examination ANAESTHESIA

A GUIDE TO THE FINAL FANZCA EXAMINATION

Christopher Thomas and Christopher Butler
Examination
Anaesthesia
Dedication

To: Janet, John and Nick Butler
Jo Potts
Abigail and George Thomas
Foreword

Assessment of knowledge in a formal summative examination is a daunting and threatening process for the learner. This is further magnified when the stakes are high, as with the final examination of the Australian and New Zealand College of Anaesthetists (ANZCA). The exam requires the candidates to consider many aspects of life and social structure beyond just acquiring and using knowledge and gaining expertise. Performance at the test requires the candidate to possess knowledge, as well as understand the nature and process of the examination.

There is a relative paucity of information on this process and most is passed down by previous candidates. This book provides the required information and gives guidance on how to prepare for what appears to be a mammoth task for the learner. It will help candidates manage the stress and the emotional rollercoaster of studying for the exam by providing valuable hints and examples. This second edition concentrates solely on the anaesthetic exam, thus eliminating any confusion between the anaesthetic and intensive care exams.

I recommend this book to all ANZCA trainees and International Medical Graduate Specialists in anaesthesia preparing for the final exam. It will also prove useful for educators who take time to teach and prepare potential candidates, as well as those organising courses related to the examination.

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# Contents

Acknowledgement xv  
Foreword vii  
Preface xiii  
List of abbreviations xvii  

## Chapter 1  Overview of the FANZCA final examination  
1  
FANZCA training scheme 1  
Format of the final examination 2  
Timing and location 2  
The written examination 3  
Multiple choice paper 3  
Short answer paper 4  
The clinical examination 5  

## Chapter 2  Preparation for the final examination  
9  
Resources 9  
The college website 9  
Curriculum 10  
Past papers 10  
Professional documents 11  
Final examination preparation resource 12  
Textbooks 12  
Journals 16  
Resuscitation guidelines 17  
Courses 17  
Preparation strategies 19  
Philosophy 19  
Timing 20  
Study groups 20  
Looking after yourself 21  
Coping with failure 21  

## Chapter 3  The written examination  
23  
Overview 23  
Performances strategies 23  
Multiple choice questions (MCQ) 24  
Short answer questions (SAQ) 25  
Written examination topics 26  
Airway management 26  
Ambulatory anaesthesia 26  
Anaesthetic equipment 27  
Applied anatomy 27  
Applied physiology and pharmacology 28  
Crisis management 28  
Intensive care topics 29  
Monitoring 29  
Neuroanaesthesia 30
Contents

Obstetric anaesthesia 30
Paediatric and neonatal anaesthesia 30
Pain management 31
Perioperative medicine 31
Regional anaesthesia 32
Remote location anaesthesia 33
Statistics and research 33
Transfusion medicine 33
Trauma anaesthesia 33
Vascular anaesthesia 34
Welfare, consent and quality assurance issues 34

Chapter 4  The medical vivas 35
Overview 35
Performance strategies 35
Patient assessment stations 37
  1. The patient with aortic valve stenosis 37
  2. The patient with ischaemic heart disease 39
  3. The patient with hypertension 41
  4. The patient with a permanent pacemaker/implantable defibrillator 43
  5. The patient with peripheral vascular disease 46
  6. The patient with chronic obstructive pulmonary disease 48
  7. The patient with pulmonary fibrosis 50
  8. The patient with diabetes 52
  9. The patient with thyroid disease 54
 10. The patient with pituitary disease 55
 11. The patient with morbid obesity/obstructive sleep apnoea 57
 12. The patient with a spinal injury 59
 13. The patient with muscular dystrophy 61
 14. The patient with multiple sclerosis 63
 15. The patient with myasthenia gravis 64
 16. The patient with chronic renal impairment 65
 17. The patient with chronic liver disease 67
 18. The patient with an organ transplant 69
 19. The patient with rheumatoid arthritis 71
 20. The patient with ankylosing spondylitis 73
 21. The patient with trisomy 21 74

Chapter 5  The anaesthesia vivas 77
Overview 77
Performance strategies 77
The viva 78
Anaesthesia viva topics 82
  Airway 82
  Blood transfusion/coagulation 83
  Burns 84
  Cardiothoracic anaesthesia 84
  Co-existing disease 84
  Complications of anaesthesia 87
  Data interpretation 87
Contents

Emergency/crisis situations 88
ENT/maxillofacial/thyroid surgery 89
Equipment/environment 90
General surgery 90
Intensive care 90
Neurosurgical anaesthesia 90
Obstetrics and gynaecology 91
Orthopaedics 93
Paediatric anaesthesia 94
Pain management 95
Regional anaesthesia 96
Remote locations 96
Trauma 97
Vascular surgery 98
Welfare and professional issues 98

Chapter 6 Data interpretation for the ANZCA examination 100
Overview 100
1. Electrocardiography 101
2. Chest radiography 119
3. Neck radiography 138
   Neck trauma 138
   Flexion/extension views 142
4. Computed tomography (CT) 143
   Head and neck CT 143
   Chest CT 146
   Abdominal CT 149
5. Magnetic resonance imaging (MRI) 150
   Basic physics 150
   Types of magnetic resonance image 150
6. Echocardiography 155
   How to interpret the report 155
   Which numbers matter and what do they mean? 156
   Summary 158
7. Arterial blood gas analysis 166
   Overview 166
   Ancillary calculations 166
8. Coagulation studies 169
   Overview 169
   Prothrombin time (PT) 170
   Activated partial thromboplastin time (aPTT) 170
   Platelet count 170
   Fibrinogen 171
   Platelet function 171
   Thromboelastography (TEG) 172
   Activated coagulation (clotting) time (ACT) 173
9. Full blood count examination 175
   Haemoglobin 176
   White cell count 177
   Platelets 178
## Contents

10. Urea and electrolytes 178
   - Overview 178
   - Sodium ($\text{Na}^+$) 178
   - Potassium ($\text{K}^+$) 179
   - Chloride ($\text{Cl}^-$) 180
   - Bicarbonate ($\text{HCO}_3^-$) 180
   - Calcium ($\text{Ca}^+$) 181
   - Urea and creatinine 181

11. Respiratory function tests 182
   - Spirometry 183
   - Reversibility of airway obstruction 184
   - Flow–volume loops 185
   - DLCO diffusion studies 187

12. Sleep studies 187
   - The sleep study 188
   - Interpretation of the sleep study 188
   - Answers to data interpretation cases 191
   - Electrocardiography 191
   - Chest radiography 194
   - Echocardiography 195
   - Arterial blood gas analysis 196
   - Coagulation studies 197

### Chapter 7 Useful reference and review articles 198
   - Overview 198
   - Airway management and spinal injury 198
   - Allergy and anaphylaxis 200
   - Anaesthesia and co-existing disease 200
   - Anaesthesia and specific situations 206
   - Cardiac anaesthesia 206
   - Cardiovascular risk and myocardial protection in anaesthesia 207
   - Coagulation and anaesthesia 210
   - Complications and consent in anaesthesia 211
   - Endocrine disease and anaesthesia 215
   - Intensive care topics 216
   - Monitoring and equipment in anaesthesia 217
   - Muscle disorders and anaesthesia 219
   - Neuroanaesthesia 219
   - Obstetric anaesthesia 220
   - Ophthalmic anaesthesia 222
   - Orthopaedic anaesthesia 222
   - Paediatric anaesthesia 223
   - Pain management 225
   - Pharmacology and anaesthesia 226
   - Regional anaesthesia 228
   - Remote locations and anaesthesia 230
   - Thoracic anaesthesia 231
   - Transfusion medicine 231
   - Vascular anaesthesia 232

Index 217
Preface

The concept of a guide to approaching a fellowship examination in a medical specialty is not a new one. For as long as examinations have existed, tips and tricks have been passed down from one generation of candidates to the next. The Australian and New Zealand College of Anaesthetists’ final fellowship examination is no exception, and much of the inspiration for this book comes from others who have attempted to ease the pain of past examination candidates, most notably Dr Gabriel Marfan, whose remembered preparation and exam experiences from the late 1990s formed the ‘Gabe Files’, still accessible online. Many other skilled mentors throughout Australasia and the Pacific region have provided invaluable guidance and encouragement for each new generation of anaesthetists approaching the last major hurdle that leads to the FANZCA finish line.

Examination Intensive Care and Anaesthesia was written in 2006, and contained the first incarnation of the volume you now hold. It was the brainchild of Carole Foot and Nikki Blackwell of intensive care fame, who co-opted one of the current authors to provide chapters and information relevant to anaesthesia. The preface of that book contained the prophetic statement: ‘As intensive care continues to develop its own identity … the concept of a combined guide to the examination process for intensivists and anaesthetists will become outmoded.’ On 1 January 2010 the College of Intensive Care Medicine was established as an independent entity. By the time this book has been published Examination Intensive Care will also be in production.

The format of the ANZCA final examination has evolved in the last few years, and this update to the exam guide aims to keep pace with those developments. The format, venues, relative weighting and timing of examination components have changed; these are reflected in the overview to the final examination presented in Chapter 1. Useful resources, including new developments on the college website, and strategies for restructuring life around exam preparation are provided in Chapter 2.

Separate chapters based on the major components of the written and clinical exams aim to provide both performance strategies and real examples of the types of questions encountered in the examination. To this end, the last 5 years of written short-answer questions and viva topics have been dissected and sorted under major topic headings. Examples of the types of cases encountered in the medical vivas are given, along with a structured approach to history-taking and examination of such patients, and topics for discussion that candidates might expect in the actual exam.

Despite the culling of the data interpretation viva from the examination format, the ability to interpret common investigations remains a rigorously evaluated attribute through all phases of the examination. The data interpretation section in Chapter 6 aims to provide a structured approach to such investigations, with clinically relevant examples similar to those encountered in the exam.

Finally, a selection of useful references and reviews is provided to serve as the nucleus for candidates’ own research and self-directed study.

Those looking for the universal panacea to the final exam will not find all the answers in this book. Candidates will, however, find advice on how to discover the answers more efficiently for themselves, which is infinitely more useful. The biggest enemy
when preparing for the final examination is the inability to effectively manage one's time. It is hoped that the information provided in this volume will both consolidate knowledge and save candidates some of that most precious resource.

We wish candidates all the best in their endeavours.

Chris Thomas
Chris Butler
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Finally, we wish to acknowledge the efforts of the editorial team at Elsevier in obtaining the relevant permissions from external sources for many of the radiological images which appear in Chapter 6, ‘Data interpretation for the ANZCA examination’.
Disclaimer

The authors have taken considerable care in ensuring the accuracy of the information contained in this book. However, the reader is advised to check all information carefully before using it to make management decisions in clinical practice. The authors take no responsibility for any errors (including those of omission) that may be contained herein, nor for any misfortune befalling any individual as the result of action taken using information in this book.

Please note that the opinions expressed in this book are entirely those of the authors, and are in no way intended to reflect or represent those of the Australian and New Zealand College of Anaesthetists; its Joint Faculties past or present; Court of Examiners; Special Interest Groups; subcommittees; other trainees or fellows.

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List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-a</td>
<td>Alveolar–arterial</td>
</tr>
<tr>
<td>AAA</td>
<td>Abdominal aortic aneurysm</td>
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<tr>
<td>ABG</td>
<td>Arterial blood gas</td>
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<tr>
<td>ACE</td>
<td>Angiotensin converting enzyme</td>
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<td>ACT</td>
<td>Activated coagulation (clotting) time</td>
</tr>
<tr>
<td>ADH</td>
<td>Antidiuretic hormone</td>
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<tr>
<td>ADP</td>
<td>Adenosine diphosphate</td>
</tr>
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<td>AF</td>
<td>Atrial fibrillation</td>
</tr>
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<td>AG</td>
<td>Anion gap</td>
</tr>
<tr>
<td>AHA</td>
<td>American Heart Association</td>
</tr>
<tr>
<td>AICD</td>
<td>Automatic implanted cardioverter defibrillator</td>
</tr>
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<td>AIDS</td>
<td>Acquired immune deficiency syndrome</td>
</tr>
<tr>
<td>ANZCA</td>
<td>Australian and New Zealand College of Anaesthetists</td>
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<tr>
<td>AP</td>
<td>Antero-posterior</td>
</tr>
<tr>
<td>aPTT</td>
<td>Activated partial thromboplastin time</td>
</tr>
<tr>
<td>ARDS</td>
<td>Acute (adult) respiratory distress syndrome</td>
</tr>
<tr>
<td>AS</td>
<td>Aortic stenosis</td>
</tr>
<tr>
<td>ASA</td>
<td>American Society of Anaesthesiologists</td>
</tr>
<tr>
<td>ASD</td>
<td>Atrial septal defect</td>
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<tr>
<td>ATLS</td>
<td>Advanced trauma life support</td>
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<td>A-V</td>
<td>Arterio-venous</td>
</tr>
<tr>
<td>A-V</td>
<td>Atrio-ventricular</td>
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<td>AVA</td>
<td>Aortic valve area</td>
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<tr>
<td>BIS</td>
<td>Bispectral index</td>
</tr>
<tr>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td>BNP</td>
<td>Type B natriuretic peptide</td>
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<tr>
<td>BP</td>
<td>Blood pressure</td>
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<td>BPEG</td>
<td>British Pacing Electrophysiology Group</td>
</tr>
<tr>
<td>BSL</td>
<td>Blood sugar (glucose) level</td>
</tr>
<tr>
<td>BTPS</td>
<td>Body temperature and pressure saturated with water vapour</td>
</tr>
<tr>
<td>BTY</td>
<td>Basic training year</td>
</tr>
<tr>
<td>CABG</td>
<td>Coronary artery bypass graft</td>
</tr>
<tr>
<td>CAD</td>
<td>Coronary artery disease</td>
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<tr>
<td>CCF</td>
<td>Congestive cardiac failure</td>
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<tr>
<td>CEA</td>
<td>Carotid endarterectomy</td>
</tr>
<tr>
<td>CK</td>
<td>Creatine kinase</td>
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<tr>
<td>CNS</td>
<td>Central nervous system</td>
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<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic obstructive pulmonary disease</td>
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<tr>
<td>COX</td>
<td>Cyclo-oxygenase</td>
</tr>
<tr>
<td>CPR</td>
<td>Cardiopulmonary resuscitation</td>
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<tr>
<td>Cr</td>
<td>Creatinine</td>
</tr>
<tr>
<td>CSF</td>
<td>Cerebrospinal fluid</td>
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<tr>
<td>CT</td>
<td>Computed tomography</td>
</tr>
<tr>
<td>CTR</td>
<td>Cardiothoracic ratio</td>
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<tr>
<td>CVC</td>
<td>Central venous catheter</td>
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<tr>
<td>CXR</td>
<td>Chest X-ray</td>
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<tr>
<td>DC</td>
<td>Direct current</td>
</tr>
<tr>
<td>DDAVP</td>
<td>Desmopressin</td>
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<tr>
<td>DIC</td>
<td>Disseminated intravascular coagulation</td>
</tr>
<tr>
<td>DKA</td>
<td>Diabetic ketoacidosis</td>
</tr>
<tr>
<td>DLCO</td>
<td>Diffusion capacity for carbon monoxide</td>
</tr>
<tr>
<td>DLT</td>
<td>Double-lumen tube</td>
</tr>
<tr>
<td>ECG</td>
<td>Electrocardiograph</td>
</tr>
<tr>
<td>ECT</td>
<td>Electroconvulsive therapy</td>
</tr>
<tr>
<td>EDTA</td>
<td>Ethylenediaminetetraacetic acid</td>
</tr>
<tr>
<td>EDH</td>
<td>Extrudural haematoma</td>
</tr>
<tr>
<td>EEG</td>
<td>Electroencephalogram</td>
</tr>
<tr>
<td>EF</td>
<td>Ejection fraction</td>
</tr>
<tr>
<td>EMAC</td>
<td>Effective Management of Anaesthetic Crises</td>
</tr>
<tr>
<td>EMG</td>
<td>Electromyogram</td>
</tr>
<tr>
<td>EMLA</td>
<td>Eutectic mixture of local anaesthetics</td>
</tr>
<tr>
<td>EMST</td>
<td>Early Management of Severe Trauma</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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</tr>
<tr>
<td>ENT</td>
<td>Ear, Nose and Throat (Otorhinolaryngology)</td>
</tr>
<tr>
<td>EOG</td>
<td>Electrooculogram</td>
</tr>
<tr>
<td>EPS</td>
<td>Electrophysiological study</td>
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<tr>
<td>ERCP</td>
<td>Endoscopic retrograde cholangiopancreatography</td>
</tr>
<tr>
<td>ETCO₂</td>
<td>End-tidal carbon dioxide</td>
</tr>
<tr>
<td>ETT</td>
<td>Endotracheal tube</td>
</tr>
<tr>
<td>FANZCA</td>
<td>Fellowship of the Australian and New Zealand College of Anaesthetists</td>
</tr>
<tr>
<td>FBC</td>
<td>Full blood count</td>
</tr>
<tr>
<td>FEF&lt;sub&gt;25–75&lt;/sub&gt;</td>
<td>Forced expiratory flow in middle half of forced vital capacity</td>
</tr>
<tr>
<td>FESS</td>
<td>Functional endoscopic sinus surgery</td>
</tr>
<tr>
<td>FEV₁</td>
<td>Forced expiratory volume in one second</td>
</tr>
<tr>
<td>FiO₂</td>
<td>Fraction of inspired oxygen</td>
</tr>
<tr>
<td>FOI</td>
<td>Fibre-optic intubation</td>
</tr>
<tr>
<td>FS</td>
<td>Fractional shortening</td>
</tr>
<tr>
<td>FVC</td>
<td>Forced vital capacity</td>
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<td>GA</td>
<td>General anaesthesia</td>
</tr>
<tr>
<td>GCS</td>
<td>Glasgow coma score</td>
</tr>
<tr>
<td>GFR</td>
<td>Glomerular filtration rate</td>
</tr>
<tr>
<td>Hb</td>
<td>Haemoglobin</td>
</tr>
<tr>
<td>HbA₁c</td>
<td>Glycosylated haemoglobin</td>
</tr>
<tr>
<td>HCO₃</td>
<td>Bicarbonate</td>
</tr>
<tr>
<td>HIV</td>
<td>Human Immunodeficiency virus</td>
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<tr>
<td>HOCM</td>
<td>Hypertrophic obstructive cardiomyopathy</td>
</tr>
<tr>
<td>HONK</td>
<td>Hyperosmolar non-ketotic coma</td>
</tr>
<tr>
<td>HT</td>
<td>Hypertension</td>
</tr>
<tr>
<td>IABP</td>
<td>Intra-aortic balloon pump</td>
</tr>
<tr>
<td>ICP</td>
<td>Intracranial pressure</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive care unit</td>
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<tr>
<td>IHD</td>
<td>Ischaemic heart disease</td>
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<td>INR</td>
<td>International normalised ratio</td>
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<tr>
<td>IV</td>
<td>Intravenous</td>
</tr>
<tr>
<td>IVS</td>
<td>Interventricular septum</td>
</tr>
<tr>
<td>JVP</td>
<td>Jugular venous pressure</td>
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<tr>
<td>LA</td>
<td>Left atrium</td>
</tr>
<tr>
<td>LMA</td>
<td>Laryngeal mask airway</td>
</tr>
<tr>
<td>LSCS</td>
<td>Lower (uterine) segment</td>
</tr>
<tr>
<td>LVDs</td>
<td>Systolic diameter of left ventricle</td>
</tr>
<tr>
<td>LVOT</td>
<td>Left ventricular outflow tract</td>
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<tr>
<td>MA</td>
<td>Maximum amplitude</td>
</tr>
<tr>
<td>MCV</td>
<td>Mean corpuscular volume</td>
</tr>
<tr>
<td>MI</td>
<td>Myocardial infarct</td>
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<tr>
<td>MRI</td>
<td>Magnetic resonance imaging</td>
</tr>
<tr>
<td>MS</td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>MV</td>
<td>Mitral valve</td>
</tr>
<tr>
<td>MVA</td>
<td>Motor vehicle accident</td>
</tr>
<tr>
<td>NASPE</td>
<td>North American Society of Pacing and Electrophysiology</td>
</tr>
<tr>
<td>NCA</td>
<td>Nurse controlled analgesia</td>
</tr>
<tr>
<td>NEXUS</td>
<td>National Emergency X-Radiography Utilization Study</td>
</tr>
<tr>
<td>NIDDM</td>
<td>Non-insulin dependent diabetes mellitus</td>
</tr>
<tr>
<td>NNT</td>
<td>Number needed to treat</td>
</tr>
<tr>
<td>NOF</td>
<td>Neck of femur</td>
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<tr>
<td>NSAID</td>
<td>Non-steroidal anti-inflammatory drug</td>
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<tr>
<td>NSTEMI</td>
<td>Non st-elevation myocardial infarct</td>
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<tr>
<td>NYHA</td>
<td>New York Heart Association</td>
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<tr>
<td>O₂</td>
<td>Oxygen</td>
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<tr>
<td>OCP</td>
<td>Oral contraceptive pill</td>
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<tr>
<td>OP</td>
<td>Occipito posterior</td>
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<tr>
<td>ORIF</td>
<td>Open reduction and internal fixation</td>
</tr>
<tr>
<td>OSA</td>
<td>Obstructive sleep apnoea</td>
</tr>
<tr>
<td>OT</td>
<td>Operating theatre</td>
</tr>
<tr>
<td>PA</td>
<td>Postero-anterior</td>
</tr>
<tr>
<td>PAC</td>
<td>Pulmonary artery catheter</td>
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<tr>
<td>PACU</td>
<td>Post-anaesthesia care unit</td>
</tr>
<tr>
<td>PCA</td>
<td>Patient-controlled analgesia</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>pCO₂</td>
<td>Partial pressure of carbon dioxide</td>
</tr>
<tr>
<td>PDA</td>
<td>Patent ductus arteriosus</td>
</tr>
<tr>
<td>PDPH</td>
<td>Post dural puncture headache</td>
</tr>
<tr>
<td>PEF</td>
<td>Peak expiratory flow</td>
</tr>
<tr>
<td>PEG</td>
<td>Percutaneous endoscopic gastrostomy</td>
</tr>
<tr>
<td>PFA</td>
<td>Platelet function analyser</td>
</tr>
<tr>
<td>PHT</td>
<td>Pulmonary hypertension</td>
</tr>
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<td>PICC</td>
<td>Peripherally inserted central catheter</td>
</tr>
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<td>PIF</td>
<td>Peak inspiratory flow</td>
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<td>PMET</td>
<td>Prevocational medical education and training</td>
</tr>
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<td>pO₂</td>
<td>Partial pressure of oxygen</td>
</tr>
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<td>PONV</td>
<td>Postoperative nausea and vomiting</td>
</tr>
<tr>
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<td>Postpartum haemorrhage</td>
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<td>PPM</td>
<td>Permanent pacemaker</td>
</tr>
<tr>
<td>PR</td>
<td>Pulse rate</td>
</tr>
<tr>
<td>PS</td>
<td>Professional standards</td>
</tr>
<tr>
<td>PT</td>
<td>Prothrombin time</td>
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<td>PTE</td>
<td>Pulmonary thromboembolism</td>
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<td>PVD</td>
<td>Peripheral vascular disease</td>
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<td>Corrected QT interval</td>
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<td>Right atrium</td>
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<td>RDI</td>
<td>Respiratory disturbance index</td>
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<td>RERA</td>
<td>Respiratory effort related arousal</td>
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<td>REM</td>
<td>Rapid eye movement</td>
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<td>Respiratory function tests</td>
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<td>Rotational thromboelastography</td>
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<td>Residual volume</td>
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<td>Short answer question</td>
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<td>Subdural haematoma</td>
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<td>Syndrome of inappropriate antidiuretic hormone secretion</td>
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<td>Supraventricular tachycardia</td>
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<td>Thromboelastograph</td>
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<td>Total lung capacity</td>
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<td>Tranoesophageal echocardiography</td>
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<td>tPA</td>
<td>Tissue plasminogen activator</td>
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<td>Transthoracic echocardiography</td>
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<td>Tricuspid valve</td>
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<td>Urea and electrolytes</td>
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<td>Urokinase</td>
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<td>Ventricular fibrillation</td>
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<td>Ventricular septal defect</td>
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<td>Velocity-time integral</td>
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<td>White cell count</td>
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<td>Wolff-Parkinson-White</td>
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<tr>
<td>XR</td>
<td>X-ray</td>
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</table>
Chapter 4

The medical vivas

The worst time to have a heart attack is during a game of charades.

DEMETRI MARTIN

Overview

The medical vivas take place the day after the written examination, and consist of two 18-minute examination stations involving a clinical encounter with a real patient. The medical vivas evaluate candidates’ ability to perform an appropriate preoperative assessment. They must take a relevant history, perform a focused examination eliciting physical signs and review investigation results, allowing them to enter into a discussion of the pathophysiology and functional reserve of the patient in relation to the risks of anaesthesia.

Marks in this component of the exam are allocated for the appropriateness of the history-taking and whether key symptoms are elicited. Candidates are expected to listen to the patient and also respond to their non-verbal cues. In the examination stage, candidates are marked on an examination technique which is sequential and logical, and which elicits key signs. Professionalism is also judged, and candidates are expected to show patients respect, with concern for their comfort and modesty. Finally, an organised and efficient presentation of findings is expected; candidates must show good knowledge of the medical condition present and its implications for anaesthesia.

The medical viva seems to have changed subtly in its emphasis over the years. In the past it was purely medical history and examination without much anaesthesia flavour, but it is now more likely to include discussions about the anaesthesia implications of the condition. The candidate should be prepared for this. You are generally not expected to examine specific anaesthesia areas of interest, such as the airway, unless it is a specific problem with the condition. For example, the case of a patient with aortic stenosis undergoing cardiovascular examination would probably not require comment about their airway, whereas that of a patient with rheumatoid arthritis probably would.

Performance strategies

Many candidates find this component of the examination the most stressful, in both its preparation and its execution. In essence, this is what trainees spend their working lives doing, so why is this part of the exam so intimidating? Firstly,
there is significant time pressure in the patient evaluation stations, and many candidates worry about being rushed and missing critical historical information or examination signs, evoking memories of difficult medical short cases performed in undergraduate examinations. This pressure has been relieved somewhat in recent years with the extension of the viva time to 18 minutes. Specific preparation for this section of the examination is often neglected as candidates concentrate on the sections of the written examination.

One of the most common criticisms of candidates is that their interrogation and examination techniques lack polish. Part of the reason for this is that most of us become used to a non-physician-like patient assessment which is not directed at a single organ system. We take significant and calculated shortcuts, often dictated by the time pressure of a large room of patients at a busy outpatient clinic. It is unusual for an anaesthetist to examine individual organ systems in turn.

It is therefore important to specifically practise for this part of the examination. Where possible, perform a single-system examination on preoperative patients to refresh any long-forgotten techniques and sequences. It is important to have a smooth examination technique for cardiovascular, respiratory, neurological and endocrine systems, and examination of the abdomen. Enlist the help of colleagues to find patients you can practise upon. Subject yourself to the scrutiny of your physician and intensivist colleagues in examination conditions as often as you can. Textbooks on physical examination, such as those by Talley and O'Connor (see Chapter 2 for details), are essential revision.

The only equipment you will need to bring with you to the medical vivas is a stethoscope. Before the day of the exam it is worth checking the patency of your stethoscope from the diaphragm to the earpieces, especially if it has lain idle for a period of time. Also remember to wash your hands before and after seeing each patient. This is commonsense, good hygiene and displays an appropriate degree of professionalism.

During the two-minute perusal time before the viva commences, write down the name and age of the patient, which will be provided on the door. A limited clinical history (which may include a list of medications) is often provided before you enter the room, and may offer some clues as to the clinical scenario to be encountered. It is important to concentrate on the instructions that have been provided very carefully, as your enquiries and examination will be directed towards a specific system or component thereof.

Candidates tend to employ one of two techniques in the medical vivas. The first and most common of these is to perform the history-taking and examination sequentially. The advantage of this approach is that it may be more familiar and comfortable for candidates. The second approach is to take the history and perform the examination simultaneously. This method is more efficient and allows for more information to be gleaned in the small amount of time allowed. It is technically more demanding, however, and trainees who plan to use this method will need to practise it many times. They must also be wary of missing important clues from the history or examination because of the distraction of performing both together.

The examiners’ reports in the past have been scathing of candidates who have not shown good interpersonal skills with patients. You must always be friendly and polite, and listen carefully to what the patient has to say. Be respectful of their modesty during the examination process, and under no circumstances do anything that will be uncomfortable for the patient or hurt them. Always thank the patient
before leaving them for the discussion. On rare occasions the viva examinations will enlist the use of inpatients who are very unwell, and whose condition may deteriorate during the exam itself. If your patient should become unwell/collapse/lose consciousness/arrest, then immediately discard the trappings of pretence of the examination and alert the examiner to the situation. Do what you can to help given the resources available to you.

Remember you have only eight or nine minutes to carry out your history and examination, so you must be focused in your approach. Always remember to ask about previous anaesthesias and a list of medications (if not provided earlier), and always try to ascertain the functional status of the patient and whether or not they are fully optimised. Patients are not instructed to withhold any information, and are often quite good at providing you with a succinct, relevant summary of their condition. It is perfectly acceptable to ask a patient what diagnosis they have been given, or what they have been led to understand about their condition.

In your examination of the patient it is important not to imagine signs that you think should be present. For example, a well-managed patient with a history of left ventricular failure may have a clear chest on auscultation.

When the discussion period commences, begin with a concise summary of the patient’s history, functional reserve and examination findings, and, where possible, the relevance of these to any proposed anaesthesia and/or surgery. The examiners will then discuss management aspects of the case, or may provide you with the opportunity to ask for and review any investigations you think relevant. It is inevitable that such investigations will appear at this point; the majority of these will be electrocardiographs, chest X-rays, arterial blood gases, spirometry and haematology results. You can also expect to see cervical spine and abdominal plain films, CT scans and MRI scans; echocardiographical, pulmonary artery catheter and sleep study data occasionally appear.

You should have a systematic technique for reviewing ECGs and CXRs. Begin by outlining the process of your technique as you go. After doing this the first time, the examiner may ask you to simply comment on any obvious abnormality on subsequent results. Commonly encountered investigations are discussed further in Chapter 6.

Always be prepared to comment on the implications of any findings and their relevance to anaesthesia.

It should be reassuring to candidates that the pass rate for the medical viva component of the examination is very high, usually similar to that of the anaesthesia vivas. Again, the usefulness of practice cannot be overemphasised.

Some sample medical viva cases are presented here to give you an indication of the type of focused history and examination that may be required in the examination. Topics for discussion are also provided.

Patient assessment stations

1. The patient with aortic valve stenosis

Possible clinical scenario
Mrs I E, 64, is due to undergo elective femoral hernia repair. She presents with worsening shortness of breath when climbing stairs. Please take a relevant history and conduct an examination as you see fit.
**Appropriate thoughts**
Before you enter the room you should be focused on either a cardiac or respiratory cause to explain the symptom outlined here.
Ischaemic and/or valvular heart disease, or chronic lung disease, need to be uncovered early in the encounter to allow for a thorough directed history and examination.

**First impressions**
- Note whether the patient appears to be an inpatient (hospital pyjamas, wheelchair, oxygen) or an outpatient. This may provide clues as to the severity of the underlying disorder.
- Is the patient dyspnoeic at rest?

**History**
- Patients with aortic stenosis will usually be able to tell you the diagnosis or some variant thereof (‘a squeaky, very exciting Antarctic valve’ was told to one recent candidate).
- The classic triad of symptoms are angina, exertional dyspnoea and exertional syncope.
- Ask about the time-frame of evolution of symptoms (often latent period >30 years) and speed of progression recently.
- Is there a history of rheumatic fever? If so, you need to consider the possibility of co-existing mitral valve disease. If not, other causes are calcification of a bicuspid valve and degenerative calcific stenosis (common in the elderly).
- Assess the patient’s exercise tolerance and functional reserve.
- Is there evidence of ventricular failure? Ask about orthopnoea, paroxysmal nocturnal dyspnoea and ankle swelling.
- Ask about other risk factors for coronary artery disease.
- What treatment options have been undertaken or planned?
- Obtain a list of medications, other medical conditions and allergies.

**Physical examination**
Position the patient at 45 degrees for cardiovascular examination and ask for the blood pressure (the examiners may make you take it yourself).
- Assess pulses for:
  - rate and rhythm
  - slow uptake or plateau carotid pulse
  - collapsing pulse (if concomitant significant aortic incompetence)
  - radio-radial and radiofemoral delay
- Assess jugular venous pressure (JVP)
- Examine the praecordium for:
  - previous cardiac surgical scars
  - displaced apex beat
  - hyperdynamic apex beat
  - aortic thrill (a sign of severity).
- Auscultate the chest:
  - Listen to the loudness of heart sounds and splitting
  - Is there a fourth heart sound?
  - Is there an ejection systolic murmur loudest in the second intercostal space radiating to neck (may be present throughout praecordium)? Listen for radiation throughout praecordium and/or axilla (if other murmurs suspected).
Listen carefully for an early diastolic murmur in expiration with patient sitting forward (aortic regurgitation will often be present to some degree).

Louder grade of murmur, later timing of peak intensity and soft or absent second heart sounds have been suggested as indicators of severity; such signs may be subtle and do not necessarily differentiate moderate and severe disease.

Perform dynamic manoeuvres:

- Leg raise or squat increases preload and makes the murmur louder.
- Valsalva (decreased preload) and hand grip (increased afterload) should, in theory, make the murmur softer.

Check lung fields for crepitations, and the lower limbs for oedema.

Useful statements

‘Mrs E gives a history of angina and dyspnoea after climbing two flights of stairs, which has been associated with syncope on two occasions. Combined with the presence of a slow upstroke carotid pulse and mid-systolic murmur radiating to the neck, I believe she has significant aortic valve stenosis, which is most likely due to a calcified aortic valve. I would seek to investigate this further before embarking on the planned elective surgery.’

Investigations

- Echocardiography: check valve area, derived gradients across valve (mean and peak), which depend for their accuracy on the contractile state of the ventricle; check left and right ventricular function
- Chest X-ray: look for post-stenotic aortic dilatation, left ventricular hypertrophy
- ECG: check voltage criteria for left ventricular hypertrophy, left ventricular strain
- Cardiac catheterisation: assess measurement of pressure gradients, look for concomitant coronary artery disease (if surgery planned).

Topics for discussion

- Classification of severity of aortic stenosis based on valve area, transvalvular pressure gradient
- NYHA classification of perioperative risk: should surgery be cancelled?
- Options for treatment of aortic stenosis: when is surgery indicated?
- Options for anaesthesia for non-cardiac surgery
- Antibiotic prophylaxis
- Central neuraxial blockade and aortic stenosis
- Haemodynamic goals during non-cardiac surgery and how to achieve these
- Role for invasive monitoring: what are particular problems with pulmonary artery catheterisation?
- What are your priorities in the event of this patient sustaining a cardiac arrest?
- The ventricular pressure/volume relationship in aortic stenosis.

2. The patient with ischaemic heart disease

Possible clinical scenario

Mrs R C, aged 72, is due for right total hip replacement in 3 months’ time. She has recently had worsening chest pain and was admitted to hospital last week. Please take a brief history and examine her cardiovascular system.
**Appropriate thoughts**
Acute-on-chronic myocardial ischaemia is the most likely cause for these symptoms. It is important to gain an impression of the severity of the disease when assessing the patient. In this situation it is also possible that the patient has suffered a myocardial infarct.

**First impressions**
- Is the patient an inpatient? Look for oxygen, intravenous therapy and/or drugs.
- Is she dyspnoeic at rest?
- Look for obvious bruising from venepuncture/arterial sites, which may indicate thrombolysis. Is there any obvious oedema?

**History**
- Determine the nature of the chest pain and whether it is typical of myocardial ischaemia.
- Always keep gastro-oesophageal reflux in mind as a differential diagnosis.
- What precipitated the admission to hospital?
- Has the patient had unstable angina (recent onset, worsening of previous angina, or symptoms at rest) or a myocardial infarct?
- Is there any history of dyspnoea, orthopnoea or paroxysmal nocturnal dyspnoea?
- What treatment did she receive (e.g. thrombolysis, cardiac catheterisation, stenting, stress test, echocardiography) and were there any complications (e.g. arrhythmias, failure, bleeding problems)? Has this resulted in a reduction in symptoms?
- Assess the patient’s functional reserve (metabolic equivalents are useful): walking distance on the flat and uphill/on stairs. Assess other limitations to normal activities of daily living.
- Ask about cardiac risk factors and any efforts to control these:
  - diabetes
  - lipid profile
  - hypertension
  - smoking
  - family history
  - OCP/menopause
  - obesity.
- Obtain a list of all medications and any allergies.

**Physical examination**
Position the patient at 45 degrees for cardiovascular examination.
- Take note of any intravenous therapy they may be receiving.
- Ask to measure the blood pressure.
- Feel the pulse for rate and rhythm.
- Feel for radio-radial and radiofemoral delay.
- Examine the mouth for cyanosis.
- Assess the JVP for height and character and feel and auscultate the carotid pulses.
- Inspect the praecordium for surgical scars, visible apex beat and pacemakers.
- Assess the location and character of the apex beat and any praecordial thrills and parasternal impulses.
• Auscultate for:
  – first and second heart sounds
  – heart murmurs, especially infarct related VSD or mitral regurgitation
  – crepitations at the lung bases.
• Assess for the presence of peripheral oedema.
  In a well-managed patient there may be surprisingly little to find on clinical examination.
  Do not manufacture signs that are not present.

**Useful statements**
‘Mrs C is currently an inpatient, having been admitted with unstable angina 1 week ago, with central chest pain radiating to her left arm at rest. She has a history of 15 years of stable angina, which had been treated with aspirin, beta blockers and calcium channel blockers. She underwent coronary angioplasty and stenting with resolution of her symptoms. She can currently walk 200 m on the flat before onset of dyspnoea.’

**Investigations**
• ECG (baseline and acute event if possible): comment on any arrhythmias, evidence of ischaemia or infarction. If infarct, ST segment elevation myocardial infarction (STEMI) or non-STEMI?
• Echocardiography
• Chest X-ray: signs of cardiomegaly, acute ventricular failure
• Cardiac catheterisation data.

**Topics for discussion**
• Cyclo-oxygenase (COX)-2 inhibitors and myocardial ischaemia
• Intraoperative monitoring for elective surgery
• Benefits of general vs regional techniques in patients with minimal cardiac reserve
• Justify your choice of anaesthesia for hip replacement surgery
• Intraoperative monitoring for myocardial ischaemia; use of transoesophageal echocardiography (TOE)
• Role of B-type natriuretic peptide in diagnosis and prognosis of myocardial injury
• Treatment of intraoperative ischaemia
• Timing of post-infarct elective surgery
• Timing of cardiac surgery; benefits of stenting versus coronary artery bypass grafting
• Management of patients with bare metal/drug-eluting stents, platelet inhibitors and elective surgery.

3. The patient with hypertension

**Possible clinical scenario**
Mr O T, 45, was due for elective varicose vein ligation, but cancelled because of high blood pressure. Please conduct a relevant history and examination.

**Appropriate thoughts**
On rare occasions the examiners may give you very specific information to focus your attention. In this case you should be considering causes of hypertension (remembering that over 90% of cases are essential hypertension), the possibility
of co-existent cardiorespiratory disease, and the effect of hypertension on other organ systems.

**First impressions**
- Are characteristic features of a secondary cause of hypertension present? A spot diagnosis of Cushing’s syndrome, acromegaly or myxoedema may lead to a modification of your approach.
- If the patient is an inpatient, this may be related to the investigation or treatment of hypertension, and again might raise suspicions of a secondary cause (e.g. renal artery stenosis, Conn’s syndrome or phaeochromocytoma).

**History**
- Ask when the diagnosis of hypertension was made, and approximate readings in recent times. How high have readings been in the past?
- Is the patient aware of a diagnosis associated with their hypertension?
  - adrenal tumour
  - renal disease or renal artery stenosis
  - aortic coarctation
  - acromegaly
  - myxoedema
  - obstructive sleep apnoea.
- Ask about factors that contribute to essential hypertension:
  - alcohol
  - obesity
  - cigarette smoking
  - poor diet and exercise patterns.
- What treatment has the patient received for their hypertension and how successful has it been?
- Have there been any complications from the hypertension?
  - peripheral vascular disease
  - visual problems
  - strokes.

**Physical examination**
- Measure the patient’s blood pressure lying and standing. Ask for measurements in each arm. Readings >140/>90 mmHg indicate the presence of hypertension.
- Carefully feel the peripheral pulses. It is appropriate to test for radio-radial delay and radiofemoral delay.
- Palpate and auscultate the carotid pulses. Ask to examine the fundi (you may be told the results of fundoscopic examination).
- Examine the chest and listen for murmurs, a fourth heart sound and evidence of left ventricular failure.
- Examine the abdomen for surgical scars, and feel for aortic aneurysms and renal masses, auscultate for renal bruits.

**Useful statements**
‘Mr T is a 45-year-old gentleman who presented 6 months ago for elective surgery which was cancelled because of a blood pressure reading of 220/110 mmHg. He had suffered headaches and blurred vision for a month before this. Prior to this he
was in excellent health and received yearly check-ups with no problems recorded. This history suggests a secondary cause of his hypertension, and Mr T confirms that further investigation resulted in a diagnosis of Conn’s syndrome for which he underwent laparoscopic right adrenalectomy last week. He is on no current medication.

‘Examination today reveals a blood pressure of 110/70 mmHg in both arms with no postural drop. Cardiovascular system examination is otherwise unremarkable. Abdominal examination shows normal healing of laparoscopic port scars and no other abnormality.’

**Investigations**
- Urea and electrolytes: preoperative values for the classical features of Conn’s syndrome (note that Cushing’s syndrome can also cause hypokalaemia), renal disease
- BSL and lipid profile
- ECG: voltage criteria for left ventricular hypertrophy
- Urinalysis for blood, protein and collection for catecholamines
- Chest X-ray
- Other imaging studies based on clinical suspicion (adrenal tumours, renal artery stenosis).

**Topics for discussion**
- Causes of secondary hypertension
- Threshold for cancelling elective surgery and further management of hypertensive patients; what are the likely intraoperative problems to be expected?
- Classes of antihypertensive drugs
- Perioperative management of patients with phaeochromocytoma
- Causes and management of hypertensive crises.

**4. The patient with a permanent pacemaker/implantable defibrillator**

**Possible clinical scenario**
Mr T A, aged 75, presents for transurethral resection of the prostate. He has had recent attacks of dizziness and palpitations. Please take a history and conduct a cardiovascular examination.

**Appropriate thoughts**
While concomitant cerebrovascular disease is a possibility, the likely focus of this case is cardiovascular, specifically cardiac arrhythmias and/or valvular lesions.

**First impressions**
- Is the patient an inpatient? This may suggest a recurring or chronic cause with recent management with which the patient may be familiar.
- It is unlikely the examiners will recruit an unwell inpatient with an unstable life-threatening arrhythmia.
- A well-looking, happy outpatient may reflect successful treatment.
**History**

A succinct history may well provide you with most of the information you need.

- Outline the time-frame of the presenting symptoms.
  - Was there any associated chest pain?
  - How often and under what circumstances (e.g. exertion) did the symptoms occur?
  - Can the patient tap out the palpitations; were they rapid/regular/irregular?
  - What exactly did the dizziness entail?

- Rapid irregular palpitations suggest atrial fibrillation.
- Regular palpitations suggest supraventricular or ventricular tachycardia.
- Heart block and sick sinus syndrome are less likely in the presence of palpitations.
- Detail any history of previous heart disease, especially ischaemia or prior cardiac surgery.
- Determine if there is a family history of cardiac disease or arrhythmias (e.g. hypertrophic obstructive cardiomyopathy, congenital long QT syndromes).
- Ask for details of treatment received:
  - Was treatment in the emergency department or subsequently as an inpatient?
  - Were physical manoeuvres (e.g. carotid sinus massage) employed?
  - Were any drugs used? (Patients may remember treatment with adenosine.)
  - Has the patient undergone cardiac catheterisation, electrophysiology studies or cardioversion?

- The presence of a pacemaker suggests an underlying bradyarrhythmia or biventricular failure. The presence of an automatic implanted cardioverter-defibrillator (AICD) suggests VT, VF or prolonged QT syndrome.
- For pacemakers and AICDs, ask when they were put in and if there have been any problems since. Does the patient carry a pacemaker card with the programming details?
- How often is the device tested and when was this last done?
- Are symptoms entirely controlled? How often does the DC shock go off?
- Ask about functional reserve pre- and post-treatment. Obtain a list of all medications.

**Physical examination**

- Perform your normal cardiovascular examination, focusing specifically on the pulse rate, rhythm and character.
- Note the presence of scars, indicating previous surgery, and the presence of a pacemaker or AICD device.

**Useful statements**

‘Mr A is an elderly gentleman who presented 6 months ago with dizziness and rapid regular palpitations on a background of ischaemic heart disease treated with CABG 5 years ago. These symptoms occurred on moderate exertion and on one occasion included a syncopal event, resulting in his hospitalisation and admission to coronary care, where he was treated with intravenous therapy and underwent subsequent cardiac catheterisation and electrophysiological studies. He was fitted with an AICD device and has experienced DC shocks on four occasions since. His exercise tolerance has improved and he can walk 1 km on the flat with no dyspnoea, chest pain or other symptoms. Examination
shows him to be in sinus rhythm, 84 beats per minute, with an obvious implanted device in the left sub-clavicular area. Cardiovascular examination was otherwise unremarkable. I suspect that Mr A was suffering episodes of VT, and that he has a device with overdrive pacing and DC cardioversion facilities. I would seek further elucidation from his cardiologist before embarking on elective surgery.

**Investigations**
- ECG: ask for this pre-treatment if possible: QT, SVT, VT, heart block and its variations, atrial fibrillation
- Serum electrolytes: potassium, magnesium
- Echocardiography
- Chest X-ray: position of the device and location of electrodes
- Catheterisation data/EPS data
- Ask for a report of the most recent check of the device.

**Topics for discussion**
- Types of pacemaker/defibrillator and their classification (see Tables 4.1 and 4.2)
- Use of biventricular pacing in the treatment of cardiac failure
- Hazards of using magnets with implanted cardiac devices
- Indications for pacemaker insertion
- Indications for AICD insertion
- Management of elective surgery and pacemakers: diathermy, disabling functions
- What contingency plans would you have in place if the device failed?

<table>
<thead>
<tr>
<th>TABLE 4.1 The North American Society of Pacing and Electrophysiology (NASPE) and British Pacing and Electrophysiology Group (BPEG) Generic Pacemaker Coding System</th>
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<tbody>
<tr>
<td><strong>Letter position Category</strong></td>
</tr>
<tr>
<td>Letters</td>
</tr>
<tr>
<td>A = atrium</td>
</tr>
<tr>
<td>V = ventricle</td>
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<tr>
<td>D = dual</td>
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</table>

5. The patient with peripheral vascular disease

Possible clinical scenario
Mr E T, 65, has suffered worsening leg pain for a number of years. Please take a history and conduct an appropriate cardiovascular examination.

Appropriate thoughts
• You should be alerted to a possible vascular cause, although from the given history it is possible the patient suffers from a chronic pain syndrome.
• It is important to assess risk factors and co-morbidities.
• Functional assessment of vascular patients is critically important.

First impressions
• Is the patient an inpatient? There may be evidence of recent limb or abdominal surgery.
• Are there any obvious previous limb amputations?

History
• A history of the site, nature and progression of limb pain is important. Patients with peripheral vascular disease can typically walk a fixed distance before needing to rest from claudication. This distance may shorten over time until pain is present even at rest.
• Concomitant features may include limb swelling, ulceration and gangrene.
• Note that a very active patient with mild disease may suffer more discomfort than a sedentary patient with more severe disease.
• Ask about risk factors for atherosclerosis: hyperlipidaemia, obesity, smoking, age, diabetes and hypertension. Note that peripheral vascular disease may also encompass aneurysmal disease caused by rarer conditions such as Marfan’s and Ehlers-Danlos syndromes.
• Atherosclerosis may affect the entire vascular tree, so it is important to ask about symptoms of cerebrovascular insufficiency, renal dysfunction and ischaemic heart disease. The limitation of functional capacity from claudication may mask symptoms of coronary artery disease (which is significant in up to 75% of patients with peripheral vascular disease).

### TABLE 4.2 The North American Society of Pacing and Electrophysiology (NASPE) and British Pacing and Electrophysiology Group (BPEG) Defibrillator Coding System

<table>
<thead>
<tr>
<th>Letter position Category</th>
<th>I Chamber shocked</th>
<th>II Antitachycardia pacing chamber</th>
<th>III Antitachycardia detection</th>
<th>IV Pacing chamber</th>
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Physical examination

- Examine the legs looking for skin integrity, asymmetry, pallor and capillary refill. Examine all peripheral pulses on both sides.
- Measure the blood pressure (or ask for the results) in both arms and both legs. The ankle/brachial index is the highest systolic blood pressure from the dorsalis pedis or posterior tibial artery divided by the systolic blood pressure measured at the brachial artery; a value of <0.6 may indicate severe lower limb ischaemia.
- Examine the heart and lung fields for valve lesions, signs of congestive heart failure and evidence of chronic lung disease from smoking.
- Palpate and auscultate the carotid arteries for a thrill or bruit.
- Palpate the abdomen for the presence of an aortic aneurysm.

Useful statements

‘Mr T is currently an inpatient being treated for a wound infection following right-sided femoro-popliteal bypass grafting 8 days ago. His risk factors for peripheral vascular disease include a 40-pack-year history of cigarette smoking, raised cholesterol and systemic hypertension. He has suffered intermittent claudication for 5 years, with the claudication distance being steady at 200 m walking on the flat, until this year when the distance dramatically decreased to around 25 m. He also reports suffering pain at rest that wakes him from sleep. He also has a history of stable angina for which he is on medical treatment, including beta-blocker therapy. His surgery was conducted with general anaesthesia and was unremarkable from the patient’s perspective.

‘On examination his surgical wounds are covered, with a hospital request to keep them so. There is no sign of obvious surrounding infection. Both dorsalis pedis pulses are palpable and strong. I cannot feel a left posterior tibial pulse, but it is present on the right side. Capillary refill is sluggish in both feet. Brachial blood pressure is 150/80; the calculated preoperative right ankle:brachial index from the information given to me is 0.5, a possible indication of severe lower limb ischaemia. Heart sounds are normal and other peripheral pulses are present. Auscultation of the carotid arteries reveals no bruits.’

Investigations

- The functional severity of claudication can be assessed using the Rutherford Standard exercise protocol (treadmill walking for 5 minutes at 3 km/h up a 2% incline)
- Limb imaging investigations include Doppler ultrasound, magnetic resonance angiography and dye angiography
- Preoperative testing prior to revascularisation should include respiratory function tests, ECG, chest X-ray, baseline bloods and echocardiography if aortic disease or symptomatic coronary artery disease
- In this patient, postoperative full blood count and wound microbiology, culture and sensitivities, and possibly blood cultures would also be of interest.

Topics for discussion

- Regional anaesthesia and management of anticoagulation
- Institution of beta-blocker therapy to decrease cardiac risk
- Techniques of regional anaesthesia for carotid endarterectomy
- Management of aortic cross-clamping
- Pre-emptive analgesia/pain management for amputation.
6. The patient with chronic obstructive pulmonary disease

Possible clinical scenario
Mr I T is a 54-year-old man with wheeze and shortness of breath on exertion. He is scheduled for semi-elective laparoscopic hernia repair. Please take a history and examine his respiratory system.

Appropriate thoughts
This combination of symptoms may steer your thinking to respiratory rather than cardiac pathophysiology, although it is important to remember that the two often co-exist.

If so, you should seek to determine the contribution of each to the underlying problem. Likely respiratory causes might be chronic bronchitis, emphysema, asthma, bronchiectasis and lung carcinoma, all of which can be elucidated on history and examination.

Consider the possible implications of any underlying pathology on the proposed surgery.

First impressions
- Is the patient dyspnoeic or cyanosed at rest?
- Are they using supplemental oxygen?
- Is the patient cachectic, nicotine-stained or obviously clubbed?
- You may not be able to see inside a sputum cup as you walk in, but its presence may give you a clue to a diagnosis (a polystyrene cup in the room may also contain the examiner’s coffee).

History
- Ask specifically about the duration and severity of presenting symptoms.
- Ask also about cough and sputum production, and any other symptoms that may be present.
- What is the diagnosis of the patient’s problem?
- Are there any precipitants or factors which worsen the condition?
- Is the patient using home oxygen? How many hours a day?
- Determine any restriction on function and reserve:
  – metabolic equivalent exercise tolerated
  – walking distance on flat and uphill/stairs
  – limitations to normal activities of daily living.
- Determine underlying causes:
  – duration and magnitude of cigarette smoking
  – occupational exposure (e.g. asbestos)
  – infections (e.g. tuberculosis)
  – genetic illnesses (alpha-1-anti-trypsin deficiency).
- Elucidate current treatment of the patient’s symptoms:
  – home oxygen
  – bronchodilators
  – antibiotics
  – steroid therapy
  – physiotherapy
  – recent admissions to hospital, including intensive care/ventilation episodes.
- Ask about any recent surgery and any complications that may have occurred.
Physical examination

It is easiest to examine the respiratory system with the patient sitting up.
- Examine the patient peripherally for cyanosis and clubbing (which will usually indicate co-existent disease, e.g. carcinoma, fibrosis or chronic infection).
  Warm peripheries and a bounding pulse may indicate carbon dioxide retention. Pulsus paradoxus may be present.
- Consider the patient’s pattern of breathing, respiratory rate and effort, including the use of accessory muscles, intercostal recession and tracheal tug.
- Is the patient centrally cyanosed?
- Ask the patient to breathe in deeply and breathe out as rapidly and completely as possible. Look for wheeze and prolonged expiration time beyond a few seconds.
- Posterior chest:
  - examine for overinflation, scars
  - palpate for reduced expansion
  - percussing the chest may be of use if you suspect the possibility of localised infection or a pleural effusion
  - auscultate the chest to evaluate breath sounds in terms of quality and symmetry, and any adventitious sounds (crepitations and wheezes), and whether these change with coughing.
- Anterior chest:
  - inspection
  - chest expansion
  - percussion
  - auscultation.
  Position the patient at 45 degrees and palpate the apex beat and look for a parasternal heave suggestive of right ventricular hypertrophy. Listen for a loud pulmonary component of the second heart sound.
  In a patient whose airflow limitation is not severe, or extremely well-managed, there may be few clinical signs present on the day of the examination.

Useful statements

‘Mr T is a middle-aged gentleman who has moderately severe chronic obstructive pulmonary disease, secondary to a 20-pack-year history of cigarette smoking, which is ongoing. He has recently been hospitalised for 1 week following an infective exacerbation of his condition. He suffers functional limitation from his condition and is unable to walk up more than one flight of stairs or 400 m on level ground without resting. He currently uses nebulised salbutamol approximately four times a day at home.
  On examination he is cachectic with nicotine-staining of his fingers and is peripherally cyanosed. He is not centrally cyanosed. There is limited chest wall expansion and reduced breath sounds globally, with expiratory wheeze present especially in the lower lung zones. His condition is not optimised for the proposed surgery and I would seek further investigations and instigate a management strategy prior to considering him for general anaesthesia.’

Investigations

- Pulse oximetry on room air is a useful test
- Spirometry: restrictive/obstructive changes and effect of bronchodilators (changes of 15% in FEV₁ are considered significant), diffusion capacity for
carbon monoxide (DLCO) is reduced in emphysema, peak flow rates, flow–volume loops
• Chest X-ray: look for hyperinflation, infection
• ABG on room air: respiratory failure if $pO_2 < 50$ mmHg, or $pCO_2 > 50$ mmHg
• Full blood count: look for polycythaemia, increased Hb
• ECG: evidence of right ventricular hypertrophy, concomitant ischaemic heart disease.

**Topics for discussion**
• Strategies for optimisation of chronic airways limitation prior to surgery: role of outpatient clinics, respiratory physicians, exercise regimens and physiotherapy
• Smoking cessation and anaesthesia: timing and consequences
• Pneumoperitoneum and pulmonary consequences
• Surgery for severe emphysema: criteria for suitability and preoperative evaluation
• Choice of laparoscopic versus open surgical technique in this patient
• Strategies for intraoperative ventilation
• Management of the patient who fails extubation at the end of surgery.

7. The patient with pulmonary fibrosis

**Possible clinical scenario**
Mr T T is a 68-year-old former roofing worker who has been admitted to hospital with worsening shortness of breath. He is normally on home oxygen. Please take a brief history and examine his respiratory system.

**Appropriate thoughts**
From the history and examination request a pulmonary disease is likely, keeping in mind the possibility of concomitant right-sided cardiac disease/cor pulmonale. Perhaps a clue to the diagnosis lies in the occupational history.

**First impressions**
• Dyspnoea, cyanosis and oxygen therapy are all likely, and the patient may have obvious clubbing.
• Cachexia may be a sign of underlying malignancy.

**History**
• Where the diagnosis is known this will usually be forthcoming, especially in the case of occupational industrial dust disease. Determine the nature, severity and duration of exposure.
• Ask about age of onset of the disease and symptom progression, concentrating on functional limitations/exercise tolerance.
• Is there any history of smoking?
• Have systemic illnesses causing chronic lung disease been excluded, e.g. rheumatoid arthritis, systemic lupus, ankylosing spondylitis, scleroderma, polyarteritis, sarcoidosis, other autoimmune disease?
• Is there any history of pulmonary infection, e.g. tuberculosis, viral infection, fungal infection?
• Take a medication history (bleomycin, nitrofurantoin, amiodarone, methotrexate among others can cause interstitial lung disease).
• Discuss current treatment.
• Patients suffering from asbestosis are at increased risk of pleural plaque formation, bronchial carcinoma (especially if smokers) and malignant mesothelioma.

**Physical examination**
• Look for clubbing, central and peripheral cyanosis.
• Determine respiratory rate, look for use of accessory muscles.
• Percussion note may be dull over areas of pleural thickening/effusion/ mesothelioma.
• Auscultate for fine inspiratory crepitations and wheeze.
• Look for signs of pulmonary hypertension/right ventricular hypertrophy (parasternal heave, loud pulmonary component of second heart sound).

**Useful statements**
‘Mr T is a gentleman with respiratory impairment from known severe pulmonary fibrosis of 6 years. This is believed to be due to occupational asbestos exposure; he worked for more than 20 years in a grinding room of untreated boards with no respiratory protection or clothing decontamination facility. He has been on home oxygen therapy 12 hours per day for 3 years. He is unable to walk across the room without becoming short of breath. He was a heavy cigarette smoker between the ages of 15 and 35, after which time he quit. He was admitted to hospital 5 days ago with worsening shortness of breath and haemoptysis. He is due for a CT-guided biopsy of a lesion detected on chest X-ray and CT scanning, which his attending doctors fear may be malignant.

‘On examination he is receiving oxygen via nasal prongs at 4 L/min. He was happy to attempt to talk while on room air, but rapidly became short of breath, unable to speak in sentences and dramatically centrally cyanosed, at which point we paused for him to put the oxygen back on. He is obviously clubbed and cachectic. His respiratory rate is 24 per minute. Chest auscultation reveals widespread, fine inspiratory crackles throughout both lung fields. He has no palpable cervical lymphadenopathy. There is no parasternal heave and heart sounds were normal.’

**Investigations**
• Respiratory function tests will typically show a restrictive pattern and reduced DLCO
• Chest X-ray may show pulmonary infiltrates, enlarged right ventricle, pleural plaques, pleural effusion, carcinoma
• Arterial blood gases
• ECG – evidence of right-sided hypertrophy/strain, right axis deviation, P pulmonale.

**Topics for discussion**
• Differential diagnosis of pulmonary infiltrates/fibrosis
• What is the role of preoperative echocardiography should such a patient present for emergency repair of an incarcerated hernia?
• What anaesthesia techniques would you employ in that circumstance, and why?
8. The patient with diabetes

Possible clinical scenario
Mr F R, 43, has recently undergone debridement of lower leg ulcers. Please take a brief history and examine the patient as you see fit.

Appropriate thoughts
- The history given in the scenario should lead you to a consideration of a patient with either peripheral vascular disease, diabetes mellitus, or both.
- Remember that diabetic patients are always available, so they commonly make an appearance in the medical vivas.
- Early questioning on the nature of the ulcers and surgery should point you in the right direction.

First impressions
Clues may be present as to the severity of any co-morbidities.
- Is the patient unwell and wheelchair-bound or an obvious outpatient?
- Are there any previous limb amputations?
- A general impression of the patient’s weight may also be useful.

History
- Ask about the cause of the ulcers and any previous episodes of ulceration/debridement.
- Determine whether the patient has type I or type II diabetes, and at what age it was diagnosed.
- Record the patient’s hypoglycaemic regimen, including dietary control, oral hypoglycaemics and insulin: what type, how much and when?
- Determine the adequacy of control: how often is BSL measured and what is the pattern of results; has HbA1c been measured, and if so what was the result?
- Have there been any symptoms of hyperglycaemia (admissions with DKA, ongoing polyuria and thirst with weight loss) or episodes of hypoglycaemia (dizziness, loss of consciousness, sweats, seizures): if so, under what circumstances?
Importantly, determine the presence or absence of major co-morbidities:
- Cardiovascular:
  - ischaemic heart disease (including silent ischaemic episodes)
  - exercise tolerance
  - claudication
  - transient ischaemic attacks/stroke
  - hypertension.
- Nervous system:
  - peripheral neuropathy
  - autonomic neuropathy (fainting when standing, dizziness, erectile dysfunction).
- Vision:
  - lens and retinal disease.
- Renal system:
  - dysuria/nocturia
  - oedema
  - renal dysfunction or failure.
Obtain a history of other previous operations, diseases, drugs and allergies.
**Physical examination**

You may be directed towards a specific system.

- Ask for the patient's weight, BSL and blood pressure, standing and supine. (You may be invited to measure the blood pressure.)
- Position the patient for cardiovascular examination.
- Assess peripheral circulation:
  - temperature
  - capillary refill of peripheries
  - peripheral pulses: carotid, radial, femoral, popliteal, dorsalis pedis and posterior tibial.
- Inspect skin for ulceration and infection.
- Test sensation for peripheral neuropathy.
- Postural hypotension (fall of >30/20 mmHg on standing from supine position) may be an indicator of autonomic neuropathy, as may tachycardia at rest.
- Examination of the eyes is useful, including assessment of visual acuity, lens opacification and fundoscopy for haemorrhages, exudates and vessel proliferation. Ask to perform fundoscopy – the examiners may tell you the relevant findings.
- Examine the chest for co-existing cardiac disease (e.g. cardiomegaly) and auscultate the lung fields.
- Assess the patient’s airway as you normally would (long-standing poor control may lead to a ‘stiff joint syndrome’ and increased incidence of intubation difficulties).

**Useful statements**

‘Mr R has long-standing type II diabetes which is well controlled on his current oral hypoglycaemics, as evidenced by tight BSL control and reportedly low HbA1c. He does, however, have several end-organ complications of his disease, including autonomic neuropathy (as evidenced by a resting heart rate of 110 beats per minute and a postural drop in lying to standing blood pressure from 140/90 mmHg to 100/50 mmHg), peripheral neuropathy, absent peripheral pulses to palpation below the knee and vascular compromise resulting in ulceration and infection of his feet.’

**Investigations**

- Full blood count, random and fasting blood glucose, HbA1c, urea and electrolytes
- Urinalysis for glucose and protein
- Chest X-ray
- ECG: look for signs of ischaemia, QT variability.

**Topics for discussion**

- Perioperative management of BSL/oral drugs and insulin
- Classification of types of insulin
- Advantages/disadvantages of spinal vs general anaesthesia for lower limb debridement
- How to construct a sliding scale of insulin; advantages/disadvantages of subcutaneous versus intravenous scales
- Mechanism of action of: sulphonylureas, metformin, alpha-glucosidase inhibitors, thiazolidinediones
- Importance of intraoperative patient positioning
- Diagnosis and management of diabetic ketoacidosis
- Features of hyperosmolar nonketotic coma.
9. The patient with thyroid disease

Possible clinical scenario
Mrs S I, 57, has had recent weight loss. Please take a history and examine her head and neck.

Appropriate thoughts
Hyperthyroidism is the most likely explanation for the presenting symptom and examination request. Keep other possible causes (e.g. malignancy) in mind.

First impressions
• Does the patient have the characteristic facies of thyrotoxicosis? Is there an obvious goitre?
• Is there a glass of water nearby (suggesting sipping by patient during previous examination)?

History
• Ask about the history of weight loss: how much and over what time period?
• Does the patient have a diagnosis for their condition? How long has this been present?
• If you suspect hyperthyroidism as a cause, ask about other symptoms:
  – anxiety
  – palpitations
  – tremor
  – heat intolerance
  – fatigue
  – eye problems
  – sweating
  – diarrhoea, vomiting.
• If a goitre is present, ask about airway symptoms:
  – positional dyspnoea (suggesting retrosternal extension)
  – dysphagia
  – stridor
  – engorgement of head and neck veins; epistaxis
  – hoarseness/stridor (recurrent laryngeal nerve involvement).
• What treatment is the patient receiving?
• Ask about any associated diseases, previous operations and current treatment.

Physical examination
• Examine the eyes for lid retraction, lid lag, exophthalmos and conjunctivitis (which suggest Graves’ disease).
• Inspect the neck and any possible thyroid swelling by getting the patient to take sips of water (a thyroid mass will rise with the larynx). See if you can see an inferior border to the mass.
• Look for prominent veins in the neck and upper chest.
• Palpate the neck from in front and behind, feeling the size and consistency of any swelling.
• It is important to locate the position of the trachea.
• Listen over the neck for a possible bruit, and ask the patient to raise their arms over their head, looking for congestion in the superior caval distribution (Pemberton’s sign).
• While in the vicinity, assess the patient’s airway as you normally would.

**Useful statements**
‘Mrs I is currently an inpatient, undergoing investigation for signs and symptoms of hyperthyroidism. She has an 8-week history of 10 kg weight loss, palpitations, heat intolerance and dry eyes, with easy fatigability causing absence from work. On examination she has a pronounced thyroid stare, exophthalmos and conjunctivitis, and a smooth diffuse swelling in the neck consistent with an enlarged thyroid. There are no signs of retrosternal extension, recurrent laryngeal nerve involvement or thoracic inlet obstruction. These findings are most consistent with a diagnosis of Graves’ disease.’

**Investigations**
• Thyroid function tests: thyroid stimulating hormone (TSH), tri-iodothyronine (T3), thyroxine (T4), free concentration T4, T3 resin uptake, radioactive iodine scan
• CT scan
• ECG.

**Topics for discussion**
• Differential diagnosis of hyperthyroidism
• Pharmacological management of hyperthyroidism: carbimazole, propylthiouracil, beta-blockers
• Manifestations and treatment of thyroid storm
• Anaesthesia technique for thyroidectomy
• Diagnosis and management of postoperative hypocalcaemia
• Management of postoperative haematoma.

10. The patient with pituitary disease

**Possible clinical scenario**
Mr A E is a 55-year-old man who presented with headaches and visual disturbance for investigation, and is now booked on your elective neurosurgical list. Please take a history and examine the patient’s visual field with the equipment provided, along with any other examination as you see fit.

**Appropriate thoughts**
The combination of presenting problems should suggest intracranial pathology somewhere along the visual pathway from the optic nerve to the occipital cortex. The possibility of a lesion near the optic chiasm should trigger some memories.

**First impressions**
• Patients with acromegaly secondary to a growth hormone secreting pituitary adenoma have characteristic facies with a large supraorbital ridge producing frontal ‘bossing’, a large, square, prognathic jaw, macroglossia and often widely spaced teeth (the disease is sometimes first detected on dental examination).
• The voice may be hoarse from laryngeal tissue growth.
• Hands and feet (the peripheral or acral components) are typically broad and spade-like, such that the acromegalic handshake is encompassing, moist and doughy.

**History**
• Onset of bony and soft tissue changes is insidious and can go unnoticed for considerable time. Patients often cease to wear rings, and their shoe size often increases.
• Headache and visual disturbances are common presenting complaints.
• Paraesthesiae and arthralgias are common; up to 50% of patients may have carpal tunnel syndrome.
• There is a strong association with obstructive sleep apnoea; ask about: snoring, gasping, fatigue, irritability, daytime somnolence. (See subsequent scenario.)
• Patients may have cardiomyopathy and symptoms of left ventricular dysfunction.
• There is a tenuous association between acromegaly and colonic polyps and carcinoma.
• Ask about medications taken (octreotide, bromocriptine, cabergoline) and any side effects (orthostatic hypotension may occur with dopamine analogues such as bromocriptine).
• Is any radiotherapy planned? (Surgery is often a first-line option.)
• Ask about symptoms of diabetes. (Glucose intolerance is common.)

**Physical examination**
• Physical features, as described above, may lead to an immediate diagnosis.
• Spend some time evaluating the airway, as acromegalic features may predispose the patient to difficulties with bag and mask ventilation, and intubation.
• The classic visual field defect is a bitemporal hemianopia (central optic nerve fibres decussate at the optic chiasm near the sella), but a wide variety of field defects may be encountered.
• It is prudent to conduct a cardiovascular examination looking for signs of congestive cardiac failure and hypertension. There is an increased risk of vascular and ischaemic heart disease and stroke.
• Examine the abdomen for organomegaly.
• Multinodular goitre may be present.

**Useful statements**
‘Mr E was diagnosed with acromegaly 7 weeks ago after presenting to his GP with headaches and reporting two traffic accidents where he sideswiped parked cars he did not see. A visiting relative also noticed a change in his appearance. On reflection, Mr E concedes noticing his shoe size has increased from 9 to 11 over a period of many months. He also reports suffering arthritic pains in most joints, and symptoms of snoring and daytime somnolence suggestive of sleep apnoea.
‘On examination he has characteristic facies and hands of acromegaly. He has a large tongue, splayed teeth, an inter-incisor distance of 2 cm and a Mallampati score of 3 on airway examination. Visual field examination reveals a bitemporal hemianopia more extensive in the left visual field. There are no signs of respiratory or cardiac disease.
‘He is scheduled for trans-sphenoidal hypophysectomy in 2 weeks’ time.’
The medical vivas

Investigations
- The diagnosis is usually confirmed by an increased assay of insulin-like growth factor IGF-1; prolactin levels may also be increased. Diagnosis can also be confirmed by failure of growth hormone suppression by glucose tolerance test.
- Other baseline tests of anterior pituitary function include assays of cortisol, thyroxine and gonadal hormones.
- While skull X-ray may show an enlarged sella, magnetic resonance imaging is the modality of choice. Pituitary adenomas appear hypodense on T1-weighted images and show less enhancement with gadolinium than surrounding tissue.
- Preoperative testing should include blood glucose measurement, ECG and echocardiography when concomitant cardiac disease is suspected.

Topics for discussion
- Management of a potentially difficult airway
- Complications of surgery: CSF rhinorrhoea, diabetes insipidus; how are they managed?
- Patient positioning for surgery: neurosurgical requirements, peripheral nerve protection.

11. The patient with morbid obesity/obstructive sleep apnoea

Possible clinical scenario
Mr L E, who is 40 years of age, recently underwent a laparoscopic gastric-banding operation. Please assess him as you see fit.

Appropriate thoughts
- Anticipate the obese patient.
- Consider the possible complications of obesity and how they may impact upon anaesthesia management.
- A patient scheduled for weight-reduction surgery will often talk happily and openly about their condition, but a degree of sensitivity is still required.

First impressions
- You will rapidly form an impression as to the magnitude of the patient’s obesity.
- There may be evidence of concomitant disease (e.g. hypothyroidism or dyspnoea at rest).
- If the patient is an inpatient it is unlikely to be because of the recent surgery unless there were complications. (patients are normally discharged around day 2.)

History
- Determine the patient’s weight and height and calculate their body mass index (kg/m²).
- Ask about any recent weight loss or gain, and over what time period changes have occurred, including any other therapies attempted prior to surgery.
- How has the patient’s size impacted on their daily living and work?
- Ask the patient if he was made aware of any problems with the operation or anaesthesia.
• Ask about co-morbidities linked to obesity, specifically:
  – hypertension
  – hyperlipidaemia
  – type II diabetes
  – coronary artery disease
  – hypothyroidism
  – stroke
  – congestive cardiac failure
  – dysrhythmias
  – reflux
  – obstructive sleep apnoea.
• Patients with obstructive sleep apnoea may report a constellation of symptoms, including:
  – snoring
  – apnoea
  – choking
  – gasping
  – frequent awakening
  – daytime sleepiness
  – fatigue
  – irritability
  – defects in attention and memory
  – depression.
• Ask about how the diagnosis was made (usually on polysomnography) and whether the patient uses a continuous positive airway pressure (CPAP) device, and if so, how this has helped.
• Assess how the sleep apnoea has impacted on the patient’s lifestyle, work and family.

**Physical examination**
• Determine the BMI, if you have not worked it out already.
• The airway should be carefully assessed, including mouth opening and Mallampati score, and any limitation of neck movement. Neck circumference has been proposed as an indicator of difficult intubation.
• Assess the blood pressure and perform cardiovascular examination, in particular looking for evidence of right ventricular hypertrophy and pulmonary hypertension.
• Listen to the lung fields.
• Examine the abdomen including the recent surgical scars. Feel for hepatomegaly (which may be difficult). Locate the subcutaneous reservoir for the gastric band, looking for signs of infection at the site.

**Investigations**
• Pulse oximetry on room air may be a good indicator of underlying pulmonary pathology
• Spirometry – assess for restrictive lung defect
• ABG – especially if low oxygen saturation on room air
• ECG – may show right-sided cardiac complications (right ventricular hypertrophy, right axis deviation) of sleep apnoea, left ventricular hypertrophy, arrhythmias
• Chest X-ray – look for advanced cardiac disease.
• Echocardiography – look for ventricular hypertrophy, contractility, pulmonary pressure (may need transoesophageal echo for adequate study).
• Polysomnography results.

Useful statements
‘Mr E is a 40-year-old gentleman who has suffered from obesity for at least 20 years. He underwent laparoscopic gastric banding 2 weeks ago, prior to which he weighed 170 kg, which in conjunction with his height of 170 cm gives him a body mass index of 59. He has lost 10 kg since the surgery and appears well motivated. As well as his problem of morbid obesity, he was diagnosed with obstructive sleep apnoea 2 years ago, underwent sleep studies and has been using nocturnal CPAP, which has relieved his symptoms of snoring, daytime somnolence and fatigue. On examination of his airway I note that he has good neck movement in all directions, a Mallampati score of 3 with a normal thyromental distance and inter-incisor distance. His blood pressure is normal, and there were no signs of pulmonary hypertension or right-sided cardiac failure.’

Topics for discussion
• Metabolic syndrome
• Obesity hypoventilation syndrome
• Risk of reflux and aspiration; use of histamine receptor and proton blockers
• Intravenous access in obese patients
• Suitability of obese patients for day surgery
• Preoperative benefits of CPAP for obstructive sleep apnoea/obesity hypoventilation syndrome
• Pharmacokinetics in obesity
• Patient positioning
• Airway management
• Monitoring
• Problems of pneumoperitoneum in this patient
• Analgesia and obstructive sleep apnoea.

12. The patient with a spinal injury

Possible clinical scenario
Mrs I H is wheelchair-bound and due to undergo check rigid cystoscopy. Please conduct a history and relevant neurological examination.

Appropriate thoughts
You should be alert to the possibility of central nervous system or neuromuscular disease.

First impressions
• Does the patient move any limbs spontaneously?
• Does the patient have a tracheostomy in situ or portable ventilator? (This may give a clue as to the height of the lesion.)
**History**
- A history of trauma is common in the spinally injured patient.
- Ask how long ago the injury occurred, and for how long the patient was initially hospitalised.
- Ask about initial treatment, including surgery.
- Patients are often very knowledgeable about the level of their lesion and the associated sensorimotor deficits.
- Did the injury result in complete spinal cord transection?
- For thoracic lesions and above, ask about autonomic symptoms triggered by everyday activities, surgery, and other events.
- Ask about chronic complications from the injury:
  - chronic pain
  - skeletal muscle spasms
  - pressure area care problems
  - pulmonary and urinary tract infections
  - thermoregulatory disorders
  - anaemia.
- What limitations does the level of injury place on the patient’s lifestyle, and how have they adapted to this?
- Obtain details of previous surgery and anaesthesias, and whether there were any associated problems.
- Obtain a list of current medications and any allergies which may be present (e.g. latex).

**Physical examination**
- You should attempt to correlate physical signs with the level of the injury.
- Remember that there will be lower motor neurone signs at the level of the lesion:
  - weakness
  - wasting
  - loss of tone
  - reduced reflexes
  - fasciculation.
- There will be upper motor neurone signs below the level of the lesion:
  - paralysis, wasting
  - increased tone and clonus
  - hyperreflexia
  - extensor plantar response.
- There will be complete sensory loss below the level of the lesion.
- Bradycardia and heart block will usually not occur unless the lesion is above T4.
- Systematic examination is best carried out with the patient supine, and should include:
  - inspection for fasciculations and muscle wasting
  - test tone at knees, hips and ankles; test for clonus
  - test power in upper and lower limbs, if any present
  - test lower limb reflexes: knee jerk, ankle jerk, plantar reflex
  - determine sensory level, comparing left and right; time will probably preclude testing of multiple modalities (touch, pain, temperature, vibration and proprioception).
- If time permits, assess the patient’s airway and listen to the praecordium and posterior chest.
Useful statements
‘Mrs H is a young woman who sustained a mid-thoracic spinal injury in a diving accident 6 years ago, leaving her paraplegic with a loss of bladder and bowel function. Despite this, she maintains a rigorous lifestyle and has had no cardiac or respiratory compromise. Complications of the injury have included relapsing urinary tract infections, and two episodes of autonomic hyperreflexia associated with catheterisation. On examination there is paralysis and wasting of both lower limbs with significant muscle spasm, increased tone, hyperreflexia of knee and ankle jerks with clonus demonstrated at the right ankle on hyperextension. There is an extensor plantar response.
‘There is sensory loss below T5 dermatomal level.’

Investigations
• Radiological investigation of the injury: X-rays, CT scan
• Spirometry
• ECG for high thoracic lesions
• Full blood count, urea and electrolytes
• Urine microscopy and culture.

Topics for discussion
• Pathophysiology of autonomic hyperreflexia: what factors increase the likelihood?
• Prevention and treatment of autonomic hyperreflexia
• Muscle relaxants in spinal injuries, acute and chronic
• Central neuraxial blockade for surgery
• Controversies in neuroprotection for acute spinal cord injury
• Airway management of the patient with a suspected cervical injury
• Controversies in radiological diagnosis of spinal injuries.

13. The patient with muscular dystrophy

Possible clinical scenario
Mr K A is a 19-year-old man with weakness. He is confined to a wheelchair. Please take a brief history and conduct a neurological examination of his upper limbs.

Appropriate thoughts
Some causes of weakness in a male patient of this age include muscular dystrophy, myasthenia (although unusual to be wheelchair-bound with treatment), myotonic dystrophy, cerebral palsy and motor neurone disease. (Of the muscular dystrophies, Becker has similar features to Duchenne, but is usually less severe, is of later onset, and is less progressive. Fascioscapulohumeral dystrophy is nearly as common as Duchenne, but less than 20% will require a wheelchair before the age of 40.)

First impressions
• Examination patients may be present with a carer, who can provide much useful history.
• ‘There may be obvious muscle wasting.
• ‘Is there kyphoscoliosis present?"
Patients with myotonic dystrophy have characteristic facies, baldness and visual problems.

**History**
- Patients should be able to give you a diagnosis.
- Ask about onset of symptoms, symptom progression and functional limitations.
- Does the patient have any cardiorespiratory problems?
- Are there any problems with speech, swallowing or oesophageal reflux?
- Have there been any recent anaesthesias, operations or intensive care admissions?
- Is anyone else in the family affected? (Sketching a brief family tree may give clues to the genetic inheritance, and hence diagnosis; be aware though that cases may be the result of spontaneous gene mutation.)

**Physical examination**
- Patients with muscular dystrophy usually have severe proximal weakness. Deep tendon reflexes tend to be preserved proportional to the amount of remaining muscle mass. Sensation is usually not affected.
- Further examination in consideration for surgery would include cardiovascular examination (patients often develop cardiomyopathy and may have mitral valve prolapse) and respiratory examination (pneumonia and respiratory failure are common terminal events).

**Useful statements**
‘Mr A is a young man who suffers from Duchenne muscular dystrophy. He has been a recent inpatient with left-sided pneumonia, from which he has now recovered. His condition was diagnosed at the age of 3, and he has been wheelchair-bound since the age of 11. Progression seems to have been rapid in the last year, with worsening weakness, reduced functional mobility and increased frequency of respiratory infections. He has difficulty swallowing and has a PEG in situ. While he is still cared for by his parents at home, he is currently being considered for full-time nursing care in a palliative care centre.

‘On examination there is severe muscle wasting of all muscle groups, and obvious kyphoscoliosis. There is marked weakness of all upper limb muscle groups, reduced grip strength, demonstrably present but reduced biceps, triceps and supinator reflexes, and no loss of sensation to light touch.’

**Investigations**
- Creatine kinase is always high in patients with Duchenne muscular dystrophy.
- Routine preoperative screening would include respiratory function testing, chest X-ray and ECG.
- Echocardiography may be extremely useful if surgery is planned.

**Topics for discussion**
- Genetic inheritance of the different muscular dystrophies
- Use of depolarising and non-depolarising relaxants, volatile agents, including dosage
- Pre-medication if surgery is planned
- What is your anaesthesia technique for this patient if appendicitis is suspected?
14. The patient with multiple sclerosis

Possible clinical scenario
Mrs O W is a 29-year-old woman who presented several years ago with transient right hemiparesis. Please take a history of her illness and examine her cranial nerves.

Appropriate thoughts
- The history suggests a central nervous system disorder, and the patient is too young to be suffering from an atherosclerotic cause (unless it was a severe familial hyperlipidaemia). Other possible causes include hemiplegic migraine, paradoxical emboli or multiple sclerosis.
- Focus on taking a thorough history and demonstrating a good cranial nerve examination technique until the nature of the problem becomes more obvious. Patients with multiple sclerosis are usually very well informed about their disease.

First impressions
- Between exacerbations some patients may appear completely well with near complete recovery of symptoms. Others may suffer a more progressive form of the disease without distinct episodes.

History
- Diagnosis of multiple sclerosis requires separate episodes of central nervous system events.
- Ask about onset and offset of symptoms, which may include limb paresis, parasthesiae, ataxia, vertigo, visual disturbance, seizures and pseudobulbar palsy.
- Ask if there are any precipitating factors for attacks (stress, extremes of temperature, intercurrent illnesses, exercise).
- Discuss how the illness impacts on functions of daily living.
- Ask about past and current treatments (which may include carbamazepine, steroids, interferon and some cytotoxics, and rarely plasmapheresis; baclofen and dantrolene may relieve muscle spasm).
- Urinary retention and urgency are common.

Physical examination
- Even with the constraints of the examination format there should be time to perform a thorough cranial nerve examination.
- Note that signs can be extremely variable; there may be loss of visual acuity with central/hemianopic field defects, internuclear ophthalmoplegia (weakness of adduction in one eye and nystagmus in the other), facial weakness and swallowing disorders. In general, cranial nerve signs occur less frequently than long tract signs.
- Further CNS examination may reveal sensory defects, especially to vibration, cerebellar signs (such as ataxia or intention tremor) and variable patterns of spastic motor weakness.

Useful statements
‘Mrs W first presented 3 years ago with a sudden fall at home and weakness of her right arm and leg, which resolved after several days. Investigations for cerebrovascular disease were negative. Approximately 9 months ago she suffered
an episode of dizziness, reduced co-ordination and difficulty maintaining her balance, and was admitted to hospital, at which point a diagnosis of multiple sclerosis was made. These symptoms also resolved after 2 weeks. Since that time she has also suffered from blurred and double vision, which is always present, but fluctuates in severity. She has no other functional limitations at present but has chosen to stop driving. She is currently taking 5 mg prednisone per day.

‘On examination of her cranial nerves there are no visual field defects to gross testing. Eye movements are preserved, but there is sustained nystagmus in her right eye on rightward gaze, which may represent either internuclear ophthalmoplegia or cerebellar disease. Her tongue deviates to the right on protrusion, but there is no wasting or fasciculation. This may represent a right hypoglossal nerve lesion. There are no other obvious cranial nerve abnormalities.’

**Investigations**
- MRI is the imaging modality of choice and may show demyelinated plaques.
- CSF analysis may show leukocytosis, IgG bands and myelin basic protein.

**Topics for discussion**
- Autonomic instability and general anaesthesia
- Importance of temperature monitoring during anaesthesia
- Does general anaesthesia affect the course of the disease?
- Would you be prepared to administer an epidural in labour for this patient?

**15. The patient with myasthenia gravis**

**Possible clinical scenario**
Mrs U S, 35, has a history of difficulty swallowing and fatigue on exertion. Please take a history and examine her upper limbs, and other areas as you see fit.

**Appropriate thoughts**
- The given history suggests a neuromuscular problem.
- With myasthenia it is important to assess the severity of the illness, current treatment, and anticipate questions related to the conduct of anaesthesia in such a patient.

**First impressions**
- Limb girdle and bulbar involvement suggests more severe disease; a degree of ptosis may be evident, and the quality of the patient’s voice may deteriorate after a few minutes; all of these may depend on the timing and effectiveness of current treatment.
- A characteristic myasthenic ‘snarl’ may be evident on smiling.

**History**
- Ask about duration and severity of symptoms, especially limb weakness and chewing or swallowing difficulty (which predict the need for intra- and postoperative airway protection).
- Ocular symptoms of ptosis and diplopia are common.
- Is there significant respiratory impairment?
- What functional limitations are present?
Previous anaesthesia history is of great importance.
What treatment has been undertaken? Thymectomy, immunosuppressives, immunoglobulin, plasmapheresis may have been tried. Symptomatic control is usually with pyridostigmine; daily dosage >700 mg is a predictor of the need for postoperative ventilation.

**Physical examination**
- Test for easy fatiguability of the upper limbs (holding above the head); power will be globally reduced.
- Reflexes in the upper limb should be preserved and there is no sensory loss.
- Ask the patient to keep gazing upward, which may reveal weakness of the eyelid and oculomotor muscles.

**Useful statements**
‘Mrs S first reported symptoms of weakness and fatigue 4 years ago, and was unable to undertake her regular gym training sessions. A diagnosis of myasthenia gravis was made, and she has been on medical therapy since. Her limb weakness improved, but in the last few months has deteriorated. Diplopia became a more significant problem and she was unable to leave her house. Swallowing difficulties with solid food appeared at the same time, and she has had two urgent gastroscopies to retrieve food boluses since then. There have been no reported respiratory problems, but she does not walk further than 200 m due to fatigue. Her current dose of pyridostigmine is 600 mg per day, and her symptoms noticeably worsen after one missed dose. She is currently being investigated and worked up for thymoma removal.
‘On examination, I noticed that her voice became husky after a few minutes speaking. She has obvious ptosis. Upper limb examination reveals easy muscle fatiguability, with overhead arm lift unable to be sustained for greater than 20 seconds. Grip strength is initially normal, but fades after about 10 seconds. Reflexes are normal and there is no sensory deficit to light touch.’

**Investigations**
- Diagnostic tests may include assay of antibodies against acetylcholine receptors, electromyography and edrophonium challenge.
- Investigations for thymoma will usually include chest X-ray and MRI scanning.
- Preoperatively spirometry is very useful; patients with markedly reduced vital capacity are more likely to require postoperative ventilatory support.

**Topics for discussion**
- How would you anaesthetise this patient for emergency laparotomy?
- Management of anticholinesterase therapy in the perioperative period
- Under what circumstances could the patient be extubated at the end of surgery?
- Differentiation of myasthenic crisis from cholinergic crisis.

16. The patient with chronic renal impairment

**Possible clinical scenario**
Mrs E N, 49, presents because of a blocked A-V fistula. Please take a history and examine as you see fit.
Appropriate thoughts
• You should have guessed by now that the patient is likely to have renal failure.
• It is important to elucidate the cause, any complications and current treatment.

First impressions
• Is the patient an inpatient? Is there a vascath or peritoneal dialysis device in situ?
• You may gain an impression of the patient’s overall hydration state.

History
• Ask when renal failure was diagnosed and what led to the diagnosis. Does the patient know the underlying cause for renal disease?
  – glomerulonephritis (primary, or as part of another disease, e.g. lupus)
  – analgesic nephropathy
  – diabetic nephropathy
  – hypertensive nephrosclerosis
  – ureteric reflux
  – polycystic kidney disease.
• Ask about progression of the disease and its treatment, including fluid restriction, dialysis (peritoneal and haemodialysis), transplantation (previous or pending) and other medical treatments (e.g. for hypertension).
• Have there been any major complications of the disease or its treatment?
  – hypertension, anaemia, uraemia, cardiac failure, gout, acute fluid overload
  – dialysis access problems, blocked or infected shunts, peritonitis
• Discuss functional limitations on the patient’s activity, and how the dialysis impacts on their life.
• Ask about concomitant medical conditions, medications, problems with previous surgery and anaesthesia and allergies.

Physical examination
• Make an assessment of the hydration of the patient. Is she clinically anaemic?
• Measure the blood pressure, and ask for the patient’s ideal body weight.
• Examine any dialysis access points, including fistulae for patency, thrombosis or infection, indwelling central venous access lines and peritoneal access points.
• Examine the chest and listen for a pericardial rub or evidence of cardiac failure. Listen to the lung fields.
• Examine the abdomen for scars of previous surgery (dialysis, transplants). Palpate for organomegaly and ascites.
• Examine the legs for oedema, bruising and peripheral neuropathy.

Useful statements
‘Mrs N has a 12-year history of chronic renal impairment caused by membranous glomerulonephritis for which she has been receiving intermittent haemodialysis three times a week for 6 years via an arteriovenous fistula fashioned on her left wrist. Prior to that she had received peritoneal dialysis, which was discontinued due to several serious peritoneal infections. Four days ago it was noted that her A-V fistula was completely thrombosed. She is currently an inpatient receiving haemodialysis via a vascath placed in her right subclavian vein, pending new A-V fistula formation tomorrow. She leads an active lifestyle despite her illness. She is
not on the waiting list for a renal transplant because of her own personal cultural beliefs. On examination she is normotensive and her hydration appears normal, consistent with her dialysis last night.’

**Investigations**
- Urea, creatinine and serum electrolytes, creatinine clearance and plasma creatinine/urea ratio
- Chest X-ray – look for acute pericarditis, position of vascath
- Full blood count
- ECG
- ABG – look for metabolic acidosis.

**Topics for discussion**
- Timing of dialysis and elective surgery, perioperative fluid management
- Complications and mortality from dialysis
- Electrolyte disturbances and their emergency treatment
- Anaesthesia techniques for A-V fistula formation: general versus regional
- Management of coagulation problems in renal failure
- Pharmacology of anaesthesia agents in renal failure.

**17. The patient with chronic liver disease**

**Possible clinical scenario**
Mr E X, aged 63, has been feeling unwell for many weeks. Please take a history and conduct an abdominal examination.

**Appropriate thoughts**
The directed examination suggests the possibility of abdominal organomegaly.

**First impressions**
- Is the patient jaundiced?
- Is the patient malnourished?
- Other immediate clues to chronic liver disease may include tattoos (a source of viral infection) or pigmentation (haemochromatosis).

**History**
- Ask the patient if they know the nature of their underlying condition. A diagnosis of cirrhosis is commonly caused by either chronic alcohol abuse or viral infection, although the differential diagnosis is large.
- What caused the patient to seek treatment? Common presenting complaints include:
  - weakness and fatigue
  - jaundice
  - abdominal pain or swelling (ascites)
  - altered mental state
  - pruritis.
- Ask about the duration of liver disease, including the following:
  - alcohol intake
  - intravenous drug addiction, tattoos, blood transfusions
– overseas travel
– drugs, e.g. isoniazid.

• Have there been any complications?
  – haematemesis from bleeding varices, melaena
  – ascites
  – encephalopathy
  – cholecystitis
  – pancreatitis.

• What treatment has the patient received (including investigations)?
  – liver biopsy
  – ascitic tap
  – protein and fluid restriction
  – gastroscopy and injection of varices, portocaval shunt.

• Enquire about restrictions on activity, and social impact of the disease.

**Physical examination**

You may be again directed by the examiner to start examination at the abdomen. The patient should be lying supine, with one pillow.

• As you approach the abdomen, you may notice other stigmata of chronic liver disease:
  – palmar erythema
  – bruising
  – spider naevi
  – yellow sclerae
  – feto
  – gynaeacomastia.

• Inspect the abdomen:
  – masses
  – distension
  – bruising
  – scars.

• Palpate all four quadrants:
  – hepatomegaly: massive, firm, tender, irregular, pulsatile
  – splenomegaly (consider rolling patient onto right side as well)
  – kidneys.

• Percuss:
  – approximate liver span
  – ascites: roll and test for shifting dullness.

• Auscultation:
  – bruits
  – friction rubs
  – presence of bowel sounds.

• Assess for the presence of hepatic encephalopathy:
  – asterixis/flap
  – constructional apraxia.

**Useful statements**

‘Mr X is currently an inpatient and gives his presenting problem as cirrhosis. He is a vague historian. On further questioning he reports excessive alcohol consumption of at least 2 bottles of port per night over a period of approximately 40 years, which is the
likely cause of his disease. He has undergone recent gastroscopy for haematemesis. He is unaware of any current medical treatments. On examination he is malnourished with several stigmata of chronic liver disease, including scleral jaundice, many spider naevi on his arms and trunk, palmar erythema and many large bruises. Examination of his abdomen reveals generalised distension. Both liver and spleen were palpable and both were significantly enlarged. I suspect the presence of ascites as evidenced by shifting dullness to percussion. The most likely diagnosis in this gentleman is cirrhosis caused by alcoholic hepatitis, and complicated by portal hypertension.’

**Investigations**

- Full blood count
- Urea and electrolytes, serum ammonia
- Transaminases, bilirubin, albumin, blood glucose
- Coagulation studies
- Ascitic fluid cytology, microscopy, culture and biochemistry
- Liver biopsy.

**Topics for discussion**

- Anaesthesia implications of chronic liver disease
- Child–Pugh classification of severity of liver disease
- Indications/contraindications for liver transplantation
- Differential diagnosis of hepatosplenomegaly
- Causes of acute hepatitis
- Risks of needle stick injury for hepatitis viruses
- Anaesthesia implications of chronic alcoholism.

**18. The patient with an organ transplant**

**Possible clinical scenario**

Mrs Q F, 36, presents for routine check-up after major surgery. Please take a history and examine her cardiovascular system.

**Appropriate thoughts**

There are few clues to go on here, unless the major surgery was on her cardiovascular system …

**First impressions**

- Unless major complications have intervened, the majority of patients with a solid organ transplant regain the function of the previously diseased organ.
- It is likely that the patient will appear fit and well, but this may depend on how long ago the operation took place. The patient may appear Cushingoid from steroid therapy.

**History**

- Most patients will be very well informed about the nature of their previous disease and treatment, and the diagnosis will quickly become obvious.
- Ask about the cause of previous cardiac failure (in this age group usually due to cardiomyopathy) and symptoms the patient was experiencing prior to surgery, including functional limitation and exercise tolerance.
• Ask about the patient’s surgery: when and where, and whether there were any complications (the most common of these are rejection and infection). Coronary vascular disease and malignancy may be problems in later years, as may hyperlipidaemia and hypertension.
• Determine the patient’s current exercise tolerance and functional reserve.
• Are they able to work?
• Ask about current medications, especially anti-hypertensives, cholesterol-lowering medication and immunosuppressants – have there been any adverse reactions from these?
• Ask about routine check-ups, including cardiac catheterisation and biopsies.
• Ask about any other co-existent diseases, previous anaesthesia problems and allergies.

Physical examination
• Perform your usual cardiovascular examination.
• Ask for the patient’s weight and blood pressure.
• The transplanted heart lacks parasympathetic innervation, the resting heart rate is usually around 90 beats per minute, and sinus arrhythmia is lost.
• A small percentage of patients require a permanent pacemaker because of postoperative bradycardias.
• A median sternotomy scar will be present, as may scars over the right internal jugular vein (from endocardial biopsies).
• Listen for normal heart sounds and clear lung fields.

Useful statements
‘Mrs F presents for routine cardiac catheterisation 3 years after successful heart transplantation. She suffered from severe cardiomyopathy prior to this, with rapid deterioration in functional status over 2 years. At the time of her operation she was bed-bound, suffered from severe orthopnoea and had an exercise tolerance of 10 metres on the flat. The operation proceeded uneventfully and there were no immediate postoperative complications. She has suffered some basal cell carcinomas on her skin since the operation, but few other problems with immunosuppression. She is working full-time and can walk for several kilometres a day.’

Investigations
• ECG: look for a second P wave (native + donor atrium; usually disappears), RBBB common
• Cardiac catheterisation data
• Echocardiography: look for intramural thrombi, ventricular function
• Full blood count and serum electrolytes
• Chest X-ray.

Topics for discussion
• Management of anaesthesia for elective surgery
• Infection prophylaxis
• Detection of postoperative ischaemia
• What signs and symptoms might alert you to the possibility of rejection?
• Long-term prognosis for transplant recipients.
Note that many candidates will sit the clinical examination in a major or capital city where transplant candidates (pre- and post-surgery) are readily available for participation in the medical vivas. The information presented above can be used in a first principles extrapolation for lung, kidney and liver transplants, i.e. cause and consequences of previous organ dysfunction, perioperative management and complications (including complications of immunosuppression), post-transplant function. You should be able to assess these patients as though they were appearing on your list for elective surgery, even if you are from a centre where transplant patients are a rarity.

19. The patient with rheumatoid arthritis

Possible clinical scenario
Mrs S A, aged 49, presents for metacarpophalangeal joint replacement of her hands. Please take a history and conduct a relevant examination.

Appropriate thoughts
• The operation should alert you to a possible diagnosis.
• Think of the articular and extra-articular manifestations of rheumatoid arthritis that may be of relevance to anaesthesia.

First impressions
• A diagnosis of rheumatoid arthritis may be obvious on first inspection.
• Does the patient look Cushingoid from steroid use?

History
• Determine if rheumatoid arthritis is the patient’s main medical problem.
• Ask when the diagnosis was made and what symptoms, initially led to the diagnosis.
• Disease progression is important. Ask which joints are mainly affected, and specifically ask about the neck and jaw.
• Ask specifically about upper limb neurological symptoms which may indicate nerve or spinal cord compression.
• Is the disease currently active? What functional impairment is present and in which joints? How does this impact on activities of daily living?
• Ask about past and present drug treatment.
• Have there been any problems related to pharmacological therapy?
• Obtain a list of all medications.
• Ask about previous anaesthesia problems and document any allergies.
• Remember non-articular symptoms of the disease:
  – dry or inflamed eyes
  – Raynaud’s phenomenon
  – peripheral neuropathy
  – dyspnoea from anaemia or pleural effusion/fibrosis
  – chest pain typical of pericarditis
  – renal problems.

Physical examination
It may be useful to describe the articular changes seen in rheumatoid arthritis to the examiners as you find them.
Examination anaesthesia

• Upper limbs:
  – swan-neck and boutonnière deformities of the fingers
  – Z deformity of the thumb
  – ulnar deviation and palmar subluxation at the wrist
  – vasculitis may be evident in the nail-beds
  – look for muscle wasting on the palmar surface of the hands
  – evidence of previous surgery
  – rheumatoid nodules, if present.
• Feel and move any affected joints for swelling and range of movement and tenderness (be gentle).
• Test the patient’s grip strength and hand function (ask the patient to undo and redo a button).
• Head and neck:
  – Look at the patient’s posture and test the range of movement of the neck in all planes
  – Look for temporomandibular joint involvement (swelling and tenderness to palpation, clicking and grating with jaw opening)
  – Examine the eyes for redness and dryness and nodular scleritis
  – Listen for hoarseness, which may indicate cricoarytenoid involvement.
• Chest:
  – Listen to the heart for murmurs and pericardial rub
  – Listen to lung fields for signs of effusion or crepitations due to pulmonary fibrosis.
• Abdomen:
  – Look for splenomegaly if time permits (in Felty’s syndrome, associated with neutropenia).

Investigations
• Serology: note that rheumatoid factor is neither particularly specific nor sensitive; urea and electrolytes for renal function
• X-rays of affected joints: look for joint erosion, destruction and swelling
• C-spine X-ray: when examining flexion and extension films look for atlanto-axial subluxation (seen as separation of anterior margin of odontoid process from posterior margin anterior arch of atlas >3–4 mm). If separation is severe, the odontoid process may protrude into foramen magnum and put pressure on spinal cord or impair blood flow through vertebral arteries. The odontoid may be eroded. Subluxation of other cervical vertebrae may occur.
• Echocardiography: look for pericardial effusion
• ECG: look for acute pericarditis, conduction defects from nodules
• Chest X-ray: look for thoracic manifestations of the disease
• FBC: check for anaemia, thrombocytopaenia
• Spirometry: look for a restrictive lung defect.

Useful statements
‘Mrs A presents for her third metacarpophalangeal joint replacement operation. She has had rheumatoid arthritis for 15 years, and manifests severe changes of a symmetric polyarthropathy to the joints in her hands and wrists, which severely limit her functional activity. She has had no problems with her cervical spine or temporomandibular joint and to date no complications of her eyes, lungs, heart or kidneys. Her current medications include aspirin, prednisolone and methotrexate,
The medical vivas

which are only partially effective in relieving her symptoms. Examination of her neck and airway is unremarkable.

Topics for discussion
- Diagnosis of cervical spine, temporomandibular joint, laryngeal involvement
- Complications of pharmacological therapy: aspirin, NSAID, steroids, methotrexate, penicillamine, gold, azathioprine, cyclosporin
- Perioperative glucocorticoid supplementation
- Airway management for distal limb surgery
- Extra-articular manifestations of the disease
- Intraoperative positioning and monitoring difficulties.

20. The patient with ankylosing spondylitis

Possible clinical scenario
Mr L O, 29, requires insertion of lower jaw prosthetic dental implants under general anaesthesia. He has a long history of back and hip pain. Please take a brief history and examine his airway and axial skeleton.

Appropriate thoughts
- The given history suggests orthopaedic injury or arthritides. The examination request raises the possibility of spondylitis.
- Perhaps the impending surgery is for dental trauma from difficult intubation?

First impressions
- Ankylosis of the spine may lead to an unusually stiff posture.
- Kyphosis may be obvious.

History
- Taking a brief dental history may be appropriate in this case.
- Ask about onset, severity and progression of back and hip pain. Patients usually complain of back pain radiating to the sacro-iliac joints and hips, which is worse at night and improves after movement.
- Tendon and ligament inflammation is common, especially Tendoachilles, costochondritis.
- Ask about visual symptoms – uveitis/iritis is common and may be severe.
- Ask about cardiovascular and renal disease; there are associations with aortitis, aortic regurgitation, pulmonary fibrosis and amyloid deposits.
- Ask about previous anaesthesia or airway difficulties.
- Specific problems include temporomandibular joint dysfunction, cervical fusion, atlanto-axial subluxation, risk of occult cervical fracture with minimal trauma, cricoarytenoid arthritis; neuraxial block may be impossible (paramedian spinal may be best option); patient positioning may be difficult; limited chest expansion may be present.
- Ask about functional limitations and current treatment.

Physical examination
- Care should be spent assessing the airway for features listed above.
- Observe any kyphosis of the spine and assess degree of movement of all parts of the spine.
Examination anaesthesia

- Feel for specific tenderness in the spine and sacro-iliac joints; assess hip range of motion.
- Examine the chest (thoracic expansion specifically) and auscultate the heart and lungs.

Useful statements
‘Mr O is a young man who suffered dental trauma from a difficult intubation while undergoing appendicectomy 7 months ago. He carries a letter and Medic Alert bracelet detailing this; the main problems seem to have been with jaw opening and limited neck movement. He was diagnosed with ankylosing spondylitis as a teenager, which affects his entire spine and his sacro-iliac joints. He has no history of cardiac disease, but suffers from uveitis. On examination there is fixed kyphosis of the thoracic spine and loss of lumbar lordosis. There is markedly reduced neck flexion and extension with some preservation of rotation. There is tenderness over both sacro-iliac joints and reduced hip flexion. My main concern is airway management for the impending surgery.’

Investigations
- Preoperative respiratory function testing and echocardiography may be indicated if evidence of extra-articular disease is present.
- Neck and spine X-rays will outline extent of disease.
- FBE may show normochromic anaemia.

Topics for discussion
- Technique of intubation
- What do you do if awake fibre-optic intubation fails?
- The patient returns 1 year later for repair of ruptured Achilles tendon. What other problems do you anticipate?

21. The patient with trisomy 21

Possible clinical scenario
Mr T O is 24 and due to undergo dental examination under anaesthesia. He is present with a carer. Please take a history and conduct a brief examination.

Appropriate thoughts
- Patients with Trisomy 21 (Down Syndrome) will occasionally appear in the medical vivas. They will often be present with a relative or carer, who may provide the bulk of relevant history. It is important to have a gentle, kind approach.
- You should be considering systemic manifestations of the condition.

First impressions
The diagnosis can be made from the characteristic facies.

History
While many patients with Trisomy 21 have intellectual impairment, there is a wide variation in cognitive abilities in this group of patients. You may be asked to direct your questions to the carer present.
• Ask about complications and associations of the syndrome that have been encountered in the past:
  – congenital heart disease (especially endocardial cushion defects/VSD/patent ductus/tetralogy of Fallot), corrective surgery, cyanotic episodes, pulmonary hypertension
  – eye problems: strabismus, cataracts
  – hypothyroidism
  – central or obstructive sleep apnoea, susceptibility to respiratory infection
  – joint problems, including cervical instability
  – epilepsy
  – hearing problems
  – immunosuppression and increased risk of malignancy, e.g. leukaemia.
• Ask about the patient’s current level of functioning at home and in the community.
• Ask about previous operations and anaesthesias and any problems encountered.
• Obtain a list of medications and ask about any allergies.

**Physical examination**

• Some time should be spent focusing on aspects of the patient’s airway. Particular problems include:
  – macroglossia
  – micrognathia
  – short, broad neck
  – atlanto-axial instability in about 15% of patients: usually asymptomatic
  – subglottic stenosis less common in adults
  – generalised joint laxity, including temporomandibular joint
  – high arched palate.
• Examine the cardiovascular system, in particular looking for evidence of previous surgery and any cardiac murmurs that may be present.
• Look for evidence of pulmonary hypertension or right ventricular hypertrophy.

**Useful statements**

‘Mr O is a young man born with Trisomy 21. He has a history of a small ventricular septal defect, which has required no further treatment. Other manifestations of the condition include epilepsy, which is currently well controlled on sodium valproate, and moderate intellectual impairment. There has been no problem with operations or anaesthesia in the past. On examination, many characteristic features of Trisomy 21 are present. My concerns relating to management of his airway include macroglossia and micrognathia with reduced neck movement in all directions. Cardiac auscultation reveals a loud pansystolic murmur throughout the praecordium consistent with a ventricular septal defect. I would seek further information before embarking on the proposed surgery.’

**Investigations**

• Previous anaesthesia records may provide much useful information
• Echocardiography
• ECG
• Thyroid function tests
• Cervical spine X-rays.
Topics for discussion

- Aetiology of the disorder
- Treatment of hypoxia/right to left shunting in children
- Approach to airway management in this patient
- Should cervical spine X-rays be routine in all Down syndrome patients?