



OXFORD SPECIALTY TRAINING

CLINICAL SAQs FOR THE FINAL FRCEM

Ashis Banerjee | Anisa J. N. Jafar | Angshuman Mukherjee
Christian Solomonides | Erik Witt

FRCEM Final
toxicology
cardiology
ENT
neurology and psychiatry
infectious diseases
emergency medicine
trauma
obstetrics and gynaecology
critical care
maxillofacial
paediatrics

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Contents

List of Abbreviations [vii](#)

Introduction [ix](#)

- 1 Abdominal Surgery [1](#)
- 2 Cardiology [19](#)
- 3 Care of the Elderly [51](#)
- 4 Critical Care and Anaesthesia [61](#)
- 5 Dermatology [71](#)
- 6 Endocrinology [83](#)
- 7 ENT Surgery [95](#)
- 8 Environmental Medicine and Toxicology [109](#)
- 9 Gastroenterology [133](#)
- 10 Haematology [143](#)
- 11 Infectious Diseases [151](#)
- 12 Maxillofacial Surgery [175](#)
- 13 Metabolic Conditions [183](#)
- 14 Musculoskeletal Conditions [195](#)
- 15 Neurology and Psychiatry [219](#)
- 16 Obstetrics and Gynaecology [247](#)
- 17 Ophthalmology [265](#)
- 18 Paediatrics [285](#)
- 19 Respiratory Medicine [315](#)
- 20 Trauma [335](#)
- 21 Urology [351](#)
- 22 Vascular Emergencies [365](#)

Index [377](#)

Abbreviations

ABCDE	Airway, Breathing, Circulation, Disability, Exposure
ACE	angiotensin-converting enzymes
ACEI	angiotensin-converting enzyme inhibitor
ACS	acute coronary syndrome
ALS	advanced life support
ANC	absolute neutrophil count
ASIS	anterior superior iliac spine
ATRIA	Anticoagulation and Risk Factors in Atrial Fibrillation
AV	atrioventricular
BCSH	British Committee for Standards in Haematology
BNF	British National Formulary
CARLS	cyanosis, air entry, retractions, level of consciousness, saturation
CATS	children's acute transport service
CIWA	Clinical Institute Withdrawal Assessment
CNS	central nervous system
COPD	chronic obstructive pulmonary disease
CPAP	continuous positive airway pressure
CPR	cardiopulmonary resuscitation
CRP	C-reactive protein
CRVO	central retinal vein occlusion
CT	computed tomography
DBP	diastolic blood pressure
DVLA	Driver and Vehicle Licensing Agency
ECG	electrocardiogram
ED	emergency department
EM	erythema migrans
ENT	ear, nose, throat
ESC	European Society of Cardiology
FFP	fresh frozen plasma
GABA	gamma-aminobutyric acid
GCS	Glasgow Coma Score
HA	hereditary angioedema
HELLP	haemolysis, elevated liver enzymes, and low platelet count
HEMS	Helicopter Emergency Medical Service
HFA	Heart Failure Association
HHS	hyperosmolar hyperglycaemic state
HSP	Henoch–Schönlein purpura
HZO	herpes zoster ophthalmicus
IBD	inflammatory bowel disease
ICD	implantable cardioverter defibrillator
ICP	intracranial pressure
INR	international normalized ratio
IRAD	International Registry of Acute Aortic Dissection
IVC	inferior vena cava
NICE	National Institute for Health and Care Excellence
NIHSS	NIH Stroke Severity Score

NSAID	non-steroidal anti-inflammatory drug
NSTE-ACS	non-ST-elevation acute coronary syndrome
ORIF	open reduction and internal fixation
PE	pulmonary embolism
PEEP	positive end-expiratory pressure
PEG	percutaneous endoscopic gastrostomy
PERC	Pulmonary Embolism Rule-Out Criteria
PID	pelvic inflammatory disease
PPE	personal protective equipment
PRISM	primary care streptococcal management
qSOFA	quick Sequential Organ Failure Assessment
RCOG	Royal College of Obstetricians and Gynaecologists
ROSIER	Recognition of Stroke in the Emergency Room
RSI	rapid sequence induction
RVO	retinal vein occlusion
SAH	subarachnoid haemorrhage
SAQ	short answer questions
SAU	surgical assessment unit
SBP	systolic blood pressure (also spontaneous bacterial peritonitis)
SJS	Steven–Johnson syndrome
SM	sartorius muscle
SOFA	Sequential Organ Failure Assessment
TBS	total body surface
TEN	toxic epidermal necrolysis
TIA	transient ischaemic attack
VOR	vestibulo-ocular reflex
WHO	World Health Organization

Introduction

The Final FRCCEM examination is a high-stakes event, successful completion of which forms part of the requirements for obtaining a Certificate of Completion of Training in the specialty of Emergency Medicine in the United Kingdom. A new examination format was introduced on 1 August 2016.

The purpose of this book is to acquaint emergency medicine trainees with the format and potential content of the Short Answer Question (SAQ) paper in the Final FRCCEM examination subsequent to introduction of the above-mentioned changes.

The Final FRCCEM SAQ section comprises 60 questions to be answered in a period of three hours with 3 marked questions. In this book each practice SAQ has 3 parts and these are worth 1 mark each—this may differ in the FRCCEM exam itself where some SAQs may have parts worth 2 marks. The extent of knowledge required for a successful outcome is wide ranging as is, indeed, the scope of emergency medicine as a specialty. There is no substitute to acquiring a solid grounding in the relevant areas of the curriculum.

While answering the SAQ paper, it is important to have a good time management strategy. Questions that appear difficult should ideally be answered towards the end after completion of the bulk of the paper.

Candidates may find this book useful in the achievement of a successful outcome, alongside self-preparation, guided by standard textbooks, online revision courses, and attendance at SAQ courses. The provided answers are inevitably of greater length than feasible in the real examination to enable provision of additional factual material. The Royal College of Emergency Medicine website provides authoritative guidance regarding the examination and must be consulted as a matter of necessity.

We wish our readers the best as they prepare for this exam.

Acknowledgements

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Chapter I **Abdominal Surgery**

SAQ 1	Abdominal Pain	2
SAQ 2	Post-laparoscopy Complications	4
SAQ 3	Cholangitis	6
SAQ 4	Acute Appendicitis	8
SAQ 5	Acute Cholecystitis	10
SAQ 6	Ingested Foreign Body	12
SAQ 7	Abdominal Pain and Vomiting	14
SAQ 8	Rectal Bleeding	16

SAQ I Abdominal Pain

An 82-year-old male presents with generalized abdominal pain and distension which has progressed over the preceding four days. Fig. I.I shows his abdominal radiograph.

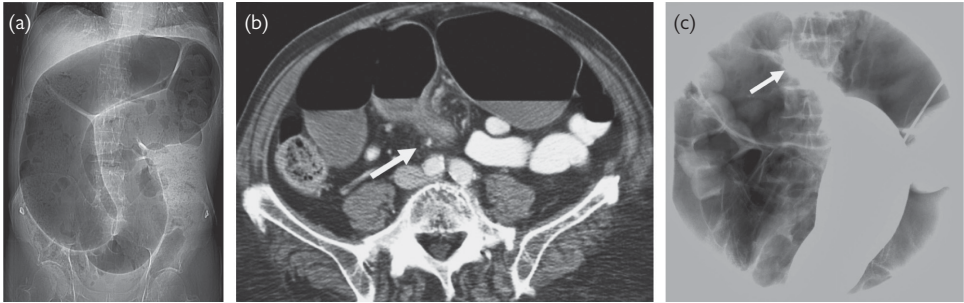


Fig. I.I Reproduced from Levy, A., Morteale, K. and Yeh, B. (2015). *Gastrointestinal Imaging*. Oxford University Press USA. Copyright © 2017 Oxford University Press. Reproduced with permission of the Licensor through PLSclear.

- Q1. What is the diagnosis? List one possible underlying cause and two complications of this condition.
- Q2. How can this be managed acutely?
- Q3. List four medical causes of acute abdominal pain.

Answers

A1.

The colon is dilated and does not display haustral markings. The features are those of a closed-loop large bowel obstruction, suggesting sigmoid volvulus, which is the commonest type of volvulus involving the gastrointestinal tract. The dilated sigmoid colon is often described as demonstrating a coffee bean appearance, caused by central notching. Potential underlying causes include chronic constipation and/or laxative abuse, chronic neurological disease (e.g. Parkinson's disease and multiple sclerosis), and psychotropic medication (e.g. for chronic schizophrenia). The redundant and mobile sigmoid colon undergoes torsion, usually in a clockwise direction, around its mesenteric axis. The root of the sigmoid mesocolons is usually narrowed. Complications include (choose two from):

- Strangulation leading to gangrene
- Bowel perforation
- Faecal peritonitis
- Recurrent volvulus

A2.

The patient is placed in the left lateral position and a sigmoidoscope (along with a rectal flatus tube) is fed into the twisted loop to decompress it, allowing detorsion. Without definitive surgery, usually performed electively and involving sigmoid resection, 60% will recur. Emergency surgery is required in the presence of bowel gangrene.

A3.

Medical causes of acute abdominal pain include (choose four from):

- Henoch–Schönlein purpura
 - ◆ Necrotizing vasculitis of arterioles and capillaries, most common in male children and with abdominal pain, haematuria/proteinuria, and joint pain as classical manifestations
- Hypercalcaemia
 - ◆ Most commonly this is caused by malignancy or primary hyperparathyroidism
- Lower lobe pneumonia
 - ◆ This further makes the case for performing chest radiography in adults with undiagnosed upper abdominal pain
- Inferior myocardial infarction
 - ◆ Electrocardiogram (ECG) is likely to show ST elevation in leads II, III, and aVF with ST depression in lateral+/- high lateral leads (I, aVL, V5, V6)
- Acute intermittent porphyria
 - ◆ Metabolic disorder with dysfunctional production of haem
- Diabetic ketoacidosis
 - ◆ The cause of abdominal pain in this circumstance is not definitively known but is likely related to a level of gastroparesis influenced by the metabolic disturbance
- Lead poisoning
 - ◆ For symptoms such as abdominal pain to appear, dangerous blood levels are likely to have been reached
- Opiate withdrawal
 - ◆ There are multiple different management modalities for this such as antidepressants, benzodiazepines, clonidine, laxatives, and psychological interventions
- Addison's disease
 - ◆ This is primary adrenal insufficiency causing low cortisol
- Sickle cell crisis
 - ◆ Although pain can be caused by vascular occlusion, a different underlying cause of the pain (such as appendicitis) may be the trigger for the crisis itself

Further Reading

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Tidy C (2015). *Sigmoid Volvulus 2015*. Available from: <http://patient.info/doctor/sigmoid-volvulus>

SAQ 2 Post-laparoscopy Complications

A 23-year-old female presents with severe abdominal pain following diagnostic laparoscopy, at which endometriosis has been diagnosed.

- Q1. List at least six features which might suggest a postoperative complication of laparoscopic surgery.
- Q2. After some time in the department, you become concerned that this lady might be suffering a complication. Which two diagnostic approaches are appropriate to assess this?
- Q3. What is meant by abdominal compartment syndrome?

Answers

A1.

Features suggesting a complication of laparoscopic surgery include:

- abdominal pain needing opiate analgesia
- anorexia or reluctance to drink
- reluctance to mobilize
- nausea
- vomiting
- tachycardia
- abdominal tenderness
- abdominal distension
- poor urine output
- cardiac arrhythmia

The National Patient Safety Association produced a report discussing missed complications of laparoscopic surgery and cited these ten indicators as something which should raise suspicion and possibly prompt senior surgical review.

A2.

Computed tomography (CT) scan and/or diagnostic laparoscopy are indicated to assess the cause of the presentation. Ultrasound is unlikely to be useful in the presence of free gas in the abdomen as it will prevent a good image.

A3.

Abdominal compartment syndrome refers to increased pressure within the abdomen usually due to oedema, accumulation of free fluid, or distension of the bowel, such that the compliance threshold of the abdomen is breached and the abdominal wall can no longer stretch. This is associated with organ dysfunction related to the consequent intra-abdominal hypertension. Organ dysfunction occurs in the presence of a sustained intra-abdominal pressure greater than 20 mm Hg. Normally, intra-abdominal

pressure ranges between 5 and 7 mm Hg, and intra-abdominal hypertension is diagnosed with a pressure greater than 12 mm Hg.

Further Reading

Kapadia CR, McMahon MJ. Guidelines on the management of complications. Association of Laparoscopic Surgeons of Great Britain and Ireland. Clinical Guidelines, ALSGBI, 2006

NPSA. Laparoscopic surgery: failure to recognise post-operative deterioration. London, UK: National Patient Safety Agency. 2010.

SAQ 3 Cholangitis

A 38-year-old man presents with right upper quadrant abdominal pain and confusion. He is pyrexial. You make a preliminary diagnosis of acute ascending cholangitis.

- Q1. Name two organisms that may be involved.
Q2. List three predisposing factors for the development of this condition.
Q3. What triad of diagnostic features typically is associated with cholangitis?
-

Answers

A1.

Potential causative organisms include:

- *Escherichia coli*
- *Klebsiella*
- Enterococci
- *Pseudomonas aeruginosa*
- *Enterobacter*
- Streptococci

A2.

Predisposing factors for cholangitis include:

- Gallstones
- Intestinal parasites
- Biliary tree instrumentation: ERCP
- Biliary stricture
- Neoplasm (ampulla of Vater, common bile duct, duodenum, head of pancreas, gallbladder)
- AIDS

A3.

The triad indicating cholangitis comprises:

- Right upper quadrant pain
- Jaundice
- Fever, usually with chills or rigors

At least half to over a third of presentations involve this triad and up to another fifth presents with the Reynolds pentad, which adds shock and an altered mental state to this classic Charcot's triad.

Ideally blood cultures ought to be taken before antibiotics are administered with Gram-negative and anaerobic cover. Sometimes endoscopic drainage is required, especially when further organ

involvement develops, or the patient develops refractory circulatory shock. Liver abscesses, sepsis, and multiorgan dysfunction can develop as a complication of cholangitis itself. Following any biliary drainage bleeding, fistulae and bile leakage are potential complications.

Further Reading

Miura F, Takada T, Strasberg SM, Solomkin JS, Pitt HA, Gouma DJ, et al. (2013) TG13 flowchart for the management of acute cholangitis and cholecystitis. *Journal of Hepatobiliary and Pancreatic Science*. 2013;20(1):47–54.

SAQ 4 Acute Appendicitis

A 17-year-old male presents with acute abdominal pain. You are concerned that he may have acute appendicitis.

- Q1. What is the mechanism by which appendicitis is believed to occur and what risk factors exist for its development?
- Q2. Describe two atypical anatomical presentations of appendicitis.
- Q3. Name a scoring system which may be useful in arriving at the diagnosis and the salient features of this scoring system.
-

Answers

A1.

It is thought that appendicitis represents secondary infection following obstruction of the appendiceal lumen. Potential causes which may lead to luminal obstruction can be:

- Faecoliths
- Submucosal lymphoid hyperplasia as a result of viral infection
- Undigestible food fragments
- Parasites
- Tumour growth, such as adenocarcinoma of the caecum, or carcinoid

Risk factors for developing appendicitis include:

- Age—there is a peak in incidence between the age of 10 and 20 years; however, any age group can develop appendicitis.
- Men—more males than females develop appendicitis by a ratio of 1.4:1.
- Antibiotic use—frequent antibiotics can alter the flora of the gut to the extent whereby response to viral infections is modified, which then may trigger appendicitis.
- Smoking—this risk is increased in smokers and in children who are passive smokers.

A2.

Atypical presentations of appendicitis can be seen in the following situations related to altered anatomical position:

- Pregnancy causes a shift in normal anatomy, especially in the latter trimesters—pain may be felt in the right upper quadrant or right flank.
- Retrocaecal appendicitis may result in right loin pain and a positive psoas test (this involves passively extending the right thigh while in the left lateral position, which elicits pain in the right lower quadrant). Overlying caecum can protect from tenderness on deep palpation.
- Pre/post-ileal appendicitis may present as diarrhoea and vomiting.

- Subcaecal/pelvic appendicitis may present with pain in the suprapubic area with urinary frequency. Tenesmus and diarrhoea are possible due to rectal irritation and vaginal tenderness is also possible on the right side. Haematuria and leucocyturia may be noted on urine dipstick testing.
- A long appendix with inflammation at the tip may cause left lower quadrant pain.

A3.

The Alvarado score comprises three symptoms, three signs, and two laboratory findings, with a maximum total score of 10:

- Abdominal pain that migrates to the right lower quadrant (+1)
- Anorexia (+1)
- Nausea or vomiting (+1)
- Right lower quadrant tenderness (+2)
- Nausea or vomiting (+1)
- Rebound tenderness (+1)
- Elevated temperature ($>37.3^{\circ}\text{C}$) (+1)
- Leukocytosis $>10\,000/\mu\text{L}$ (+2)
- Neutrophilia with left shift (+1)

Reprinted from *Annals of Emergency Medicine*, 15, 5, Alvarado, A. A practical score for the early diagnosis of acute appendicitis. pp. 557–564. [https://doi.org/10.1016/S0196-0644\(86\)80993-3](https://doi.org/10.1016/S0196-0644(86)80993-3). Copyright © 1986 Published by Mosby, Inc., with permission from Elsevier.

There is a very low risk of appendicitis with a score of less than 4 points.

Further Reading

Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Annals of Emergency Medicine*. 1986;15(5):557–64.

NICE (2016). *Appendicitis—CKS 2016*. Available from: <https://cks.nice.org.uk/appendicitis#!topicsummary>

SAQ 5 Acute Cholecystitis

A 32-year-old female presents to you with right upper quadrant pain. She is known to have gallstones and you suspect that this is cholecystitis.

Q1. Give four risk factors for gallstone formation

Q2. What are the clinical features you look for when diagnosing cholecystitis? Give at least four

Q3. Give two possible complications of acute cholecystitis

Answers

A1.

Risk factors for gallstone formation include any four from:

- Female sex
- Older age
- Obesity
- Rapid weight loss over a short period
- Pregnancy
- Crohn's disease
- Hyperlipidaemia
- Diabetes mellitus (metabolic syndrome of type 2 diabetes mellitus, truncal obesity, insulin resistance, hypertension, and hyperlipidaemia)
- Family history of gall stones
- Haemolytic disorders (pigment gallstones)

A2.

Signs and symptoms of acute cholecystitis include (give four from):

- Sudden onset right upper quadrant pain which is constant and severe
- Anorexia
- Nausea and vomiting
- Fever (usually low grade)
- Tender right upper quadrant with a positive Murphy's sign, which has a specificity of over 79% (this is pain on palpation of the right upper quadrant which inhibits inspiration)
- Gallstones in the history

Raised white cell count and C-reactive protein are commonly found. Other differential diagnoses to be aware of include peptic ulcer disease, hepatitis, pancreatitis, and cardiac disease. It is important to try to rule them out with history, physical examination, and investigations as appropriate.

A3.

Complications of acute cholecystitis include (give two from):

- Gallbladder perforation
- Biliary peritonitis
- Development of pericholecystic abscess
- Development of fistula between the gallbladder and duodenum

Although mortality is less than 10%, in older people it is higher and comorbidities (such as diabetes mellitus) worsen prognosis.

Further Reading

Elwood DR. Cholecystitis. *Surgical Clinics of North America*. 2008;88(6):1241–52, viii.

NICE. *Cholecystitis—Acute—CKS*. 2013. Available from: <https://cks.nice.org.uk/cholecystitis-acute>

SAQ 6 Ingested Foreign Body

Worried parents bring their three-year-old son into the emergency department, concerned that their child may have a coin stuck in the throat. See Fig. 1.2.

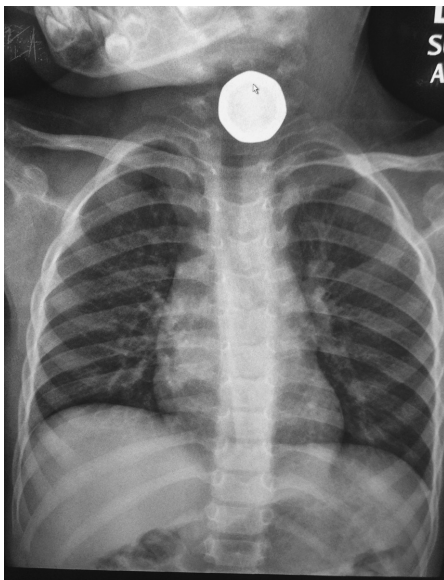


Fig. 1.2

- Q1. Please consider the choking algorithm. If this conscious child has an ineffective cough, what are the next steps?
- Q2. With gastrointestinal foreign bodies, where are the high-risk areas for impaction?
- Q3. List three possible complications of foreign body ingestion.

Answers

A1.

The recommended sequence of actions includes:

1. Five back blows initially
2. Five thrusts (chest for infant, abdominal for child >1 year)
3. If the child is unconscious, the next step would be to open the airway, give five rescue breaths, and commence cardiopulmonary resuscitation

A2.

Foreign body impaction in the gastrointestinal tract occurs preferentially at either:

- Upper oesophageal sphincter
- Lower oesophageal sphincter
- Pylorus

This coin is likely to be in the oesophagus, as it projects *en face*, appearing round, in the anteroposterior view. A coin in the trachea appears in the sagittal plane (end on) in this projection.

Radiography is only useful for radio-opaque items (unless there are concerns about perforation, for example). It should be remembered that bottle caps and can rings do not always show up, however, they are potentially problematic if not investigated. Endoscopy is important in cases where sharp, large, long, oddly shaped (likely to obstruct) objects have been swallowed.

A3.

Complications of foreign body ingestion include (choose three from):

- Laceration of mucosal surfaces
- Stricture
- Perforation (subsequent mediastinitis/pneumothorax/pericarditis/cardiac tamponade/peritonitis)
- Abscess formation
- Fistula formation
- Bowel necrosis
- Heavy metal poisoning

It is well known that button batteries are especially concerning because of their increased size resulting in much more likely oesophageal impaction, and the increasing use of lithium means that a higher voltage is carried. A release of hydroxide radicals at the site causes a caustic mucosal injury due to an increase in pH.

One key element of the consultation must be to document and address any home circumstances which may have led to the child being able to ingest a foreign body. Clearly young children are prone to such events; however, it must at least be in the clinician's mind to seek for evidence of neglect/chaotic living. Furthermore, especially in an older child, deliberate ingestion must be investigated appropriately.

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Kramer RE, Lerner DG, Lin T, Manfredi M, Shah M, Stephen TC, et al. Management of ingested foreign bodies in children: a clinical report of the NASPGHAN Endoscopy Committee. *Journal of Pediatric Gastroenterology and Nutrition*. 2015;60(4):562–74.

Resuscitation Council UK. *Paediatric Choking Algorithm*. 2015. Available from: <https://www.resus.org.uk/resuscitation-guidelines/paediatric-basic-life-support/#choking>

SAQ 7 Abdominal Pain and Vomiting

A patient presents with abdominal pain and vomiting. Her abdominal radiograph is shown in Fig. 1.3.



Fig. 1.3 Reproduced from Thomas, W., Reed, M. and Wyatt, M. (2016). *Oxford Textbook of Fundamentals of Surgery*. Oxford: Oxford University Press. © Oxford University Press 2016. Reproduced with permission of the Licensor through PLSclear.

- Q1. What does the radiograph show?
Q2. What causes this presentation?
Q3. What is the management?

Answers

A1.

The X-ray shows gastric volvulus.

Some features to look out for on a radiograph include:

- A stomach which appears to be 'upside down'
- A fluid level behind the cardiac shadow
- A double air-fluid level
- An overly large and distended stomach
- Collapse of the small bowel distal to the volvulus

A2.

Gastric volvulus can be:

Primary: related to neoplasia, adhesions, or abnormal attachments of stomach (due to ligament anomalies);

Secondary to disorders of gastric anatomy/gastric function; abnormalities of adjacent organs (diaphragm, spleen); or occurring in association, in adults, with a para-oesophageal hernia/traumatic defects/diaphragmatic eventration/ phrenic nerve paralysis.

A3.

Initial treatment includes keeping the patient prone and inserting a nasogastric tube to facilitate compression. Surgical involvement is needed immediately if the diagnosis is acute, because of the risk of vascular compromise and mortality. Surgical and/or conservative approaches have been used successfully. The most frequently reported surgery is open surgical reduction +/- gastropexy, although laparoscopic approaches/endoscopic reduction as well as a percutaneous endoscopic gastrostomy (PEG) tube can be used. In older people or those with chronic gastric volvulus, conservative approaches are more commonly adopted.

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SAQ 8 Rectal Bleeding

A 24-year-old female presents with severe pain and rectal bleeding.



Fig. 1.4

- Q1. What is the abnormality seen in the CT scan (Fig. 1.4)?
Q2. What is the likely diagnosis?
Q3. List three management priorities.

Answers

A1.

The CT scan shows extensive retroperitoneal gas within the presacral space and tissues surrounding the rectum.

A2.

The likely diagnosis is rectal perforation.

A3.

Management comprises the following:

- Fluid resuscitation
- Intravenous analgesia
- Intravenous broad-spectrum antibiotics
- Nil by mouth
- Urgent surgical referral

Rectal perforation can be iatrogenic (related to instrumentation or enema administration), or associated with rectal prolapse, diverticular disease, neoplasm, blunt or penetrating trauma (including auto-erotic activity), ulcerative colitis, or stercoral ulceration.

Rectal bleeding is usually caused by benign conditions (e.g. anal fissures, haemorrhoids especially in those under 30 years of age). However, there are other possible causes, such as inflammatory bowel disease (again, more likely in the under 30s), neoplastic disease (more suspicious in the over 50s), diverticulitis, polyps, radiation proctitis, gastroenteritis, angiodysplasia, ischaemic colitis, rectal ulceration, sexually transmitted infections, and anorectal trauma.

The first-line treatment for anal fissures is glyceryl trinitrate ointment followed by topical diltiazem at 2%. Other options include botulinum toxin injection, fistulectomy, and sphincterotomy.

Radiation proctitis does not respond well to many topical treatments except rectal sucralfate enemas. Argon plasma coagulation is the ultimate management for this.

Further Reading

Banerjee A, Oliver C. Surgery. In: *Revision Notes for the FRCEM Intermediate SAQ Paper*, Chapter 6. Oxford, UK: Oxford University Press; 2017.

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Chapter 2 **Cardiology**

SAQ 1	Acute Coronary Syndrome	20
SAQ 2	CHA2-DS2-VASc Score	22
SAQ 3	Echo Image	24
SAQ 4	Young Chest Pain	26
SAQ 5	Abnormal ECG	28
SAQ 6	Bradycardia	30
SAQ 7	Central Crushing Chest Pain	32
SAQ 8	Medical Device	34
SAQ 9	Elderly Chest Pain	36
SAQ 10	Abnormal Computed Tomography (CT) Scan	37
SAQ 11	Collapse in a Young Person	39
SAQ 12	Palpitations	41
SAQ 13	Abnormal ECG 2	43
SAQ 14	Dyspnoea	45
SAQ 15	Elderly Unwell	47
SAQ 16	Syncope	48

SAQ I Acute Coronary Syndrome

A 73-year-old female is diagnosed with Takotsubo cardiomyopathy, following presentation with chest pain and ST elevation on a 12-lead electrocardiogram (ECG)

- Q1. List three of the most frequent causes of raised troponin other than acute myocardial infarction or Takotsubo cardiomyopathy.
- Q2. If this patient did not have ST elevation and was awaiting troponin results, she would clinically fit the NSTEMI-ACS (non-ST-elevation acute coronary syndrome) category. In that scenario, what should her ACS drug treatment have been pending the troponin result?
- Q3. List at least two high-risk criteria which, according to optimal management guidance, would mandate invasive management (i.e. angiography with or without revascularization) of NSTEMI-ACS in less than two hours from first clinical contact.

Answers

A1.

Choose three other causes of raised troponin from:

- Tachyarrhythmia
- Heart failure
- Hypertensive emergencies
- Critical illness (such as shock/sepsis/burns)
- Myocarditis
- Structural heart disease (such as aortic stenosis)
- Aortic dissection
- Pulmonary embolism
- Pulmonary hypertension
- Renal dysfunction alongside cardiac disease

Takotsubo cardiomyopathy is also referred to as 'apical ballooning' and is widely considered to be a cardiomyopathy triggered by extreme emotional stress. The features include chest pain, raised troponin, often a normal angiogram, and some left ventricular dysfunction on echocardiography (appearing similar to acute myocardial infarction), which is both acute and transient. Angiography must be performed regardless of diagnostic suspicion to rule out a coronary aetiology. Around 75% of those with Takotsubo cardiomyopathy have a high catecholamine level and therefore some dysfunction of the vasculature, which then leads to microvascular spasm and is purported as the mechanism of the disease. Formal diagnosis and treatment of the condition remains without consensus.

A2.

Aspirin and parenteral anticoagulant (usually a low-molecular weight heparin or fondaparinux) for anticoagulation. If NSTEMI-ACS was then established and the patient was not intended for urgent intervention and did not represent a high bleeding risk, ticagrelor should be added.

A3.

Two high-risk criteria would include:

- Haemodynamic instability/cardiogenic shock
- Recurrent/ongoing chest pain refractory to medical management
- Life-threatening arrhythmia/cardiac arrest
- Mechanical complications of myocardial infarction
- Acute cardiac failure
- Recurrent dynamic ST-T wave change

The European Society of Cardiology has up-to-date guidance on the optimal timing of invasive management of patients with NSTEMI-ACS depending on presence/absence of specific risk-level features.

Further Reading

Roffi M, Patrono C, Collet JP, Mueller C, Valgimigli M, Andreotti F, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). *European Heart Journal*. 2016;37(3):267–315.

Sharkey SW, Lesser JR, Maron BJ (2011). Cardiology patient page. Takotsubo (stress) cardiomyopathy. *Circulation*. 2011;124(18):e460–2.

SAQ 2 CHA2-DS2-VASc Score

A 65-year-old woman presents in atrial fibrillation. She has been feeling 'not quite right' for a week or so, with fluttering feelings in her chest. She has a past medical history of hypertension, but does not seem to have a precipitating cause for atrial fibrillation.

- Q1. Based on the CHA2-DS2-VASc Score, would you be recommending that this lady is anticoagulated?
- Q2. Why might the CHADS2 score be less preferable for use in an emergency department?
- Q3. What is the Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA) score?
-

Answers

A1.

Yes. She scores 3 on the calculator, and therefore without other contraindications, anticoagulation should be offered. She has just under 5% risk per year of stroke/TIA/systemic embolism.

The score is made up as follows:

- Age: <65 = 0 Age: 65–74 = 1 Age: 75+ = 2
- Male = 0 Female = 1
- Congestive heart failure = 1
- Hypertension = 1
- History of stroke/TIA/thromboembolism = 2
- History of vascular disease = 1
- Diabetes mellitus = 1

Reprinted from Chest, 137, 2, Lip G.Y. et al. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the euro heart survey on atrial fibrillation. pp. 263-72. <https://doi.org/10.1378/chest.09-1584>. Copyright © 2010 The American College of Chest Physicians. Published by Elsevier Inc. All rights reserved. With permission from Elsevier.

A2.

The CHADS2 score misses some higher risk patients, therefore a score of 0 could still mean a yearly risk of 3.2% for stroke if a patient is left without anticoagulation.

A3.

The ATRIA score is a tool used to predict warfarin-associated haemorrhage, and looks at several parameters, outlined in Table 2.1.

Table 2.1

Risk factor	Point value
Anaemia	+3
Severe renal disease/dialysis	+3
Age \geq 75	+2
Stroke history	+1
Prior haemorrhage	+1
Hypertension	+1

Low risk is considered to be a score less than 4.

Reproduced from Singer, D.E. et al. A new risk scheme to predict ischemic stroke and other thromboembolism in atrial fibrillation: the ATRIA study stroke risk score. *J Am Heart Assoc.* 2013;2:e000250. <https://doi.org/10.1161/JAHA.113.000250>. © American Heart Association, Inc. All rights reserved.

In comparison, the HAS-BLED score was considered to perform better and looks at several parameters outlined in Table 2.2.

Table 2.2

Risk factor	Point value
Hypertension	1
Abnormal liver function	1
Abnormal renal function	1
Stroke history	1
Bleeding predisposition	1
Labile INRs	1
Elderly (age $>$ 65)	1
Drug/alcohol usage	1

Reprinted from *Chest*, 138, 5, Pisters, R. et al. A novel user-friendly score (HAS-BLED) to assess 1-year risk of major bleeding in patients with atrial fibrillation. pp. 1093–100. doi:10.1378/chest.10-0134. PMID 20299623. Copyright © 2010 The American College of Chest Physicians. Published by Elsevier Inc. All rights reserved. With permission from Elsevier.

Here a score of 3 or more should prompt a clinician to consider alternatives to anticoagulation as bleeding risk is high. A score of 2 represents moderate risk and therefore close monitoring of further risk factors will need to be taken if the patient is to be anticoagulated.

Further Reading

Lip GY, Nieuwlaat R, Pisters R, Lane DA, Crijns HJ. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the Euro Heart Survey on atrial fibrillation. *Chest*. 2010;137(2):263–72.

MDCalc. *CHA₂DS₂-VASC Score for Atrial Fibrillation Stroke Risk*. 2016. Available from: <http://www.mdcalc.com/cha2ds2-vasc-score-atrial-fibrillation-stroke-risk/>

MDCalc. *HAS-BLED Score for Major Bleeding Risk*. 2016. Available from: <http://www.mdcalc.com/has-bled-score-major-bleeding-risk/#about-equation>

SAQ 3 Echo Image

Q1. What is the diagnosis in Fig. 2.1?

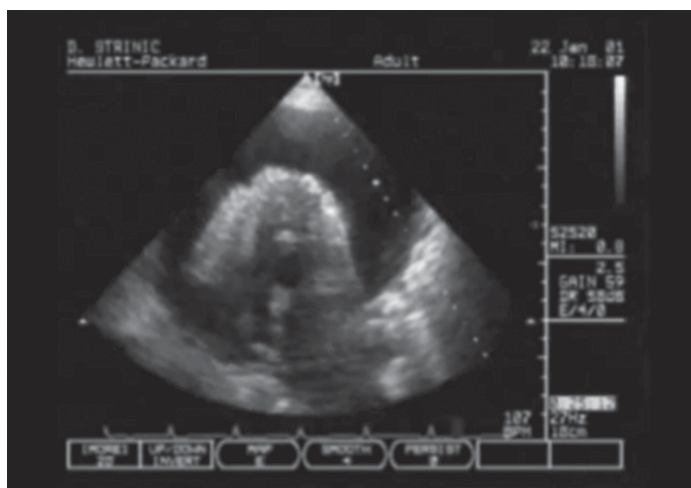


Fig. 2.1 Reproduced from Lancellotti, P., Zamorano, J., Habib, G. and Badano, L. (2016). *The EACVI Textbook of Echocardiography*. 2nd ed. Oxford University Press. © European Society of Cardiology 2017. Reproduced with permission of the Licensor through PLSclear.

Q2. What are the possible causes?

Q3. What is the most urgent concern in this patient and how do you detect it?

Answers

Al.

The diagnosis is pericardial effusion, as demonstrated by a circumferential echo-free space surrounding the heart, and between the parietal and visceral layers of the pericardium. Epicardial fat presents as a hypoechoic space anterior to the right ventricle.

A2.

There are many potential causes of pericardial effusion:

- Infectious
 - ◆ Viral (Coxsackie virus; echovirus; adenovirus; cytomegalovirus; Epstein–Barr virus; mumps; rubella; parvovirus B19; HIV, and so on)
 - ◆ Bacterial (staphylococcus; streptococcus; Neisseria usually)
 - ◆ Mycobacterial: tuberculosis
 - ◆ Fungal
 - ◆ Parasitic

- Immune-mediated (systemic lupus erythematosus; Dressler's syndrome; drug-induced; amyloid; granulomatosis with polyangiitis)
- Endocrine (hypothyroidism)
- Neoplastic (metastatic malignancy)
- Cardiac (aortic dissection/heart failure/post-cardiac surgery or intervention)
- Traumatic
- Renal (uraemia)

Acute or subacute pericardial effusions are considered to be those present for less than 3 months, with chronic effusions present for longer. There is a variable approach to classifying an effusion as large or small, however if the total of anterior and posterior echo-absent space comes to more than 20 mm, it is considered to be large.

Depending on the cause, the fluid itself may be serous, purulent, haemorrhagic, chylous, or serosanguinous. This does not help very much in identifying a cause. Instead the categorization of the fluid as transudative or exudative helps narrow the cause down.

Exudates (with high levels of protein (i.e. greater than 3 g/dL), caused by inflammatory processes) include idiopathic, iatrogenic, infectious, malignant, traumatic, cardiorespiratory, and autoimmune processes. A small transudative effusion is not considered to be clinically important.

A3.

The most significant complication is cardiac tamponade, which occurs when a pericardial effusion raises intrapericardial pressure to impair cardiac filling due to chamber compression. This can cause hypotension and cardiovascular collapse. The clinical criteria are:

- Hypotension
- Pulsus paradoxus (fall in systolic blood pressure of 10 mm Hg or more during inspiration)
- Increased jugular venous pressure
- Muffled heart sounds
- Tamponade can be recognized on echocardiography by right atrial systolic collapse, right ventricular diastolic collapse, increased diameter of the inferior vena cava (IVC) with reduced or absent IVC inspiratory inflow leading to loss of respiratory variation

Further Reading

BMJ. *Assessment of Pericardial Effusion*. 2016. Available from: <http://bestpractice.bmj.com/best-practice/monograph/458.html>

SAQ 4 Young Chest Pain

A 19-year-old footballer is brought in by ambulance with sudden onset pleuritic central chest pain while playing. There is no past medical history of note, his observations are normal, and the rhythm strip provided by the ambulance service is seen in Fig. 2.2:

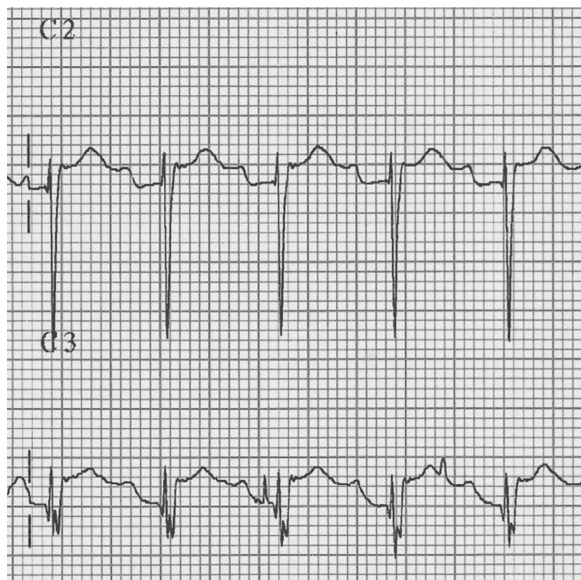


Fig. 2.2 Reproduced from Myerson, S., Choudhury, R. and Mitchell, A. (2010). *Emergencies in Cardiology*. 2nd ed. Oxford: Oxford University Press. © Oxford University Press 2009. Reproduced with permission of the Licensor through PLSclear.

- Q1. Describe the rhythm strip in Fig. 2.2 and give the likely diagnosis.
- Q2. What beside test would help you evaluate this case and how would you manage the diagnosis?
- Q3. List two possible complications.

Answers

A1.

The strip shows sinus rhythm, with PR depression and ST elevation. ST elevation is diffuse, with a concave or saddle-shaped contour. PR depression is very specific for pericarditis (which is the most likely diagnosis in this presentation). PR depression may also be found in atrial ischaemia. In diagnosing acute pericarditis, the patient needs to exhibit two from: chest pain (usually sharp and pleuritic and relieved by sitting forward); a pericardial friction rub on auscultation; complimentary ECG changes (described earlier); a new or worsened pericardial effusion. To move on to a diagnosis of recurrent pericarditis requires a definitive first episode of acute pericarditis (according to the aforementioned

criteria), a period of at least 4–6 weeks without any symptoms, good evidence of a recurring picture which involves recurrent pain plus one or more of: pericardial rub on auscultation; complementary ECG changes (described earlier); changes on echocardiography; a new or worsened pericardial effusion; raised white cell count/ESR/CRP (at any level above the laboratory normal range—see further reading).

A2.

Bedside echocardiography (parasternal, four-chamber, or subxiphoid views) would help identify the presence or absence of pericardial effusion. You could recommend non-steroidal anti-inflammatory drugs and colchicine, which reduces the recurrence risk. It is important that the patient is encouraged not to exercise while symptomatic, and competitive athletes should not compete until biomarkers and symptoms have normalized.

A3.

Complications of pericarditis include two from:

- Pericardial effusion
- Cardiac tamponade
- Myopericarditis (which leads to an elevated troponin)
- Chronic constrictive pericarditis

Further Reading

Imazio M, Gaita F, LeWinter M. Evaluation and treatment of pericarditis: a systematic review. *Journal of the American Medical Association*. 2015;314(14):1498–506.

SAQ 5 Abnormal ECG

A 48-year-old gentleman attends after three days of diarrhoea and vomiting. He is drowsy and has been moved to the resuscitation room. His ECG is as shown in Fig. 2.3.

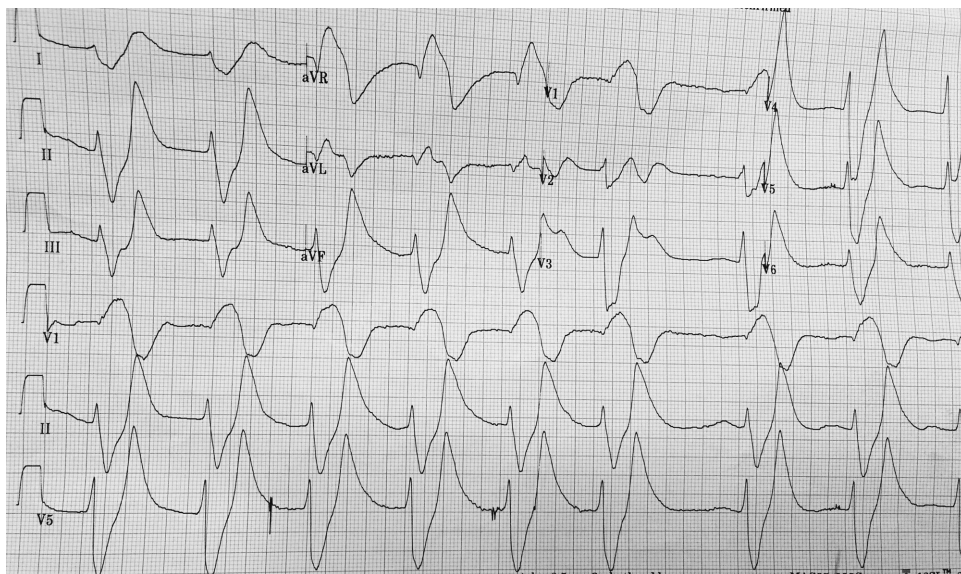


Fig. 2.3

- Q1. What does this ECG in Fig. 2.3 show?
Q2. What is the likely underlying cause for this ECG?
Q3. How will you treat this condition in the emergency department?

Answers

A1.

This ECG shows late signs of hyperkalaemia. A broadened QRS complex, flat P, and tall T waves are present. But more importantly the morphology starts to look like a sine wave (hence the name sine wave, which is a preterminal finding).

A2.

The underlying cause for the ECG changes is hyperkalaemia. The first changes of hyperkalaemia are tall T waves and a shortened QT interval. This is followed by progressive lengthening of the PR interval, then of the QRS duration. Eventually the sine wave pattern as just described develops as a preterminal finding.

Causes of hyperkalaemia can be split into those causing impaired renal excretion of potassium such as:

- Acquired hyporeninaemic hypoaldosteronism
- Addison's disease
- Congenital adrenal hyperplasia
- Mineralocorticoid deficiency
- Primary hypoaldosteronism or hyporeninaemia
- Pseudo-hypoaldosteronism
- Renal insufficiency or failure
- Systemic lupus erythematosus
- Type IV renal tubular acidosis
- Most medication causes of hyperkalaemia have an effect on renal excretion

Other causes which result in movement of potassium into the extracellular space include:

- Acidosis
- Damage to tissue from rhabdomyolysis, burns, or trauma
- Familial hyperkalaemic periodic paralysis
- Hyperosmolar states (e.g. uncontrolled diabetes mellitus, glucose infusions)
- Insulin deficiency or resistance
- Tumour lysis syndrome
- Some agents can cause hyperkalaemia by this extracellular mechanism such as: amino acids and packed red blood cells

A3.

A dose of 20 ml 10% calcium gluconate or 10 ml 10% calcium chloride can be used to stabilize the myocardium, while 50 ml of 50% glucose (25 g glucose) with 10 units of short-acting insulin (Actrapid) can help shift the potassium into the cells. Nebulized salbutamol further helps this shift. The current evidence only supports the use of sodium bicarbonate in patients on renal dialysis with severe acidosis.

Further Reading

Hollander-Rodriguez JC, Calvert JF. Hyperkalemia. *American Family Physician*. 2006;73(2):283–90.

SAQ 6 Bradycardia

A 72-year-old woman is brought into the resuscitation room with a history of acute onset dizziness. Her blood pressure can only be measured as a systolic of 65 mm Hg, and she appears confused and distressed. The nursing staff have managed to site a cannula.

Q1. What is the diagnosis on the ECG in Fig. 2.4 and what medications could precipitate it?

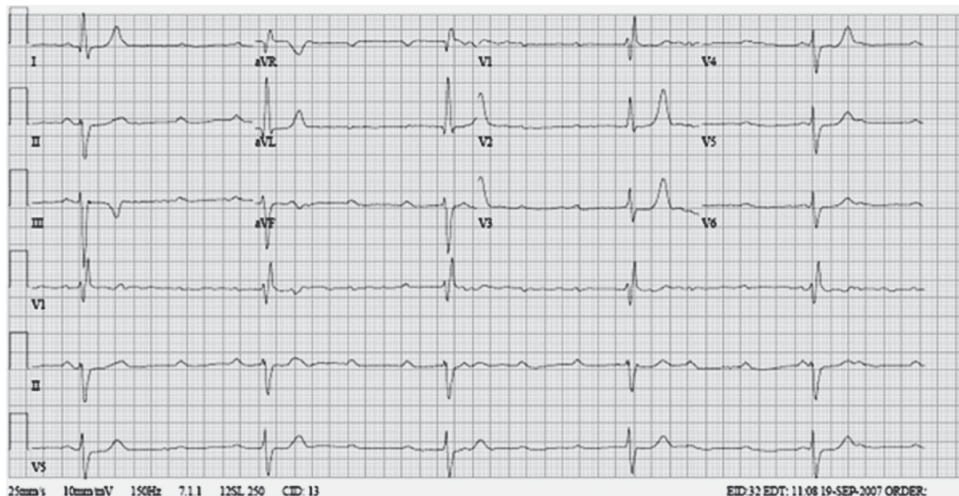


Fig. 2.4 Reproduced from Gray, R. and Pack, L. (2011). *Cardiovascular Disease in the Elderly*. Oxford: Oxford University Press. © Oxford University Press, 2011. Reproduced with permission of the Licensor through PLSclear.

- Q2. After your initial ABCDE (Airway, Breathing, Circulation, Disability, Exposure) assessment, placement of monitoring, and full set of observations what is your first-line management?
- Q3. Your first-line management is not successful. What are your options now?

Answers

A1.

Complete heart block. This could be precipitated by medications such as: beta-blockers, calcium channel blockers, digoxin. The ECG would concern you more if there was a broad complex and/or ventricular pauses longer than 3 seconds as this would increase the chance of asystole.

A2.

This lady is haemodynamically unstable. First-line measures would be a dose of intravenous atropine 500 mcg. This may then be repeated up to six times (to a maximum of 3 mg). Alternatively, glycopyrronium bromide can be used.