to identify normal anatomical structures in such images

2.3 Clinically relevant human physiology:

- 2.3.1 Candidates should have detailed knowledge of:

- Homeostasis, thermodynamics, positive and negative feedback
- Fluid and electrolyte and acid-base physiology and pathophysiology
- Body water compartments
- Composition, osmotic activity and oncotic pressure of body fluids
- Water and electrolyte exchange
- Mechanisms of osmoregulation and volume regulation
- Buffer systems and mechanisms of acid-base haemostasis
- The haemopoietic system
- Lung function and respiratory exchange and oxygen transport. Control of respiration and breathing. Ventilatory response to exercise. Measuring lung function. Ventilation perfusion ratios, control of pulmonary circulation
- Oxygen transport:\
- Renal function: control systems with respect to microanatomy, autoregulation, regulation of GFR, renal tubular function (in health and disease), the effect of diuretics, the effect of obstruction at various points, bladder function and control (in health and disease)
- Adrenal function
- Function of the GIT in digestion, motility and transit, absorption
- The secretions of the GIT
- Hepatic function
- Nutrition:
 - The interrelationship between fat, carbohydrate and protein metabolism and changes with under and over nutrition. The role of trace elements and vitamins in nutrition.
 - The nutritional impact of surgery and injury
- Cardiac function, electrophysiology and circulation
- Physiology of the peripheral vascular system and microvasculature
- Physiology of the splanchnic, hepatic circulation
- Placental and fetal circulation
- Control of blood pressure
- The endothelium
- The extracellular space and lymph systems
- The cardiovascular response to exercise and stress
- The role of Nitric Oxide
- Neurophysiology:
 - Cell membrane excitability, intercellular signaling, somatic and autonomic nervous systems, cerebral function, the functional role of the basal ganglia, limbic system, hypothalamus brainstem and reticular activating system, reflex controls, spinal neurophysiology, the cortex (and its role in speech, sensory perception and motor control), the cerebellum (and its role in fine motor coordination), the cranial nerves
- The CSF and blood brain barrier
- Endocrine function (pituitary, thyroid, parathyroid, adrenal medulla and cortex, pancreas, kidney, sex hormones)

- The regulation of body function in response to exercise, trauma, starvation, sepsis and stress of surgery
- Paracrine and autocrine function
- The different physiology of the neonate, child, the pregnant woman and the elderly must be understood

2.4 PATHOPHYSIOLOGY IN SURGICAL PATIENTS

- 2.4.1 It is expected that the candidate will have a clear understanding of normal human physiology and recognise how this may be altered by pathological processes, surgery or anaesthesia. Correlation between physiological changes and physical signs or symptoms elicited in patients should be clearly understood. For example, there should be a clear understanding of the physiological changes that:
- ensue in a patient following prolonged vomiting or diarrhoea,
 - occur in renal function after surgery
 - prevail in a patient with a perforated duodenal ulcer
 - occur during and after major surgery
 - occur with deep obstructive jaundice
 - affect fluid balance in the surgical patient
- 2.4.2 The pathophysiological effects of insult to the neonate, child, the pregnant woman and the aged must be understood
- 2.4.3 Interpretation of laboratory results in a clinical scenario eg:
- Fluid, electrolyte and acid base disturbances and their identification
 - Acid base abnormalities
 - Haemostasis

2.5 GENERAL PATHOLOGY PRINCIPLES AND MECHANISMS OF DISEASE

- 2.5.1 Candidates should demonstrate an understanding of the general pathological mechanisms (degenerative, reactive and neoplastic) underlying common disease. This will include knowledge of aetiology, pathogenesis, epidemiology, investigation and natural history. Areas to be concentrated on are:
- General pathological phenomena including cell injury, adaptation and death, inflammation, apoptosis, cell death, degenerations including atherosclerosis, pigmentation and calculus formation, alterations of growth, differentiation and function of cells and of age
 - The effects of aging on the body
 - Tissue response to injury including the adaptive reactions of the body to injury. This includes an understanding of important morphological manifestations, pathophysiology of important disease states (eg major organ failure either single or combined, shock, sepsis, disseminated intravascular coagulation), biochemical mechanisms and manifestations where these factors are important in the understanding of pathogenesis, natural history
 - The processes of wound healing and tissue inflammation(acute and chronic)
 - The principles of cellular events and resulting in local and systemic inflammatory responses. This includes knowledge of the common cytokines and other mediators of inflammation
 - Common and important issues in systemic pathology are examinable in so far as:
 - (i) a given lesion exemplifies a basic pathological process, eg anaphylaxis as an example of hypersensitivity reactions, myocardial infarction in atherosclerosis, colorectal carcinoma as an example of neoplasia, or
 - (ii) disorders of a given system are likely to be encountered in surgical practice, eg post-operative pneumonia
 - Knowledge of laboratory medicine

2.6 THE GENETIC BASIS OF DISEASE (Genetics and Molecular Biology)

- 2.6.1 Structure of DNA and RNA, the cell cycle, the generation of genetic abnormalities
- 2.6.2 Mendelian genetics
- 2.6.3 Cytogenetics including basics of laboratory techniques for detection of cytogenetic abnormalities
- 2.6.4 Specific conditions are examinable in so far as they illustrate important principles or are common or important disorders

2.7 ONCOLOGICAL PRINCIPLES IN SURGERY

2.7.1 An understanding of Cancer biology is essential. The following specific aspects pertaining to oncology should be known in detail:

- Cells and tissues of origin
- Reproductive, growth (proliferative) patterns and host interaction
- Mechanisms of invasion and metastasis
- Molecular biological, genetic and inherited characteristics
- Geographic racial and cultural (population) factors
- Mechanisms and types of chemical, physical and microbial carcinogenesis
- Distinctive pathological (macroscopic, histological and immunochemical) features which aid diagnosis
- The application of the above to common cancers in children and adults
- Principles of oncological surgery
- Basic mechanisms of action of current common chemotherapeutic agents

2.8 Immunology:

2.8.1 Basic Immunology including:

- non-specific defence mechanisms, the complement system, the major histocompatibility complex
- the cells of the immune system, their functions, their interactions, cell subsets, cell surface markers and receptors structure, function, genetics of secretory products of cells involved in the immune response including immunoglobulins, interleukins, various other factors activation and control of the normal immune response
- Immunity infection including bacteria, viruses, fungi and protozoa
- Abnormal Immunological Responses including hypersensitivity, autoimmune disorders and immunodeficiency disorders
- Diagnostic Immunology including the basic principles (not detailed) of commonly used immunological tests, their applications and their limitations
- Immunology pertaining to blood product transfusion

2.9 Transplantation:

- Define and differentiate autografts, allografts and xenografts
- Understand the role of major histocompatibility complex in clinical transplantation

2.10 PRINCIPLES OF MICROBIOLOGY RELEVANT TO GENERAL SURGICAL PRACTICE

An understanding and knowledge of infectious agents (viruses, bacteria, fungi, protozoa and sub-viral particles eg prions) in surgical disease processes and of the developing microbial resistance to current antimicrobials is essential

- Pathogenesis of infection
- Host defence mechanisms and microbial virulence:
 - The normal microbial flora of the body and its role in health and disease
 - Surgically relevant bacterial, viral, fungal and parasitic infections;
 - infection following surgery, eg wound infection, septicaemia
 - infections with surgical implications, eg peritonitis, anaerobic soft tissue infections, AIDS
 - The principles of antimicrobial agents and their scientific use in the therapy and prevention (prophylaxis) of infection
 - Sterilisation and disinfection
 - Laboratory medicine aspects of infectious diseases, eg principles behind blood culture techniques, interpretation of gram stains, antimicrobial susceptibility techniques

2.11 PRINCIPLES OF PHARMACOLOGY AND THERAPEUTICS IN GENERAL SURGERY

- Pharmacological principles relevant to surgery and Pharmacology of drugs commonly used in surgery
- The following *principles* are to be covered in detail:
- Pharmacodynamics and pharmacokinetics of major drug groups
- The pharmacodynamics includes the mechanism of action of a drug, particularly where it may be important in understanding its use and/or its side-effects, whereas the pharmacokinetics include factors such as bioavailability (particularly to emphasise difference in routes of administration), plasma protein binding, clearance (metabolism if relevant) etc. The clinical application of pharmacodynamics and pharmacokinetics in route of administration, dosage and dosing schedules, the effect of disease states on drugs, the effect of the drug on the patient, and potential clinically relevant drug interactions
- The changes in the neonate, child and elderly that effect pharmacodynamics and pharmacokinetics
- The above principles pertaining to the following drug groups should be emphasised:
 - Pain killers
 - Diuretics
 - Inotropes, vasoconstrictors, vasodilators, anti arrhythmics
 - Immune modulators including steroids and anti-inflammatories
 - Antimicrobials
 - Drugs affecting the GIT eg those affecting gastric acid secretion, gut motility, stool transit time
 - Drugs affecting haemostasis eg Heparin, Warfarin, Fractionated Heparin, Thrombolytics
 - Anaesthetic drugs (Inhalational, oral, and intravenous)
 - Local anaesthetics
 - Drugs affecting glucose metabolism eg insulin, oral hypoglycaemics
 - Cytotoxics, Anti-oestrogens eg Tamoxifen
 - Thyroxin and anti-thyroid drugs

2.12 HAEMATOLOGY AND TRANSFUSION

- The following aspects should be known in detail:
 - The origin and differentiation of haematopoietic cells
 - Anaemias of acute and chronic blood loss. Basic investigations to differentiate various causes of anaemia eg types and mechanisms of haemolysis, anaemias caused by substrate deficiency
 - Mechanisms of haemostasis. Tests of haemostasis and their clinical application
 - Abnormal haemostasis
 - Bleeding disorders, congenital and acquired
 - Disseminated intravascular haemostasis
 - Origin, differentiation and proliferations of white cells particularly lymphomas
 - Blood products, components and substitutes

2.13 ASEPSIS AND ANTISEPSIS

- Blood constituents, clotting mechanisms and blood product transfusion principles
- Fluid requirements and fluid management in the surgical patient

2.14 CRITICAL APPRAISAL OF THE LITERATURE, EVIDENCE BASED MEDICINE AND SEARCHING THE LITERATURE

- With the explosion of available medical literature, the candidate should understand the key concepts of Evidence Based Medicine (EBM), levels of evidence and how to effectively and efficiently search the literature

2.15 LEGAL AND ETHICAL ISSUES

- Candidates should know the ethical and legal principles relating to:
 - Informed consent
 - Confidentiality and access to health records
 - Filling out a death certificate
 - Medico-legal post mortems
 - Obtaining permission for autopsy
 - Withholding resuscitative measures
 - Organ donation
 - Brain death
- HPCSA regulations pertaining to surgical practice including issues of professional misconduct

2.16 **APPLIED MEDICAL STATISTICS, BIOSTATISTICS, EPIDEMIOLOGY**

- The candidate should:
 - Understand the principles of biostatistics and research design and commonly used statistical tests and terminology as necessary to critically appraise the clinical and experimental surgical literature
 - Understand the principles of biostatistics and epidemiology applicable to the use of diagnostic tests, screening and disease prevention programmes, patterns of disease (eg trauma, cancer), risk assessment, scoring systems (eg physiologic and anatomic scoring of trauma, neurologic function etc), prediction of outcome etc
 - Identify the meaning and appropriate usage of commonly used terms, including sensitivity, specificity, positive predictive value, negative predictive value, false positive, false negative, confidence limits, standard deviation, retrospective, prospective, intention to treat, power, randomised trial, control, blind, double blind, relative risk reduction, number needed to treat, meta analysis, systematic review
 - Identify types 1 and 2 statistical errors and the factors influencing them
 - Identify the requirements for the appropriate usage of common statistical comparison, including test, chi-square, ANOVA, correlation, regression, non parametric testing”

2.17 **THE BASIC SURGICAL SKILLS COURSE**

- It is expected that all candidates have successfully completed the Basic Surgical Skills course that is run under the Aegis of the Colleges of Medicine of South Africa under licence from the Royal College of Surgeons of England
- The following are examinable:
 - Asepsis and antisepsis
 - Safety in theatre
 - The principles of anastomosis
 - Suture materials and needles
 - The principles of debridement
 - Diathermy principles and safety
 - Basic principles of laparoscopy

2.18 **Suggested texts for new FCS(SA) Primary:**

- Raferty AT, Delbridge MS. *Basic Science for the MRCS*. Churchill Livingstone, Elsevier Science, 2006. ISBN-13 978-0-443-10109-0
- Raferty AT. *Applied Basic Science for Basic Surgical Training*. Churchill Livingstone, 2000. ISBN 0 443 06143 2
- Winscow TDV, Campbell MJ. *Statistics at Square One 10th Edition*. BMJ Books, 2002. ISBN 10 : 0 72791552 5
- Basic Surgical Skills Manual; Third edition
The above texts are highly recommended and cover almost the entire syllabus of the FCS Primary. It is expected, however, that the following texts be used as references for a deeper understanding of the basic sciences
- **Anatomy:**
 - Snell, Richard S. *Clinical Anatomy*. 7th Edition. Lippincott Williams and Wilkins, Philadelphia, 2004
 - McMinn R.M.H., *Last's Anatomy, Regional and Applied*, 9th Ed., 1998 (Reprinted 2003) Churchill Livingstone
 - Abrahams PH, Marks SC, Hutchings RT. *Mc Minns Color Atlas of Human Anatomy*. CV Mosby 2003 ISBN 0723432120
- **Physiology:**
 - Ganong W.F *Review of Medical Physiology*, 21th Ed., 2005, Lange Mc Graw-Hill
or
 - Guyton, AC, Hall JE. *Text Book of Medical Physiology*, 11th Ed. Elsevier. 2000
- **Pathology:**
 - McPhee SJ, Lingappa, VR, Ganong WF. *Pathophysiology of Disease. An introduction to clinical medicine*. Fourth Edition Lange Medical Books/ McGraw-Hill 2003
 - Really Essential Medical Immunology: *Ivan Roitt & Arthur Rabson*
 - Cotran, Ramzi S. Joint authors/editors: Robbins, Stanley L. Kumar. V, Tucker. C *Robbins pathologic basis of disease*. 3rd ed. Philadelphia: London: Saunders, c1999

APPENDIX B

GUIDELINES FOR CANDIDATES ENTERING THE FCS(SA) INTERMEDIATE EXAMINATION

FCS(SA) Intermediate Objectives

Overall objectives

The candidate is required to know and understand the principles of surgery in general and the principles of the major specialities of surgery. It is expected that the candidate will have the theoretical knowledge and practical skills to deal with:

- all aspects pertinent to the resuscitation and emergency treatment of life threatening surgical conditions in both adults and children.
- all aspects of patient care relevant to the peri-operative period, including intensive care support,

General Learning Outcomes

- Demonstrate understanding of the principles and practical application of supportive surgical care including emergency care.
- Demonstrate understanding of the principles and practical application of care related to the other surgical specialities with particular focus on emergency care. These specialities are Orthopaedics, Urology, Plastic Surgery, Cardiothoracic Surgery, Paediatric Surgery, Neurosurgery, Ophthalmology, Otorhinolaryngology and Obstetrics and Gynaecology including emergency care.
- Demonstrate knowledge of relevant clinical anatomy, physiology and pathophysiology behind the general principles and interpretation and application of commonly used diagnostic tests and imaging modalities.
- Demonstrate understanding of applied pathophysiology relevant to peri-operative care of the surgical patient including organ support in critical illness.

FCS(SA) INTERMEDIATE PAPER I: PRINCIPLES OF SURGERY IN GENERAL

General Objectives

The candidates are required to know and understand the principles of surgery in general. It is expected that the candidates will have the theoretical knowledge and practical skills to deal with:

- all aspects pertinent to the resuscitation and emergency treatment of life threatening surgical conditions in both adults and children.
- all aspects of patient care relevant to the peri-operative period, including intensive care support.

1.0 A: SUPPORT IN CRITICAL ILLNESS :

1.1 General objectives

Understand the anatomical, physiological and pathophysiology principles involved in the practical provision of major organ support for the critically ill surgical patient relating to the following topics:

1.2 Support of oxygenation and ventilation

Understand the anatomical and practical principles involved in airway management in relation to the following headings.

- Simple measures
- Endo-tracheal intubation
- Intubation of the difficult airway
- Surgical airways

Understand lung physiology and pathophysiology as applicable to mechanical ventilation with particular reference to the following topics.

- Lung functions
- Peri-operative evaluation of lung function
- Lung volumes and capacities
- Problems with the alveolo-capillary interface
- The interpretation of blood gas analysis

Understand the physiology behind oxygenation in the ventilated patient with particular reference to the following topics

- Hypoxia and hypoxaemia
- DO_2 / VO_2 / SvO_2
- Oxygen consumption in critical illness
- Oxygen therapy / PEEP / CPAP

Understand the principles behind the practical provision of mechanical ventilation under the following headings

- Indications for ventilation
- Non-invasive ventilation
- Modes of ventilation
- Lung protective ventilation
- Alveolar recruitment
- Weaning measures and protocols
- Lung mechanics and monitoring

Understand the mechanism and management of pulmonary aspiration syndromes and infections.

Understand the pathophysiology and management of acute lung injuries under the following headings

- Inflammatory
- Infective
- Ventilator associated

1.3 **Support of the circulation systems**

Understand the classification, pathophysiology, clinical presentation and treatment of shock under the following headings

- Hypo-volaemic / haemorrhagic shock
- Cardiogenic shock (cardiac and extra-cardiac)
- Septic / redistributive shock
- Anaphylactic / allergic shock
- Neurogenic shock and the difference to spinal shock
- Free oxygen radicals and reperfusion injuries
- Lactic acidosis
- Endpoints of resuscitation
- Understand the pharmacology and practical use of cardiovascular drugs in critical illness under the following categories
- Inotropic agents
- Anti dysrhythmic agents
- Vasodilators
- Vasopressors

Understand the pathophysiology and practical principles involved in managing acute cardiac disturbances under the following headings

- ECG interpretation
- Cardiac arrest
- Cardiopulmonary resuscitation
- Defibrillation
- Electric and mechanical support of the failing heart
- Cardiac dysrhythmias. Interpretation of the ECG
- Hypertensive crisis

1.4 Monitoring Devices

Understand the principles, application, interpretation, and complications of the following devices used in monitoring patients with critical illness

- Pulse oximetry
- Arterial, central venous and Swan Ganz catheters
- Endotracheal cuff pressure
- Capnography, calorimetry and metabolic monitoring
- Tonometry
- Thrombo-elastography
- Oesophageal Sonar

1.5 Temperature Control of the Patient

Understand the mechanisms of thermal loss and the principles and practical application of preventative and restorative treatment measures.

- Hypothermia
- Hyperthermia including malignant hyperpyrexia

1.6 Inflammatory Syndromes and Organ dysfunction

Know and understand the definitions, underlying pathophysiology and management of inflammatory syndromes and organ dysfunction under the following headings.

- SIRS Systemic Inflammatory Response Syndrome
- CARS Compensated Anti-inflammatory Response Syndrome
- MARS Mixed Anti-inflammatory Response Syndrome
- MODS Multiple Organ Dysfunction Syndrome
- MOF Multiple Organ Failure
- Scoring systems

1.7 Intra-abdominal Hypertension

Understand the pathophysiology and practical management of raised intra-abdominal pressure under the following headings

- Measurement of Intra-abdominal pressure
- Abdominal Compartment Syndrome
- Content containment techniques

1.8 Transport of the critically ill patient

Understand the principles and practical aspects of the transfer of critically ill patients.

1.9 Endocrine and Metabolic aspects of critical illnesses

Understand the physiological and pathophysiological principles involved in endocrine and metabolic abnormalities and their practical application in the treatment of these conditions.

- Endocrine
 - Glycaemic control
 - Diabetes Insipidus
 - Adreno-cortical Insufficiency
 - Thyroid Storm
 - Adrenergic crisis
- Metabolic
 - Acid Base disturbances
 - Hyperkalaemia
 - Hypercalcaemia

1.10 Nutritional aspects of critical illnesses

Understand the physiological and pathophysiology principles involved in the practical provision of nutritional support both enteral and parenteral of the critically ill patient under the following headings

- Nutrient provision
- Access
- Complications

1.11 Renal Failure

Understand the physiological and pathophysiological principles involved in the diagnosis and supportive management of renal failure under the following headings

- Acute renal failure
- Myoglobinanaemia and myoglobinuria
- Haemodialysis
- Peritoneal dialysis
- Ultrafiltration

2.0 B: PERI - OPERATIVE CARE:**2.1 General objective**

Understand the principles involved and their practical application in the provision of perioperative surgical care under the following topics.

2.2 Co-morbidity risk

Understand the principles of assessment of general and disease specific co-morbidity risk and the optimisation of patients for procedures or surgery under the following headings.

- Cardiac
- Pulmonary
- Hepatic
- Renal
- Endocrine
- Obesity
- Age
- Medications

2.3 Abnormalities of homeostasis

Understand the physiological reasons underlying the principles of assessment and management of abnormalities of homeostasis related to the following

- Metabolic response to injury
- Fluid and electrolyte therapy
- Acid base balance

2.4 Haemostatic disorders

Understand the anatomical, physiological and pathophysiological principles involved in haemostasis and their practical application in the treatment of haemostatic disorders.

- Laboratory Investigations
- Component Therapy
- Thrombosis and Thrombo-Embolicism
- Deep Venous Thrombosis
- Pulmonary Embolism
- Haemostatic Failure and DIC
- Anticoagulant Therapy
- Thrombolytic Therapy

2.5 Surgical Nutrition

Understand the principles of nutritional assessment, the recognition of nutritional deficiency and the practical provision of nutritional support in the surgical patient related to the following

- Assessment of nutritional status.
- Indications for nutritional support.
- Calculation of nutrient requirements.
- Parenteral and enteral nutrition
- Access
- Provision
- Complications
- Metabolic related
- Delivery related

2.6 Endocrine conditions

Understand the pathophysiology and the principles of diagnosis and management of endocrine emergency conditions and the management of endocrine conditions in relation to surgery under the following headings.

- Hyper and hypothyroidism
- Hypercalcaemia
- Steroid therapy
- Hypo and hyper adrenal function
- Hypo and hyperglycaemia
- Diabetic keto-acidosis

2.7 Imaging

Understand the principles of imaging techniques, their application and interpretation included in the emergency care situation under the following headings.

- Chest radiography
- Ultra sound
- Duplex Doppler
- Computerised axial tomography
- Magnetic resonance imaging
- Isotope scanning

2.8 Pharmacology

Understand the pharmacology of commonly used drugs in surgical practice and the principles of their appropriate use.

- Drugs used for sedation and analgesia
- Antibiotics
- Steroids
- NSAIDS

2.9 Infection and Antimicrobials

Understand the principles of the prevention and treatment of infection under the following headings

- Asepsis and sterile technique
- Surgical technique
- Prophylactic antibiotics
- Therapeutic antibiotics

2.10 Blood transfusion

Understand the principles governing the use of blood and blood products and their practical application under the following headings.

- Blood groups and cross matching
- Indications for transfusion
- Transfusion reactions
- Massive transfusion

2.11 Intra-Operative Care

Understand the principles involved in the practical and safe application of intra-operative surgical care relating to the following topics

- Aseptic and antiseptic techniques
- Hazards and precautions in operating theatres
- Energy and imaging devices used in theatre.
- Diathermy
- Unipolar
- Monopolar
- Harmonic scalpel
- Laser

2.12 Post-operative complications

Understand the mechanisms of postoperative complications and the principles of prevention and management in relation to the following topics.

- Haemorrhage
- Fever
- Post operative confusion
- Respiratory distress
- Cardiac dysfunction
- Urinary tract complications
- Surgical site infection

FCS INTERMEDIATE PAPER 2 - PRINCIPLES OF THE SURGICAL SPECIALITIES**General objectives**

The candidate is required to know and understand the principles of the major specialities of surgery. It is expected that the candidate will have the theoretical knowledge and practical skills to deal with:

- all aspects pertinent to the resuscitation and emergency treatment of acute surgical conditions in both adults and children
- all aspects of patient care related to the surgical specialities pertinent to the management of the surgical patient in the peri-operative period, including the intensive care unit

3.0 GENERAL SURGERY**3.1 Abdominal conditions**

Understand the pathophysiology and the principles of diagnosis and management of abdominal emergency conditions due to

- Intra-peritoneal inflammation (localised or generalised)
- Retroperitoneal inflammation
- Obstruction of a hollow organ
- Haemorrhage (intra-peritoneal or intraluminal)
- Trauma (blunt or penetrating)
- Obstetric and gynaecological diseases
 - Ectopic pregnancy
 - Pelvic inflammatory disease
 - Ovarian torsion
 - Vaginal bleeding
- Medical conditions simulating acute abdominal emergencies

3.2 Wound Healing

Understand the principles of wound healing and the treatment of wounds including:

- Classification and types of wound
- Techniques of excision and debridement
- Wound management and dressings
- Suture materials
- Mechanical staplers
- Closure of incised wounds
- Bites
- Tetanus and gas gangrene prophylaxis

3.3 Neurosurgery

Understand the principles of the pathophysiology assessment and emergency management of acute neurosurgical conditions in relation to the following.

- Conscious level assessment (Glasgow Coma Score)
- Coma
- Head injuries
- Raised intracranial pressure

- Prevention of .../

- Prevention of secondary brain injury
- Decompression of extradural haematoma
- Brain Death
- Acute spinal cord injury
- Infection of the central nervous system
- Fluid and electrolyte abnormalities

3.4 **Ear, Nose and Throat Surgery**

Understand the principles of treatment of the following ENT emergency conditions

- Trauma: Penetrating and blunt
 - Pharynx
 - Larynx
 - Trachea
 - Cervical Oesophagus
- Upper airway obstruction
- Ingestion of caustic agents
- Foreign bodies in the upper airway or oesophagus

3.5 **Ophthalmology**

Understand the principles of treatment of the following ocular emergency conditions

- Ocular trauma
- Intra-orbital bleeding
- Peri-orbital infections with threatening blindness

3.6 **Maxillo Facial Surgery**

Understand the principles of diagnosis and treatment of the following maxilla-facial emergency conditions:

- Facial fractures (blunt and penetrating)
 - Recognition in relation to airway compromise
- Head and neck infections
 - Management
 - Microbiology

3.7 **Orthopaedic Surgery**

Understand the principles of diagnosis, assessment and the practical emergency management of the following common orthopaedic conditions emergency:

- Osteomyelitis and acute septic arthritis
- Limb fractures and joint dislocations
 - Classification of fractures and dislocations
 - Splintage and immobilisation
 - Neurovascular deficits
- Hand injuries and infections
- Pelvic fractures

3.8 **Spinal injuries**

Understand the principles of diagnosis, assessment and the practical emergency management of spinal injuries under the following headings:

- Mechanism of injury
- Radiological recognition of cervical and thoraco-lumbar
 - Fractures
 - Dislocations
 - Fracture dislocations
 - Assessment of instability and neurological deficits
- Principles of treatment
- The application of Halo and Cone calliper

- The “plegic” patient
 - Neuro-physiology of the spinal cord injury
 - Haemodynamic changes
 - Acute resuscitation
 - Neuro-pathology of the spinal cord
 - Complete / incomplete lesions
 - Anterior cord syndrome
 - Central cord syndrome
 - Prevention of complications

3.9 Urology

Understand the principles of diagnosis and management of the following urological emergencies:

- Genito-urinary trauma
- Urinary tract infections
- Scrotal emergencies
- Haematuria
- Acute retention of urine
- Urinary catheter management

3.10 Cardiothoracic Surgery

Understand the pathophysiology and the principles of diagnosis and management of the following conditions:

- Trachea and bronchus injury and rupture
- Foreign bodies in the trachea, bronchus and oesophagus
 - Techniques of removal
 - Types of anaesthetic required
- Non-penetrating chest trauma
- Penetrating wounds of the thorax
- Management of pleural collections
 - Simple pneumothorax
 - Open pneumothorax
 - Tension pneumothorax
 - Haemothorax
 - Massive haemothorax
- Tube thoracostomy
- Management of acute broncho pleural fistulae
- Penetrating wounds of the thorax inlet
- Penetrating wounds of the heart
- Cardiac tamponade
- Aorta: dissection and rupture
- Rib fractures: single, multiple and segmental
- Diaphragmatic injury
- Injuries of the oesophagus
 - traumatic
 - spontaneous
 - iatrogenic
- Pleural and pulmonary infection
 - Post-pneumonic empyema
 - Tuberculous empyema
 - Chronic broncho-pleural fistula
 - Lung abscess

3.11 Vascular Surgery

Understand the pathophysiology, principles of diagnosis and emergency management of acute vascular emergencies

- Haemorrhage control
- Arterial and venous trauma (penetrating or blunt)
- Acute arterial embolism
- Acute arterial thrombosis
- Complicated aneurysms
- Acute thrombophlebitis
- Deep vein thrombosis
- Compartment syndrome
- Mangled extremity
- Reperfusion syndrome

3.12 Paediatric Surgery

Understand the physiology, pathophysiology and principles of the diagnosis and practical management of paediatric patients (neonates and children) in relationship to emergency surgical conditions under the following headings:

- Physiological differences between neonates and children and adults in respect of the following:
 - Haematological parameters
 - Respiratory function
 - Cardio-vascular physiology
 - Jaundice
- Peri-operative management of the paediatric patient in respect of the following:
 - Transport of neonates and children
 - Venous access
 - Fluid and electrolyte management
 - Blood and blood product usage
 - Pain management
 - Renal failure
- Assessment and emergency management of the following surgical conditions:
 - Blunt and penetrating abdominal and thoracic trauma
 - Strangulated inguinal hernias
 - Oesophageal foreign bodies
 - Burns
- Recognition and institution of appropriate supportive care for the following specific neonatal conditions:
 - Oesophageal atresia and oesophago-tracheal fistulae
 - Bochdaleck hernia
 - Exomphalos
 - Intestinal obstruction
 - Anus imperforatum

3.13 Plastic Surgery

Understand the principles of plastic surgery and their practical application under the following headings:

- Wound and wound healing
 - Pathophysiology
 - Classification and types of wound
 - Techniques of excision and debridement
 - Closure of incised wounds
 - Suture materials
 - Principles of wound cover
 - Split skin grafts
 - Local flaps
 - Free flaps
 - Management of the open wound
 - Dressings and modern aids to wound healing

- Thermal Injury.../

- Thermal Injury
 - Understand the mechanisms of thermal injury and their management through all phases of treatment under the following headings:
 - Mechanisms
 - Thermal: hot / cold
 - Electric: high and low tension
 - Chemical: acid and alkaline
 - Resuscitation
 - Inhalational burns
 - Burns degree and area assessments size assessment
 - Management of the burn wound
 - Rehabilitation
- Soft tissue injury:
 - Understand the pathophysiology of local and systemic effect of soft tissue injury and its treatment under the following headings:
 - Compartment syndrome
 - Rhabdomyolysis
 - Reno protective strategies
 - Reperfusion injury
 - Degloving injury

3.14 Techniques

Understand the anatomical details and be technically competent to perform the following procedures:

- Airway maintenance
 - Bag mask ventilation
 - Endotracheal intubation
 - Surgical cricothyroidotomy
 - Tracheostomy
- Intra-vascular access
- Tube thoracostomy
- Nasogastric tube placement
- Bladder catheterisation
- Embolectomy
- Limb fasciotomy
- Emergency burr holes

SUGGESTED READING FOR THE FCS(SA) INTERMEDIATE EXAMINATION

In preparation for the FCS(SA) Intermediate examination, the postgraduate student's reading should not be limited to the suggested texts. Much of the information necessary for the examination will be acquired during training on the wards, intensive care and trauma units.

The following texts contain the basic material and approach necessary for both of the FCS(SA) Intermediate papers:

- The Handbook of Surgical Intensive Care. Lyerly HK, Gaynor JW, Mosby Yearbook.
- The ICU Book. Marino PL. William and Wilkens
- Handbook of Trauma for Southern Africa. Nicol & Steyn. Oxford
- Oh TE. Intensive Care Manual. 3rd ed. Sydney: Butterworths, 1996. Intensive Care Manual. Oh TE, Butterworth Heineman
- Trunkey, Lewis. Current Therapy of Trauma. 2nd ed. BC Dekker, 1999
- Schwartz SI, Shires GT. Principles of Surgery. 7th ed. New York; London: McGraw-Hill, Health Professions Division, 1997
- Christopher. F. Davis-Christopher Textbook of Surgery: The Biological Basis of Modern Surgical Practice: Sabiston Textbook of Surgery: 16th ed. Philadelphia; London: WB Saunders, 2000
- Principles of Surgical Patient Care 2nd Edition. Mieny CJ, Mennen U, New Africa Education.
- Review of Medical Physiology. Ganong WF, Appelton & Lange.
- Intensive Care Medicine. Irwin and Rippe
- Surgical Intensive Care. Barie FS, Shires GT, Library Congress Cataloging in Publication Data.
- ATLS Manual American College of Surgeons 4th Edition
- Paediatric Work Book First Edition Ed. JH Becker. Published Van Schaik Pretoria 2006

APPENDIX C

SYLLABUS FOR THE FINAL EXAMINATION (Comprehensive)

1.0 BASIC SCIENCES

1.1 Surgical Anatomy of the Lung and Chest Wall

1.1.1 Anatomy of the Thorax and Pleura

- Surface landmarks and structures superficial to the thorax
- Anatomical features of the thorax
- The sternum
- The ribs
- Intercostal space
- Pleura and lungs in relation to the thoracic wall

1.1.2 Surgical Anatomy of the Lung

- Lobes and fissures
- Bronchopulmonary segments
- Bronchial tree
- Pulmonary arterial system
- Pulmonary venous system
- Intra-pericardial anatomy
- Bronchial arteries and veins (including systemic- pulmonary artery anastomosis)
- Pulmonary lymphatics
- Secondary pulmonary lobule

1.2 Surgical Anatomy of the Heart and Blood Vessels

1.2.1 Relationships of the Heart

1.2.2 The Atria

1.2.3 The Ventricles

1.2.4 Cardiac Skeleton

1.2.5 Cardiac Sub-systems

- Coronary circulation
- Conduction system
- Nervous system

1.2.6 Clinical Cardiac Anatomy

1.2.7 Great Vessels of the Thorax

1.2.8 The Femoral Triangle

1.2.9 Radial Artery

1.2.10 Saphenous System of Veins

1.3 Pulmonary Physiology and Assessment of Pulmonary Function

1.3.1 Microscopic Anatomy of the Lung

- Secondary pulmonary lobule

1.3.2 Pulmonary Gas Exchange

1.3.3 Mechanics of Breathing

1.3.4 Pulmonary Function Tests

1.4 Cardiovascular Physiology

1.4.1 Circulation: General Features

- Volume and pressure
 - Distribution
 - Relationships
 - Distensibility and compliance
- Mean circulatory pressure
- Tension in vessel wall - Laplace Theorem

1.4.2 Haemodynamics

1.4.3 The Heart: Structure and Function

1.4.4 Pressure and Flow in the Arterial and Venous Systems

- 1.4.5 Electrical Properties of the Heart
- 1.4.6 Contractile Properties of the Heart
- 1.4.7 Venous Return and Cardiac Output
- 1.4.8 The Peripheral Circulation and its Regulation
- 1.4.9 Regulation of Arterial Blood Pressure
- 1.4.10 Coronary Circulation

1.5 **Cardiopulmonary Bypass (CPB)**

- 1.5.1 Circuits and Design
 - Goals of CPB
 - CPB circuit
 - Priming the CPB Circuit
 - Malfunctions during CPB
 - Safety devices
 - Emergency CPB
- 1.5.2 Pathophysiology and Related Complication
 - CPB as a perfusion system
 - CPB as an oxygen delivery system
 - Hypothermia and CPB
 - Systemic effects and complication of CPB
- 1.5.3 Management during CPB
 - Preparation for CPB (including types of CPB): (L) Heart Bypass
(R) Heart Bypass
 - Sites of cannulation
 - Potential bypass catastrophes
 - Massive air embolism protocol
 - Abnormalities during CPB
 - BP control during CPB
 - Fluid management
 - Total circulatory arrest
 - Management of CPB in pregnancy
 - Management of rare diseases affecting CPB
 - Circulatory assist devices

1.6 **Myocardial Preservation**

- 1.6.1 Definition
- 1.6.2 General Principles of Myocardial Metabolism
- 1.6.3 Myocardial Preservation prior to CPB
- 1.6.4 Myocardial Preservation during Institution of CPB
 - Factors leading to decreased myocardial oxygen supply
 - Factors leading to increased myocardial oxygen demand
 - Management of oxygen supply and demand of the beating myocardium on CPB
 - Management suggestions for specific cardiac pathologies
- 1.6.5 Myocardial Preservation during Cardioplegic Arrest
 - Clinical application of cardioplegic arrest
 - Hypothermia
 - Normothermia (Warm Heart Surgery)
 - Biochemical cardiac arrest
 - Technical aspects of cardioplegic infusion
 - Venting
 - Reperfusion injury
- 1.6.6 Pre-ischaemic Conditioning
- 1.6.7 The Right Ventricle: Special Concerns

1.7 Cardiovascular Pharmacology

1.7.1 Haemostasis, Coagulation and Drugs

- Physiology of haemostasis and thrombolysis
- Anticoagulants
 - eg Heparin and Enoxeparin
Warfarin (Coumadin)
- Anti-platelet Drugs
 - eg Aspirin
Dipyridamole
Sulfinpyrazone
- Thrombolytics (Fibrinolytics)
 - eg Streptokinase
tPA
Anistreplase (APSAC)
Prourokinase
Urokinase
- Haemostasis
 - eg Platelets
Protamine
Aprotonin
Cyclokapron
e-Amino Caproic Acid

1.7.2 Pressor and Inotropic Drugs

- Sympathomimetic Drugs
 - eg Dobutamine
Dopamine
Ephedrine
Isoprenaline
Phenylephrine
- Non-sympathomimetic Drugs
 - eg Digoxin
Amrinone
Calcium

1.7.3 Vasodilator Drugs

- eg Nitroglycerine
Nitroprusside
Phentolamine
Prostaglandin E
ACE - inhibitors

1.7.4 Calcium – Channel Blockers

- eg Verapamil
Nifedipine
Diltiazem

1.7.5 Anti-arrhythmic Drugs

- eg Amiodarone
Atropine
B – Adrenergic Blockers
Bretylium
Disopyramide
Lignocaine

1.7.6 Diuretics

- Loop diuretics
- Thiazide diuretics
- Potassium – sparing diuretics

- 1.8 **Blood Conservation in Cardiac Surgery**
 - 1.8.1 Physiology of Haemostasis and Coagulation
 - 1.8.2 Pre-operative Blood Conservation Techniques
 - 1.8.3 Intra-operative Blood Conservation Techniques
 - 1.8.4 Post-operative Blood Conservation Techniques
 - 1.8.5 Pharmacological Agents
 - 1.8.6 Future Directions
- 1.9 **Diagnostic and Therapeutic Procedures in Cardiac Surgery**
 - 1.9.1 Diagnostic Cardiology
 - Echocardiography
 - Radionuclide imaging
 - Computed tomography
 - Magnetic resonance imaging
 - Cardiac catheterization, angiography
 - 1.9.2 Interventional Cardiology
 - Percutaneous transluminal coronary angioplasty
 - Balloon valvuloplasty
 - Other
- 2.0 **GENERAL THORACIC SURGERY**
 - 2.1 **The Trachea**
 - 2.1.1 Surgical Anatomy of the Trachea and Techniques of Resection
 - Anatomy
 - Methods of reconstruction of the trachea
 - Surgery of the trachea
 - Tracheostomy and its problems
 - 2.1.2 Management of Non-neoplastic Diseases of the Trachea
 - Infection
 - Post-traumatic Lesions
 - Extrinsic Lesions
 - Miscellaneous Lesions
 - Diagnostic studies
 - Operative versus non-operative treatment
 - 2.1.3 Benign and Malignant Tumours of the Trachea
 - Symptoms and findings
 - Diagnosis
 - Benign tumours
 - Primary malignant tracheal tumours
 - Secondary malignant tracheal tumours
 - Principles and results of surgical treatment
 - Radiation therapy
 - Endoscopic management
 - Management of secondary tumours involving the trachea
 - 2.1 **Chest Wall Abnormalities and Tumours**
 - 2.2.1 Chest Wall Deformities
 - Pectus excavatum
 - Pectus carinatum
 - Sternal defects
 - 2.2.2 Infections of the Chest Wall
 - Skin and soft tissue infections
 - Empyema necessitatis
 - Miscellaneous infections
 - 2.2.3 Chest Wall Tumours
 - Incidence
 - Basic principles
 - Specific tumours

- 2.2.4 Chest Wall Reconstruction
 - Aetiology
 - Pre-operative evaluation
 - Consideration for reconstruction
 - Special considerations
 - Skeletal reconstruction
 - Soft tissue reconstruction

2.3 The Pleura

- 2.3.1 Diseases of the Pleural Space
 - Pneumothorax
 - Benign pleural effusions
 - Malignant pleural effusions
 - Pyothorax (empyema thoracis)
 -
 - Fibrothorax
 - Thoracoplasty
 - Anatomy of the thoracic duct and chylothorax
- 2.3.2 Diseases of the Pleura
 - Localized fibrous tumours of the pleura
 - Diffuse malignant mesothelioma
 - Uncommon tumours of the pleura

2.4 The Mediastinum

- 2.4.1 Anatomy
- 2.4.2 Non-invasive Diagnostic Investigations
- 2.4.3 Invasive Diagnostic Investigations
- 2.4.4 Mediastinal Infections
- 2.4.5 Primary Mediastinal Cysts and Tumours
 - Thymic tumours
 - Myasthenia gravis
 - Mediastinal lymphomas
 - Germ cell tumours of the mediastinum
 - Mediastinal neurogenic tumours
 - Mediastinal paragangliomas and pheochromocytomas
 - Mesenchymal tumours of the mediastinum
 - Mediastinal parathyroid adenomas and carcinomas
 - Foregut cysts of the mediastinum
 - Gastroenteric and neuroenteric cysts of the mediastinum
 - Mesothelial and other less common cysts of the mediastinum

2.5 The Lung

- 2.5.1 Developmental Anomalies
 - Bronchial anomalies
 - Infantile lobar emphysema
 - Pulmonary dysplasia
 - Sequestration
 - Congenital cystic adenomatoid malformation
 - Pulmonary arteriovenous malformations
 - Bronchogenic cysts
- 2.5.2 Emphysema of the Lung
 - Terminology and definition
 - Pathophysiology of bullous lung disease
 - Surgical management of bullous disease
 - Surgical management of diffuse emphysema
- 2.5.3 Benign Diffuse Pulmonary Disease (Interstitial Lung Disease)
 - Secondary pulmonary lobule
- 2.5.4 Destructive Pneumonias

- 2.5.5 Lung Abscess
- 2.5.6 Bronchiectasis
- 2.5.7 Actinomycosis
- 2.5.8 Fungal Diseases of the Lung
- 2.5.9 Parasitic Diseases of the Lung
- 2.5.10 Surgical Treatment of Tuberculosis
- 2.5.11 Carcinoma of the Lung
 - Epidemiology
 - Screening for lung cancer
 - Molecular biology
 - Pathology of carcinoma of the lung
 - Diagnosis and staging of lung cancer
 - Surgical treatment of non-small cell lung cancer
 - Small cell lung cancer
 - Immunology and immunotherapy of lung cancer
- 2.5.12 Other Tumours of the Lung
 - Carcinoid tumours
 - Adenomatoid cystic carcinomas and other primary salivary gland-type tumours of the lung
 - Benign tumours of the lung
 - Uncommon primary malignant tumours of the lung
 - Secondary tumours of the lung

2.6 The Oesophagus

- 2.6.1 Congenital Anomalies
 - Embryology
 - Congenital atresia and tracheo-oesophageal fistula
 - Other congenital anomalies
 - Congenital stenosis
 - Congenital web
 - Duplication rests and cysts
 - Congenital short oesophagus
 - Congenital oesophago-bronchial fistula
- 2.6.2 Motility Disorders and Reflux Oesophagitis
 - Anatomy
 - Physiology
 - Diagnostic techniques
 - Oesophageal motility disturbances
 - Upper oesophageal sphincter
 - Body of oesophagus and lower oesophageal sphincter
 - Reflux oesophagitis
 - Barrett's oesophagus
- 2.6.3 Neoplasms
 - Benign tumours
 - Malignant tumours
 - Squamous cell carcinoma
 - Other malignant tumours

2.7 The Diaphragm

- 2.7.1 Embryology, Anatomy, Physiology
- 2.7.2 Paralysis and Eventration
- 2.7.3 Pacing of the Diaphragm
- 2.7.4 Hernias
 - Congenital posterolateral diaphragmatic hernia
 - Foramen of Morgagni hernia
 - Para-oesophageal hiatal hernia
 - Less common hernias
- 2.7.5 Tumours of the Diaphragm

2.8 Thoracic Trauma**2.8.1 Blunt and Penetrating Injuries**

- Chest wall
- Pleural space sequelae
- Lung trauma
- Tracheo-bronchial injuries
- Oesophageal injuries
- Diaphragmatic injuries
- Cardiovascular trauma
- Transmediastinal injuries
- Foreign bodies
 - Airway
 - Oesophagus
 - Other

3.0 SURGERY FOR ACQUIRED CARDIOVASCULAR DISEASE**3.1 The Pericardium**

3.1.1 Anatomy and Function

3.1.2 Pericardial Compression

3.1.3 Benign Pericardial Disease

3.1.4 Malignant Pericardial Disease

3.1.5 Pericardial Decompression and Drainage

- Pericardiocentesis
- Open pericardial drainage
- Pericardiectomy

3.2 Valvular Heart Disease: Mitral, Aortic, Tricuspid

3.2.1 Structure and Pathology

3.2.2 Clinical Features

3.2.3 Indications for Operation

3.2.4 Operations

- Repair / Reconstruction
- Replacement
- Special considerations

3.2.5 Prosthetic Heart Valves: Mechanical and Bioprosthetic Valves

- Haemodynamics
- Thromboembolism
- Haemorrhage
- Endocarditis
- Periprosthetic leakage
- Structural valve degeneration
- Non-structural valve dysfunction
- Valve selection

3.2.6 Surgery for Infective Endocarditis

- Pathogenesis and pathology
- Native valve endocarditis
- Prosthetic valve endocarditis

3.3 Surgery for Coronary Artery Disease

3.3.1 Surgical and Radiological Anatomy of the Coronary Arteries

3.3.2 Pathology of Coronary Atherosclerosis

3.3.3 Coronary Revascularisation

- Non-surgical
- Surgical
 - Techniques and conduits
 - Hybrid techniques

3.3.4 Surgery for the Complication of Myocardial Infarction

- Cardiogenic shock
- Post-infarction ventricular septal rupture
- Ischaemic mitral regurgitation
- Left ventricular aneurysm

- 3.4 **Cardiac Pacemakers and Conduction Abnormalities**
 - 3.4.1 Anatomical Principles
 - Anatomy of conduction system
 - Additional anatomical considerations
 - 3.4.2 Electrophysiology of Cardiac Pacing
 - Cardiac impulse initiation and propagation
 - 3.4.3 Current Pacemaker Technology
 - 3.4.4 Clinical Cardiac Pacing
 - 3.4.5 Pacemaker Implantation
 - Indications
 - Techniques – Permanent
 - Temporary
 - Complications
 - 3.4.6 Current Practice
- 3.5. **Surgery for Cardiac Arrhythmias**
 - 3.5.1 Supraventricular Arrhythmias
 - Accessory atrioventricular corrections
 - Anatomy
 - Surgical treatment and results
 - AV nodal re-entrant tachycardia
 - Anatomy
 - Surgical treatment and results
 - Ectopic or automatic atrial tachycardias
 - Anatomy
 - Surgical treatment and results
 - Atrial Flutter and Fibrillation
 - Electrophysiology and anatomy
 - Procedures: Maze procedure and modifications
 - 3.5.2 Ventricular Tachyarrhythmias
 - Pathophysiology
 - Programmed electrical stimulation
 - Surgery and results
 - Encircling endocardial ventriculotomy
 - Electrophysiologically directed endocardial resection
 - Implantable cardioverter defibrillator
 - Strategies for the choice of therapy
- 3.6 **Cardiac Tumours**
 - 3.6.1 Classification
 - 3.6.2 Benign Tumours
 - Myxomas
 - Other benign tumours
 - 3.6.3 Primary Malignant Tumours
 - 3.6.4 Secondary Cardiac Tumours
 - Metastases
 - Direct extension
 - 3.6.5 Operative Techniques

3.7 Cardiac Failure: Assist Devices and Cardiomyoplasty

3.7.1 Intra-aortic Balloon Counterpulsation

- Indications
- Techniques of insertion and removal
- Complications

3.7.2 Mechanical Ventricular Assist Pumping

- Types of ventricular assist pump systems
 - Roller pumps
 - Centrifugal (Vortex) pumps
 - Pneumatic pulsatile sac-type pumps
 - Electric pulsatile pumps
- Indications for use of ventricular assist devices
- Contra-indications to the use of ventricular assist devices
- Post-operative management and weaning procedures
- Results and complications
- Long-term mechanical ventricular assist pump
- The artificial heart

3.7.3 Cardiomyoplasty

- Mechanism of action
 - Effects on left ventricular systolic function
 - Effects on left ventricular volume
 - Effects on diastolic function
- Technical aspects
 - Mobilization of the latissimus dorsi
 - Left latissimus dorsi cardiomyoplasty
 - Right latissimus dorsi cardiomyoplasty
- Clinical results

3.8 Transplantation

3.8.1 Cardiac Transplantation

- Guidelines for selection of recipients
- Cardiac donor selection
- Donor cardiectomy
- Recipient operation
- Heterotopic cardiac transplantation
- Post-transplant concerns
 - Rejection and immunosuppression
 - Coronary graft vasculopathy
 - Post-transplant infection/other
 - Renal failure
 - Other complications associated with immunosuppression
- Survival

3.8.2 Heart and Lung Transplantation

- Candidate selection
- Selection criteria for heart-lung donors
- Heart and lung procurement
- Recipient operation for heart-lung transplantation
- Post-operative management
- Immunosuppression
- Complications
 - Re-implantation response
 - Tracheal complications
 - Infection
 - Acute rejection\
 - Obliterative bronchiolitis
 - Accelerated graft atherosclerosis
 - Other complications
- Current results

- 3.8.3 Lung Transplantation
 - Pathophysiology of end-stage lung disease
 - Recipient selection
 - Pre-operative evaluation and management of recipients
 - Technique of lung preservation and extraction
 - Procedure of lung transplantation
 - Anaesthetic considerations
 - Technique of lung transplantation
 - Post-operative management
 - Monitoring
 - Pain control
 - Ventilation
 - Postural drainage and physiotherapy
 - Haemodynamics
 - Bronchoscopy
 - Pleural drainage
 - Nutrition
 - Infection control
 - Immunosuppression
 - Follow-up strategies and procedures
 - Clinico-pathological entities encountered in the recipient
 - Results of lung transplantation

3.9 Thoracic Vascular Surgery

- 3.9.1 Aneurysms of the Ascending Aorta
 - Pathology
 - Diagnosis
 - Indications for operation
 - Operative techniques
 - Results of operation
- 3.9.2 Aneurysms of the Aortic Arch
 - Pathology
 - Clinical features and diagnosis
 - Indications for surgery
 - Surgical treatment
- 3.9.3 Descending Aortic Aneurysms
 - Pathology
 - Diagnosis
 - Treatment
 - Surgical technique
 - “Elephant Trunk” adjunctive procedures
 - Results
 - Major surgical complications
 - Endovascular stent-grafts
- 3.9.4 Dissections of the Aorta
 - Definition, incidence, aetiology
 - Anatomical and clinical classification
 - Pathology
 - Clinical presentation
 - Diagnosis
 - Acute dissections
 - Medical treatment
 - Surgical treatment

- Management of dissection-related acute complications
 - Intra-operative malperfusion syndrome
 - Fenestration and treatment of post-operative malperfusion
 - Stroke and paraplegia
 - Pulse deficits and limb ischaemia
 - Renal failure
 - Visceral ischaemia
 - Compression of the true lumen and pseudocoarctation
 - Controversies
 - Chronic dissections
 - Indications for surgery
 - Surgical treatment
- 3.9.5 Pulmonary Embolism
- Acute pulmonary thromboembolic disease
 - Prophylaxis
 - Supportive and thrombolytic therapy
 - Acute pulmonary embolectomy
 - Catheter removal of emboli
 - Caval interruption and Warfarin therapy
 - Chronic pulmonary thromboembolic disease
 - Diagnostic tests
 - Pulmonary thromboendarterectomy
 - Post-operative management
 - Results

4.0 SURGERY FOR CONGENITAL CARDIOVASCULAR DISEASE

4.1 General Principles

- 4.1.1 Cardiovascular Embryology
- 4.1.2 Pathogenesis of Malformations
- 4.1.3 Structural and Functional Diagnosis of Congenital Heart Disease
- 4.1.4 Cardiopulmonary Bypass, Hypothermia and Circulatory Arrest
- 4.1.5 Myocardial Preservation
- 4.1.6 Peri-operative Care

4.2 Aortic Arch Anomalies : Vascular Rings

- 4.2.1 Double Aortic Arch
- 4.2.2 Right Arch with Retro-Oesophageal Left Ligamentum Arteriosum
- 4.2.3 Left Arch with Right Descending Aorta and Right Ligamentum
- 4.2.4 Partial Vascular Rings
- 4.2.5 Pulmonary Artery Sling
- 4.2.6 Clinical Features and Diagnosis
- 4.2.7 Surgical Management

4.3 Patent Ductus Arteriosus

- 4.3.1 Anatomy and Variations, Pathophysiology
- 4.3.2 Clinical Features and Diagnosis
- 4.3.3 Natural History
- 4.3.4 Treatment
 - Initial therapy
 - Pharmacological
 - Surgery
 - Alternative procedures
 - Thoracoscopic closure
 - Transarterial catheter closure

- 4.4 **Coarctation of the Aorta**
 - 4.4.1 Embryology and Anatomy
 - 4.4.2 Natural History and Pathophysiology
 - 4.4.3 Diagnosis
 - 4.4.4 Surgical Techniques
 - 4.4.5 Balloon Angioplasty
 - 4.4.6 Complications of Repair
 - 4.4.7 Management of Recoarctation
 - 4.4.8 Hypoplastic Aortic Arch
 - Definition
 - Treatment
- 4.5 **Interrupted Aortic Arch**
 - 4.5.1 Embryology and Anatomical Classification
 - 4.5.2 Pathophysiology and Clinical Presentation
 - 4.5.3 Diagnosis
 - 4.5.4 Surgical Management
 - Staged repair
 - Single stage complete repair
- 4.6 **Aorto-Pulmonary Window**
 - 4.6.1 Embryology and Anatomical Classification
 - 4.6.2 Pathophysiology and Clinical Presentation
 - 4.6.3 Diagnosis
 - 4.6.4 Management
 - Medical
 - Surgical
- 4.7 **Sinus of Valsalva Aneurysms and Fistulae**
 - 4.7.1 Anatomy and Pathology
 - 4.7.2 Clinical Features
 - 4.7.3 Treatment
- 4.8 **Coronary Artery Anomalies**
 - 4.8.1 Anomalous Origin
 - Anomalous origin from the aorta
 - Anomalous origin from the pulmonary artery
 - 4.8.2 Anomalous Termination
 - Right, left, both or single coronary artery fistula with
 - Left-to-right shunt
 - Right-to-left shunt
 - Anomalous Course
 - Coronary Arterial Aneurysm
- 4.9 **Atrial Septal Defect**
 - 4.9.1 Embryology and Anatomy, Associated Lesions
 - 4.9.2 Pathophysiology
 - 4.9.3 Clinical Features
 - 4.9.4 Treatment
 - Catheter closure
 - Operative management
- 4.10 **Ventricular Septal Defect**
 - 4.10.1 Definition and Anatomical Classification
 - Membranous / Conoventricular
 - Outlet / Conal
 - Atrioventricular canal-type (inlet)
 - Muscular (trabecular)

- 4.10.2 Pathophysiology and Clinical Classification
 - Group 1 a b c
 - Group 2
 - Group 3 a b
- 4.10.3 Natural History
- 4.10.4 Diagnosis
- 4.10.5 Treatment
 - Catheter closure
 - Operative technique
 - Post-operative care
- 4.10.6 Associated Anomalies
- 4.10.7 Results
- 4.11 **Atrioventricular Canal (Septal) Defects**
 - 4.11.1 Embryology
 - 4.11.2 Anatomy
 - Partial
 - Transitional
 - Complete
 - Rastelli Classification
 - 4.11.3 Diagnosis and Surgery
 - Partial
 - Transitional
 - Complete – Two patch technique
 - Complete – Single patch (Classic or Modified)
 - 4.11.4 Post-operative Care
 - 4.11.5 Results
- 4.12 **Left Ventricular Outflow Tract Obstruction**
 - 4.12.1 Embryology and Anatomy
 - 4.12.2 Valvar Aortic Stenosis
 - 4.12.3 Subvalvar Aortic Stenosis
 - 4.12.4 Supravalvar Aortic Stenosis
- 4.13 **Tetralogy of Fallot**
 - 4.13.1 Anatomical Features
 - 4.13.2 Associated Anomalies and Fallot Variants
 - 4.13.3 Physiology and Clinical Presentation
 - 4.13.4 Natural History
 - 4.13.5 Diagnosis
 - 4.13.6 Surgical Treatment
 - Modified Blalock-Taussig shunt
 - Technique of complete repair
 - 4.13.7 Post-operative Care and Results
 - 4.13.8 Anatomical Subsets
 - Absent pulmonary valve syndrome
 - With atrioventricular septal defect
 - With anomalous course of coronary artery
- 4.14 **Pulmonary Stenosis with Intact Ventricular Septum**
 - 4.14.1 Critical Pulmonary Stenosis of the Neonate
 - Presentation and diagnosis
 - Management and intervention
 - 4.14.2 Pulmonary Stenosis in Infants, Children and Adults
 - Presentation and diagnosis
 - Intervention
 - 4.14.3 Pulmonary Valve Dysplasia
 - Presentation and diagnosis
 - Intervention
 - 4.14.4 Double Chamber Right Ventricle
 - Presentation and Diagnosis
 - Intervention

- 4.15 **Pulmonary Atresia with Intact Ventricular Septum**
 - 4.15.1 Aetiology and Morphology
 - 4.15.2 Pathophysiology
 - 4.15.3 Clinical Features, Diagnosis and Indications for Surgery
 - 4.15.4 Management
 - Initial surgical management
 - Subsequent management

- 4.16 **Pulmonary Atresia with Ventricular Septal Defect**
 - 4.16.1 Anatomical Classification and Diagnosis
 - 4.16.2 Clinical Presentation and Diagnosis
 - 4.16.3 Surgical Treatment
 - With MAPCA's
 - Unifocalisation (single / staged)
 - Without MAPCA's
 - Shunt
 - Primary repair results and conclusions
 - 4.16.5 Medical Treatment
 - 4.16.6 Percutaneous techniques

- 4.17 **Double Outlet Right Ventricle and Double Outlet Left Ventricle**
 - 4.17.1 Definition
 - 4.17.2 Embryology
 - 4.17.3 Anatomy
 - 4.17.4 Pathophysiological Classification
 - Tetralogy type
 - VSD type
 - TGA type
 - Non committed VSD type
 - 4.17.5 Diagnosis and Operation

- 4.18 **Transposition of the Great Arteries**
 - 4.18.1 Classification and Embryology
 - 4.18.2 Anatomical Anomalies
 - 4.18.3 Physiology, Presentation and diagnosis
 - 4.18.4 Medical Palliation of the Neonate
 - 4.18.5 Surgical Management
 - Palliative operations
 - Atrial repairs
 - Arterial repairs
 - Special situations
 - 4.18.6 Outcomes

- 4.19 **Congenitally Corrected Transposition of the Great Arteries**
 - 4.19.1 Natural History
 - 4.19.2 Surgical Anatomy
 - 4.19.3 Clinical Presentation and Diagnosis
 - 4.19.4 Medical Treatment
 - 4.19.5 Surgical Treatment
 - Palliative approach
 - Definitive treatment
 - Traditional surgical treatment
 - Alternative surgical approach

- 4.20 **Total Anomalous Pulmonary Venous Connection and Cor Triatriatum**
 - 4.20.1 Embryology and Anatomical Classification
 - 4.20.2 Pathophysiology and Diagnosis
 - 4.20.3 Surgical Technique
 - 4.20.4 Post-operative Management

- 4.21 **Truncus Arteriosus**
 - 4.21.1 Embryology and Anatomical Classification
 - 4.21.2 Associated Anomalies
 - 4.21.3 Pathophysiology and Diagnosis
 - 4.21.4 Treatment
 - Surgical technique
 - Special operative considerations
 - Truncal valve regurgitation
 - Interrupted aortic arch
 - Ventricular septal defect closure
 - Right ventricular tract reconstruction
 - 4.21.5 Post-operative Management
 - 4.21.6 Results
- 4.22 **Tricuspid Atresia**
 - 4.22.1 Anatomical Features
 - 4.22.2 Pathophysiology and Diagnosis
 - 4.22.3 Natural History
 - 4.22.4 Treatment
 - Medical management
 - Surgical procedures
 - Palliative operations
 - Glenn shunt
 - Fontan repair and its modifications
 - 4.22.5 Complications
- 4.23 **Hypoplastic Left Heart Syndrome**
 - 4.23.1 Anatomy
 - 4.23.2 Physiology
 - 4.23.3 Therapy
 - 4.23.4 Reconstructive Surgery
- 4.24 **Complex Functional Single Ventricle**
 - 4.24.1 Terminology and Anatomy
 - 4.24.2 Natural History
 - 4.24.3 Clinical Presentation
 - 4.24.4 Pre-operative Evaluation
 - 4.24.5 Surgical Treatment
 - Palliative procedures
 - Definitive procedures
- 4.25 **Congenital Anomalies of the Mitral Valve**
 - 4.25.1 Embryology
 - 4.25.2 Patho-anatomy
 - Congenital mitral stenosis
 - Congenital mitral regurgitation
 - 4.25.3 Pathophysiology
 - 4.25.4 Natural History
 - 4.25.5 Diagnosis
 - 4.25.6 Treatment
 - Techniques of mitral valve reconstruction
 - 4.25.7 Post-operative Complications
 - 4.25.8 Results
- 4.26 **Ebstein's Anomaly**
 - 4.26.1 Pathoanatomy
 - 4.26.2 Diagnosis
 - 4.26.3 Treatment
 - 4.26.4 Results

4.27 Palliative Procedures in Congenital Heart Disease

4.27.1 To Increase Pulmonary Blood Flow

- Blalock-Taussig (classical or modified)
- Central (aorta-to-pulmonary artery)
- Waterston (ascending aorta-to-right pulmonary artery)
- Potts (descending aorta-to-left pulmonary artery)
- Glenn (SVC-to-pulmonary artery)
- Bidirectional cavopulmonary anastomosis and Hemi- Fontan procedure
- Brock (pulmonary valvotomy and infundibulectomy)
- Outflow patch right ventricle – pulmonary artery outflow tract patch

4.27.2 To Decrease Pulmonary Blood Flow: Pulmonary Artery Banding

4.27.3 To Increase Pulmonary – Systemic Mixing

- Blalock-Hanlon atrial septectomy
- Mustard or Senning (intra-atrial venous transposition without closure of septal defect)

4.27.4 Transcatheter Methods

- Rashkind - rupture of membrane of fossa ovale by balloon catheter
- Park - atrial septostomy using catheter blade

4.28 Adult Congenital Heart Disease

4.28.1 Survival Patterns

- Natural survival
- Common defects in which survival to adulthood is expected
- Uncommon defects in which survival to adulthood is expected
- Common defects in which adult survival is exceptional
- Survival after cardiac surgery or interventional catheterisation

4.28.2 Medical Management of Congenital Heart Disease in the Adult

- Cyanotic congenital heart disease
- Infective endocarditis
- Pregnancy and congenital heart disease
- Medical management of the pregnant woman
- Medical management of the fetus

4.28.3 Cardiac Surgical Considerations in Adults with Congenital Heart Disease

- Operation and re-operation
- Cardiac catheterisation as a therapeutic intervention
- Non-cardiac surgery in adults with congenital heart disease
- Post-operative residua and sequelae

SUGGESTED TEXT⁶**1.0 BASIC SCIENCES****SUGGESTED TEXT****1.1 CORE SYLLABUS**

- Sabiston and Spencer Surgery of the Chest. Sellke FW, del Nido PJ, Swanson SJ. 2010 8th edition. (Look out for the 2016 9th edition which will replace the 8th edition). Elsevier Saunders.
- Johns Hopkins Medicine Textbook of Cardiothoracic Surgery. David D. Yuh, Luca A. Vricella, Stephen Yang, John R. Doty. 2014 2nd edition. McGraw Hill Education.
- Mastery of Cardiothoracic Surgery. Kaiser LR, Kron IL, Spray TL. 2014. 3rd edition. Lippincott, Williams & Wilkins.
- Glenn's Thoracic And Cardiovascular Surgery. Baue AE, Geha AS, Hammond GL, Laks H, Naunheim KS. 1996 Sixth edition. McGraw-Hill publishing.

1.2 ADULT CARDIAC SURGERY

- Cardiac Surgery – Recent Advances and Techniques. Moorjani N, Ohri SK, Wechsler AS. 2014. CRC Press
- Cardiac Surgery in the Adult. Lawrence H. Cohn. 4th edition. 2012. McGraw Hill Medical.
- Cardiac Surgery – Safeguards and Pitfalls in Operative Technique. Khonsari S, Sintek CF. 2008. 4th edition. Wolters Kluwer Health. Lippincott Williams & Wilkins.
- Manual of Peri-operative Care in Adult Cardiac Surgery. Bojar RM. 5th edition. 2011. Wiley-Blackwell.
- Cardiac Surgery Operative technique. Doty DB, Doty JR. 2nd edition. 2012. Elsevier Saunders.
- Kirklin / Barrat-Boyes Cardiac Surgery. Kouchoukos NT, Blackstone EH, Haley FL, Kirklin JK. 4th edition. 2013. Elsevier Saunders.

1.3 PAEDIATRIC CARDIAC SURGERY

- Comprehensive Surgical Management of Congenital Heart Disease. Jonas RA. 2014. 2nd edition. CRC Press.
- Paediatric Cardiac Surgery. Mavroudis C, Idriss F, Backer C. 2013. 4th edition. Wiley-Blackburn.
- Surgery for Congenital Heart Defects. Stark JF, De Leval M, Tsang VT. 2006. 3rd edition. Wiley.
- Cardiac Surgery of the Neonate and Infant. Castaneda AR, Jonas RA, Mayer JE, Hanley FL. 1994. Saunders

1.4 GENERAL THORACIC SURGERY

- General Thoracic Surgery. Shields T, LoCicero J, Reed CE, Feins RH. 2011. 7th edition. Lippincott Williams & Wilkins.
- (Look out for the Shields' General Thoracic Surgery. Locicero J. 2016. 8th edition which will replace the 7th edition)
- Thoracic Surgery Atlas. Ferguson MK. 2008. Saunders.

1.5 SPECIFIC EXAMINATION PREPARATION

- Key questions in Cardiac Surgery. Moorjani N, Viola N, Ohri SK. 2011. Tfm Publishing Limited.
- Key questions in Congenital Cardiac Surgery. Moorjani N, Viola N, Caldarone C. 2015. Tfm Publishing Limited.
- Key questions in Thoracic Surgery. Moorjani N, Viola N, Walker S. 2015. Tfm Publishing Limited.
- Oxford specialist handbook in Cardiothoracic Surgery. Chikwe J, Cooke D, Weiss A. 2013. 2nd edition. Oxford University Press.
- Cardiothoracic Surgery Review. Franco KL, Thourani VH. 2012. Lippincott Williams & Wilkins, Wolters Kluwer.
- TSRA (Thoracic Surgery Residence Association) Review of Cardiothoracic Surgery. Mery CM, Turek JW. 2011. CreateSpace Independent Publishing Platform.
- TSRA Review of Cardiothoracic Surgery. Mery C. 2015. CreateSpace Independent Publishing Platform.

2.0 SELECTED READING

Although some of the texts listed below are out of print, the usefulness of such books in the elucidation of basic concepts, warrants a search in Medical Libraries, Internet (amazon.com) etc. for their availability

2.1 Surgical Anatomy of the Lung and Chest Wall

- Shields T.W., (Ed) : General Thoracic Surgery, Lea and Febyer Philadelphia.
- Spencer H., (Ed) : Pathology of the Lung Vol I Pergamon Press

2.2 Surgical Anatomy of the Heart and Blood Vessels

- Wilcox R.B., Cook AC, Anderson R.H. (Ed) : Surgical Anatomy of the Heart. Gower Medical Publishing, 3rd edition. 2007. Cambridge.
- Anderson R.H., Becker A.E. (Ed) : Cardiac Anatomy. Gower Medical Publishing, 1980 Churchill Livingstone
- Baue A.E., et al (Ed) : Glens' Thoracic and Cardiovascular Surgery. Appleton & Lange, 1991
- Kirklin J.W., and Barratt-Boyes B.G. : Cardiac Surgery. New York. John Wiley & Sons, 1986
- Stark J., and de Leval M. (Eds) : Surgery for Congenital Heart Defects. New York, Grunne & Stratton, 1983

2.3 Pulmonary Physiology and Assessment of Pulmonary Function

- Spencer H. (Ed) : Pathology of the Lung Vol 1 Pergamon Press
- Shields T.W. (Ed) : General Thoracic Surgery, Lea and Febyer Philadelphia
- Sabiston D.C., Spencer F.C. (Eds) : Surgery of the Chest (5th Ed) W.B. Saunders Co.
- Miller R.D. (Ed) : Anaesthesia. Vol 1 Churchill Livingstone
- Scurr C., Feldman S. (Eds) : Scientific foundations of Anaesthesia (4th Ed) W. Heinemann Medical Books Ltd.
- Wanger J. : Pulmonary Function Testing

2.4 Cardiovascular Physiology

- Dubin D. : Rapid interpretation of the ECG. 6th edition November 2000
- Schrire V., Chester E. : Schrire's Clinical Cardiology. Elsevier 1981
- Smith J.J., Kampine J.P. (Eds) : Circulatory Physiology. Williams and Wilkins

2.5 Cardiopulmonary Bypass

- Cardiopulmonary Bypass (Cambridge Clinical Guides). Ghosh S, Falter F, Cook DJ. 2009. Cambridge Medicine.
- Cardiopulmonary Bypass: Principles and technique of extra-corporeal circulation. Guyton PG, More CT. 2011. Springer-Verlag.
- Hensley F.A., Martin D.E. (Eds) : The Practice of Cardiac Anaesthesia. Little Brown and Company. 1990.
- Casthley P.A., Bregman D. (Eds) : Cardiopulmonary Bypass; Futura Publishing Co, Inc New York 1991

2.6 Myocardial Preservation

- Cardiac Anesthesia. Hensley FA, Martin DE, Gravlee GP. 5th edition. 2013. Lippincott Williams & Wilkins.
- Hensley F.A., Martin D.E. (Eds) : The Practice of Cardiac Anaesthesia. Little Brown and Co. 1990
- Casthley P.A., Bregman D. (Eds) : Cardiopulmonary Bypass; Futura Publishing Co, Inc New York 1991

2.7 Cardiovascular Pharmacology

- Opie L.H. (Ed), Gersh BJ : Drugs for the Heart. Elsevier Saunders. 8th edition. 2013.
- Hensley F.A., Martin D.E. (Eds) : The Practice of Cardiac Anaesthesia. Little Brown and Co. 1990
- Cohen J.R. : Vascular Surgery for the House Officer. Williams and Wilkins 1986

2.8 Diagnostic and Therapeutic Procedures in Cardiac Surgery

- Sabiston and Spencer Surgery of the Chest. Sellke FW, del Nido PJ, Swanson SJ. 2010 8th edition
- Heger LW, Nieman JT, Criley JM : Cardiology for the House Officer. 5th edition. 2003. Lippincott Williams & Wilkins.

2.9 Chest wall

- le Roux B.T., Shama D.M. : Resection of tumours of the Chest wall. Curr. in Surg. 83 June 20(6) 345-386

2.10 Pleuro-pulmonary Suppuration

- le Roux B.T., Mohlala M.L., Odell J., Whitton I.D. : Suppurative diseases of the lung and pleural space I : Emyema thoracis and lung abscess. Curr. Prob. in Surg. 86 January 23(1) 1-89
- le Roux B.T., Mohlala M.L., Odell J., Whitton I.D. : Suppurative diseases of the lung and pleural space II. Bronchiectasis. Curr. Prob. in Surg. 86 January 23(2) 94-159

2.11 Mediastinum

- le Roux B.T., Kallichurum S., Shama D.M. : Mediastinal cysts and tumours. Curr. Prob. in Surg. 84 November 21(11) 1-77

2.12 Oesophagus

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- Thorax
- Heart

A P P E N D I X D

GUIDELINES FOR CANDIDATES

(Website link to be inserted for the guidelines and appeals mechanism)

Appeals Mechanism

https://www.cmsa.co.za/force_download.aspx?documentid=1732

A P P E N D I X E

PORTFOLIO OF LEARNING

(Website link)

https://www.cmsa.co.za/view_exam.aspx?QualificationID=2 Cardio(SA) Portfolio