

Year Three General Surgery Workbook

University of Leicester Medical School

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Investigation normal ranges

White Cell Count	4.0 - 11.0	$\times 10^9/\text{L}$
Red Blood Count	3.90 - 6.50	$\times 10^{12}/\text{L}$
Haemoglobin (New Units)	130 - 175	g/L
Mean Cell Volume	80.0 - 99.0	fL
Platelet Count	150 - 400	$\times 10^9/\text{L}$
Sodium	135 - 146	mmol/L
Potassium	3.5 - 5.3	mmol/L
Urea	2.5 - 7.8	mmol/L
Creatinine	60 - 120	umol/L
eGFR	>90	mL/min/1.73m ²
Albumin	35 - 50	g/l
Alkaline Phosphatase(ALP)	30 - 130	U/L
Alanine Transaminase(ALT)	10 - 49	U/L
Total Bilirubin	<21	umol/L
Amylase	<70	u/L
CRP	<5	mg/l
pH	7.35-7.45	
PaO ₂	10.5-13.5	kPa
PaCO ₂	4.7-6.0	kPa
HCO ₃ ⁻	22-24	mmol/L
Lactate	0.5-2.2	mmol/L
Base Excess (BE)	-2.0-2.0	mEq/L
Blood glucose	3.9-5.5	mmol/L
Adjusted calcium	2.2-2.6	mmol/L
Lactate dehydrogenase	140-280	Iu/L
INR	0.8-1.2	

b) What investigations would aid diagnosis and why?

The results of initial investigations are shown below:

White Cell Count	18.5	x10 ⁹ /L
Haemoglobin (New Units)	124	g/L
Platelet Count	277	x10 ⁹ /L
Sodium	140	mmol/L
Potassium	4.2	mmol/L
Urea	5.9	mmol/L
Creatinine	88	umol/L
Alkaline Phosphatase(ALP)	80	U/L
Alanine Transaminase(ALT)	45	U/L
Total Bilirubin	15	umol/L
Amylase	84	u/L

Urine dip:

Bld	negative
Protein	negative
Nitrites	negative
Leucocytes	negative
Beta HCG	negative

Ultrasound scan of the pelvis: Verbal consent gained for the procedure. Kidneys, gall bladder, liver and spleen appear normal. Aortic diameter of 2.2cm. Both ovaries and uterus are visualised - no abnormality detected. Endometrial thickness of 2 mm. Trace of free fluid in the pelvis only. Appendix not visualised.

CT abdomen and pelvis: The appendix demonstrates mucosal enhancement and surrounding fat stranding. Appearances consistent with uncomplicated appendicitis. No perforation. Other visualised organs are unremarkable.

The consultant surgeon requests that antibiotics for appendicitis be prescribed and for the patient to be booked for laparoscopic appendicectomy the following morning.

- c) The nurse looking after the patient on the ward asks how long she needs to be kept nil by mouth (NBM)? Why is this important and for how long must she be NBM for prior to her operation?

Maintenance fluids will be required in the preoperative period while the patient is starved. Her weight is 65 kg. The following bags of fluid are available on the surgical ward.

- 1L Normal Saline 0.9% + 40mmolKCl
- 1L Hartmann's solution
- 1L 5% glucose + 40mmolKL
- 1L 0.45% NaCl + 4% glucose + 40mmolKCL
- Gelofusine

d) Which of these fluids are crystalloids, and which are colloids?

- e) How much Na^+ , K^+ , Mg^{++} , Cl^- do these fluids contain?

- f) What are Lianna's daily requirements of water and these ions?

- g) Prescribe a 24-hour fluid regime for this patient (fluid, volume, rate).

Case 2

Svetlana, a 57-year old woman, is seen in the Emergency Department with a 2-day history of abdominal pain and two episodes of vomiting. The pain is on the left side of the abdomen, and has been associated with two small volume fresh rectal bleeds. She has a past medical history of hypertension and type-2 diabetes, but no previous operations. She takes amlodipine and metformin. She has no allergies. She lives with her family who are in attendance.

On examination she is alert, but appears unwell and in pain. Observations are temperature 38.8°C, pulse 104/minute, blood pressure 94/70 mmHg, O2 saturations 99% on air, respiratory rate 24/minute. Capillary refill time is 2 seconds. NEWS 2 score is 6. Blood glucose via finger-prick test is 8.2 mmol/L. Abdominal examination reveals tenderness and guarding in the left iliac fossa. Rectal examination reveals blood-stained faeces.

a) State five differential diagnoses for this presentation. Justify your answers.

b) What diagnostic investigations should be performed (bedside, bloods & imaging)?

The Emergency Department registrar suspects that the patient has sepsis.

c) What does sepsis mean?

d) Does she meet any criteria for sepsis?

e) What is meant by the term “sepsis 6”? What is the aim of the “sepsis 6” pathway?

The ED registrar is concerned about the patient's blood pressure and requests a resuscitation fluid prescription for this patient based on NICE guidelines.

- f) Suggest a fluid prescription (fluid, volume, rate).

It is now midnight. The following investigation results are received:

Mid stream urine specimen

Nitrites negative

Leucocytes negative

Beta HCG negative

Blood results

White Cell Count	18.5	$\times 10^9/\text{L}$
Haemoglobin (New Units)	124	g/L
Platelet Count	277	$\times 10^9/\text{L}$
Sodium	133	mmol/L
Potassium	5.1	mmol/L
Urea	10.4	mmol/L
Creatinine	208 (baseline 95)	umol/L
eGFR	21	mL/min/1.73m ²
Alkaline Phosphatase(ALP)	80	U/L
Alanine Transaminase(ALT)	45	U/L
Total Bilirubin	15	umol/L
Amylase	84	u/L

CT Abdomen and pelvis:

There is inflammatory change in the left iliac fossa encompassing the sigmoid colon, with evidence of diverticulosis. Small localised perforation noted with early abscess formation. No free intraperitoneal air. Major vessels appear normal.

g) What are the important findings in the investigations?

h) What is the acute diagnosis? Justify your answer.

i) What biochemical disturbances need addressing urgently?

The nurse on the ward calls to indicate that the patient's BM now measures 21.2 mmol/L.

- j) Why is this? What therapy should be prescribed to address this?

Svetlana is taken to theatre for a laparotomy and resection of the inflamed, perforated sigmoid colon, with end colostomy.

- k) What is the name of this procedure?

The fluid balance chart for the following 24 hours is given over the page.

- l) What is the significance of the nasogastric tube output?

- m) Calculate the fluid balance for this 24 hour period.

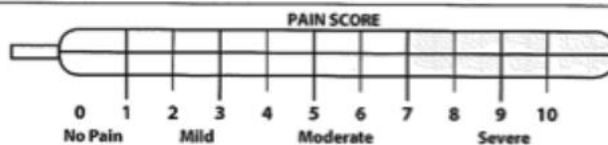
③

DAY OF SURGERY

FLUID BALANCE

Name: SVETLANA S Number: 12791871 Ward: 22 Date: 2/8/18

Ward Round Review Senior Decision Maker only:		☐ (Tick)		Previous INPUT:	Previous 24 hours BALANCE:	Previous OUTPUT:	Patients Weight:								
Time	INPUT							OUTPUT							BALANCE
	Oral Intake (ml)	Fluids IV or SC/ Blood	Bolus Drugs	Drug Infusions	PCA/ Epidural	NG/TPN/ PEG/Je (ml)	Running Total In	Urine	Drains	Drains		Vomit/ NGT	Bowels/ Stoma	Running Total Out	
01.00	1	125						10							
02.00	1	125						20							
03.00		500						35							
04.00	NBM	500						40							
05.00	1	125						40							
06.00	1	125						25							
07.00	1	125					1675	30							
08.00															
09.00															
10.00															
11.00															
12.00		83						25							
13.00		83						20				500 ml			
14.00		83						35		200					
15.00	20	83						40							
16.00		83						35							
17.00		83						30							
18.00		83						20							
19.00	50	83						10							
20.00		83						10		50		500			
21.00		83						5							
22.00		83					2608	10						1690	
23.00															
24.00															
Totals															
Total INTAKE=				mls				OUTPUT=				mls			
Urinalysis pH:		Protein:		Blood:		Leucocytes:		Glucose:		Ketones:		Nitrites:			
Date:															



Session 2

Case 1

Simon, a 68-year-old man presents to the emergency department with a 3-hour history of sudden onset central abdominal pain radiating through to his back and left flank. He has vomited twice and last opened his bowel this morning. He has not had this pain before and was watching television at the time of onset. He has a past medical history of intermittent claudication and can walk 100 meters on the flat before experiencing claudication pain in his legs. His medical history includes a MI and two TIAs. He takes aspirin, simvastatin, bisoprolol and ramipril. He lives at home independently with his wife, has a 40-pack year smoking history and drinks 30 units of alcohol a week.

- a) List 4 differential diagnoses and justify your reasoning.

On examination he appears unwell, pale and is sweating profusely. His observations are temperature 36.1°C, pulse 148/minute, blood pressure 105/60mmHg, O2 saturations 98% on air, respiratory rate 25/minute. Examination findings include a body mass index of 38 Kg/m² and a normal cardiorespiratory examination. Abdominal examination reveals central abdominal tenderness and the presence of a palpable, supraumbilical, expansile mass. There are no obvious herniae palpable.

- b) What is the most likely diagnosis based on the above findings?

Initial laboratory investigations are shown:

White Cell Count	8.2	$\times 10^9/\text{L}$
Haemoglobin (New Units)	76	g/L
Amylase	125	u/L
PaO ₂	12.8	kPa
PaCO ₂	3.5	kPa
HCO ₃ ⁻	13.2	mmol/L
Lactate	12.7	mmol/L
BE	-8.4	mEq/L

Urine dipstick

Bld	positive
Pro	positive
Neu	negative
Leu	negative

c) Interpret the blood results commenting on the patient's acid base balance

The on call vascular surgeon is called. An urgent CT angiogram and 4 unit cross match is requested.

d) What is the meant by group and save, and crossmatch?

Two large bore intravenous cannulas are placed, and blood transfusion is commenced. The CT angiogram confirms a ruptured abdominal aortic aneurysm, and the patient undergoes an emergency open repair.

24 hours after surgery, while the patient is in intensive care, it is becoming increasingly difficult to ventilate them, with higher lung insufflation pressures being required. The portable chest Xray is shown below:



- e) What lung complication of massive transfusion has Simon suffered? Why has this occurred despite receiving typed blood?

f) What is the clinical course of this condition?

Case 2

Satvinder, a 49-year-old man, presents via the Emergency department with a 12-hour history of epigastric pain. He states the pain came on this morning whilst driving to work. The pain is constant, dull in nature, but does not radiate. There are no exacerbating or relieving factors. He has a past medical history of type 2 diabetes and atrial fibrillation. He takes metformin, apixaban, simvastatin and bisoprolol. He lives independently with this wife and two sons, does not smoke, and drinks 20 units of alcohol a week.

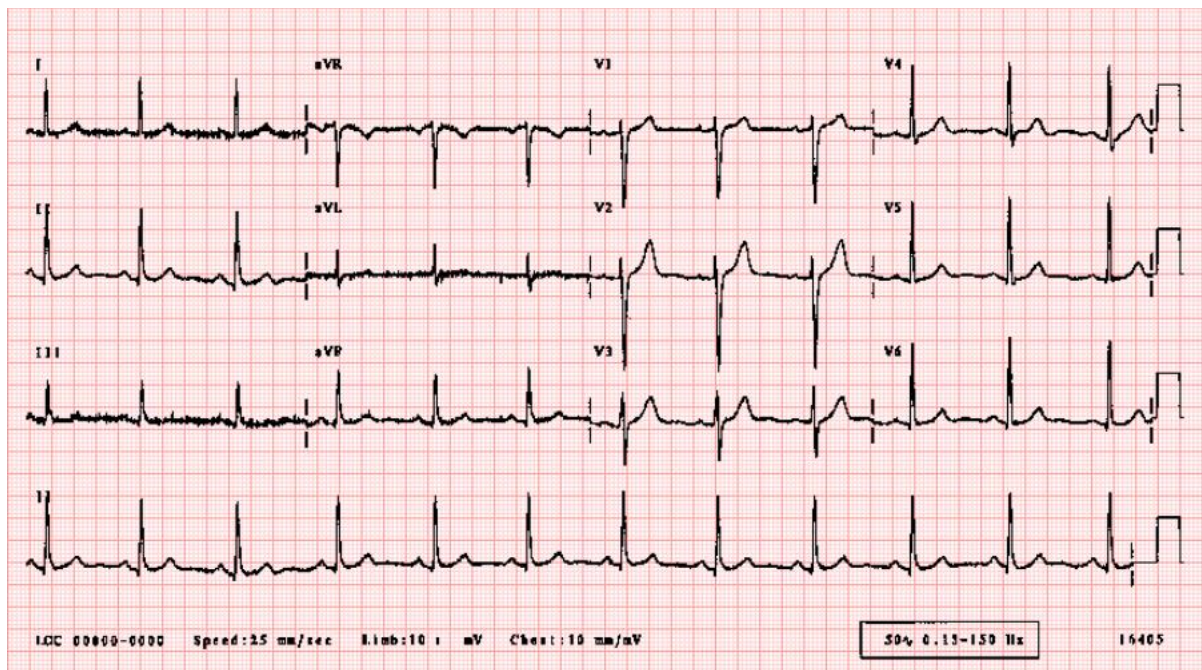
On examination, he appears well. His modified early warning score is 0. His observations are temperature 36.9°C, pulse 84/minute, blood pressure 149/95mmHg, O2 saturations 100% on room air, respiratory rate 15/minute. Cardiorespiratory examination is unremarkable. Abdominal examination reveals mild tenderness in the epigastrium, but no guarding. There are no palpable herniae.

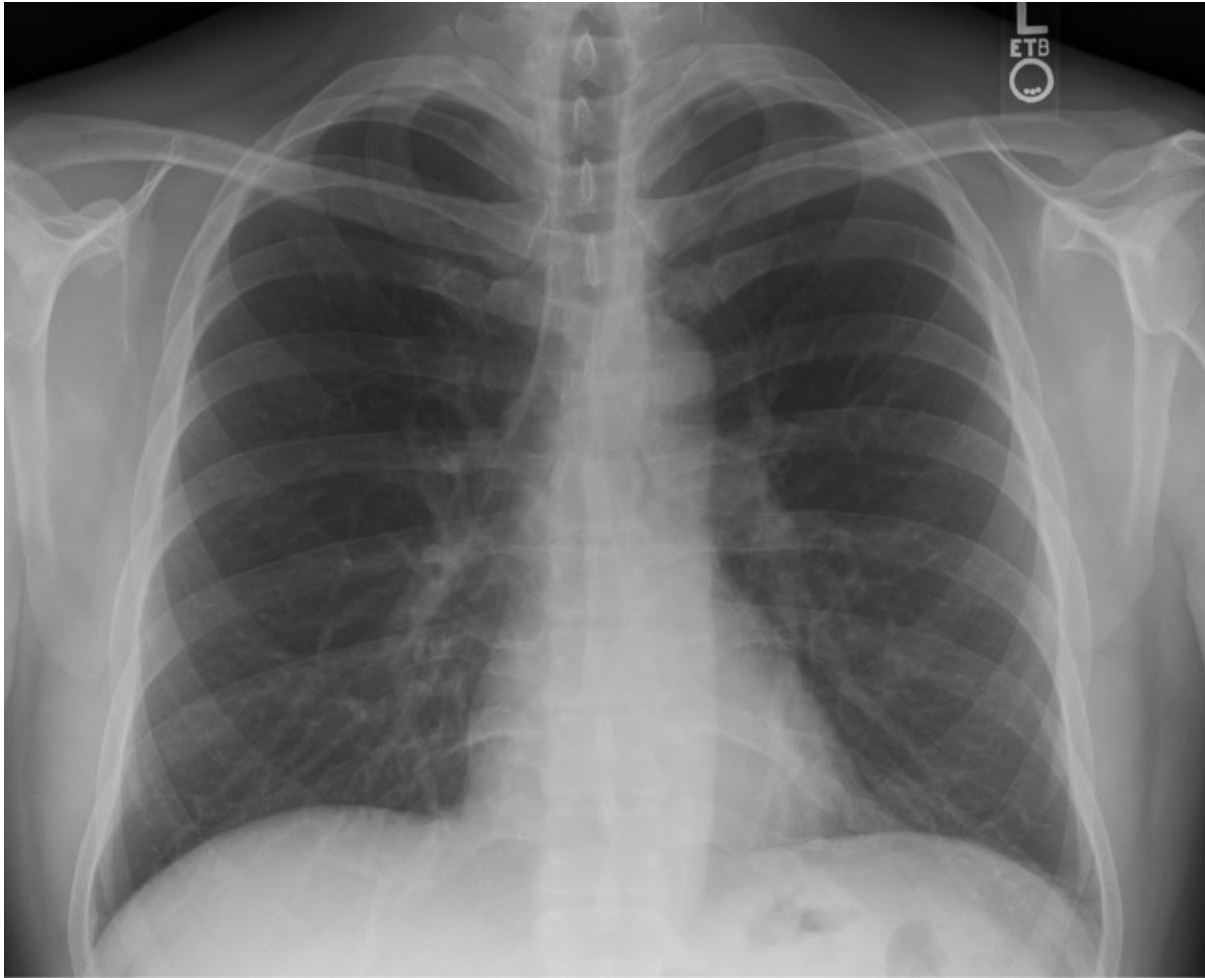
a) List seven differential diagnoses for epigastric pain in this patient.

b) Suggest four investigations for the above patient while in the ED.

Results of initial investigations are shown:

White Cell Count	12.5	$\times 10^9/\text{L}$
Haemoglobin (New Units)	153	g/L
Platelet Count	311	$\times 10^9/\text{L}$
Sodium	133	mmol/L
Potassium	4.2	mmol/L
Urea	6.4	mmol/L
Creatinine	78	$\mu\text{mol/L}$
eGFR	>90	mL/min/1.73m^2
Alkaline Phosphatase(ALP)	80	U/L
Alanine Transaminase(ALT)	45	U/L
Total Bilirubin	15	$\mu\text{mol/L}$
Amylase	84	u/L
Trop	<10	





Interpret the above investigations. Which differential diagnoses have been excluded?

What further investigations should be requested

The patient is transferred the surgical assessment unit. An ultrasound scan of the abdomen is requested and is reported as follows:

USS abdomen: Kidneys, gall bladder, liver and spleen appear normal. Pancreas is partially obscured due to bowel gas, though where visualised appears normal. Aortic diameter of 2.1 cm. Appendix not visualised due to overlying bowel gas.

Satvinder is discharged home and an urgent outpatient upper GI endoscopy (OGD) is requested.

How should his medications be managed (metformin and apixaban) immediately prior to his procedure?

The endoscopy findings are:

OGD

FINDINGS:

Oesophagus – normal

Stomach – normal.

Duodenum – A single, well-demarcated ulcer measuring approximately 1 cm in diameter was identified on the anterior wall. The ulcer base appeared clean with no active bleeding or visible vessels.

CLO test – positive.

What is the significance of the CLO test?

A course of eradication therapy is prescribed for Satvinder. To what classes of drugs do the three components of this treatment belong?

What are their mechanisms of action?

Session 3

Case 1

Aaron, a 60-year old taxi driver has been referred from his GP to the upper GI clinic with a three month history of dysphagia. The dysphagia is worse with solids compared to liquids, and has become worse over that time. He has lost 10 Kg in weight. He has no other past medical history of note, but does smoke heavily, and drinks around 20 units of whisky a week.

a) What is meant by the term “dysphagia?”

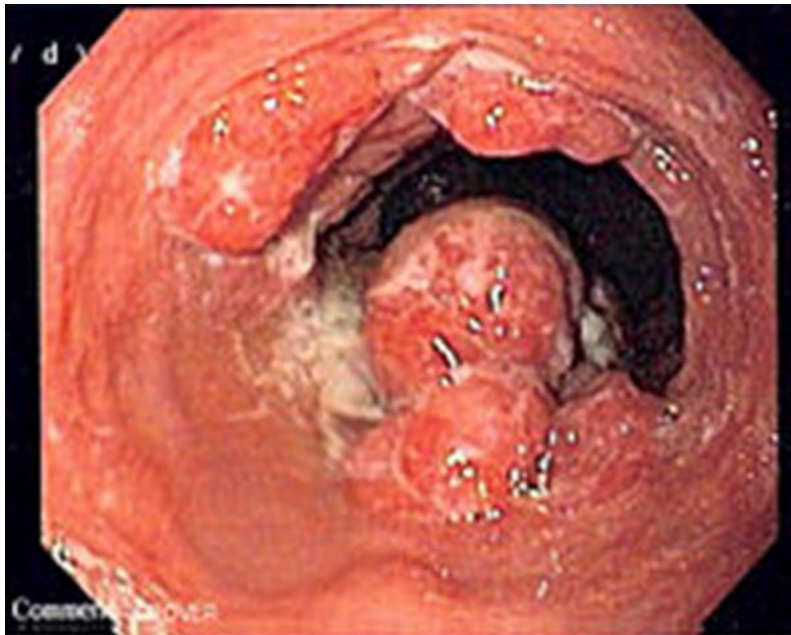
b) State seven causes of dysphagia.

Examination of the cardiorespiratory and abdominal systems are unremarkable.

c) What is the most appropriate diagnostic investigation for Aaron?

d) What referral pathway should this patient's investigations come under?

Aaron undergoes upper GI endoscopy (OGD). A suspicious abnormality is noted in the oesophagus (at 32 cm from the incisors):



Biopsy of this lesion confirms a moderately differentiated adenocarcinoma.

- e) What are the risk factors for developing malignancy of the oesophagus?
- f) What 3 further investigations are required in order to plan treatment? Where should these results be discussed?

The patient is discussed at the upper GI cancer multi-disciplinary team (MDT) meeting. The CT scan of the thorax abdomen and pelvis reveal no distant metastases but local lymph node involvement (T2 N1 M0), endoscopic ultrasound (EUS) confirms a T2 N1 tumour. PET CT shows no distant metastatic disease.

The MDT consensus is that Aaron should receive neoadjuvant chemotherapy, restaging and potential surgical resection of the cancer.

g) What procedure should be performed in this case to achieve clearance of the tumour? How is restoration of the upper GI tract achieved once the oesophagus has been removed (resected)?

h) What body cavities must be surgically entered in order to achieve this?

Following his oesophageal surgery, Aaron will be allowed only fluids by mouth for the first 5 days.

- i) How will his nutrition be provided during this time? Suggest 3 options.

Aaron had a feeding jejunostomy placed.

j) What is meant by the term jejunostomy?

Aaron is prescribed an initial jejunostomy feeding regime running at 20 mL/hour, increasing up to 80 mL/hour over the next 7 days.

- k) What is the rationale for this regime? What are the consequences of rapid introduction of feeding regimens?

Case 2

Fatima, a 65-year old, has been referred from her GP to the upper GI clinic with a troublesome history of “reflux.” She states that over the past 18 months, following a meal she frequently experiences retrosternal burning, lasting from ten minutes to one hour. She denies any difficulty swallowing, or weight loss. She has a past medical history of type 2 diabetes and takes metformin 500mg BD. She is otherwise well. Her GP has previously treated her symptoms with omeprazole, although more recently these tablets have become ineffective, even at a higher dose. She is a non-smoker and does not drink alcohol.

Examination of the cardiorespiratory and abdominal systems is unremarkable.

a) Which anatomical and physiological factors normally prevent gastro-oesophageal reflux?

b) What is the most appropriate initial investigation for this patient?

Fatima is referred for an upper GI endoscopy. This reveals grade A reflux oesophagitis, above a 4 cm hiatus hernia. There is no evidence of Barrett's oesophagus.

c) Define Barrett's oesophagus.

d) What is a hiatus hernia? State the three types of hiatus hernia.

Fatima has been reading on the internet about anti-reflux surgery for her gastro-oesophageal reflux disease and has requested a procedure.

- [illegible]

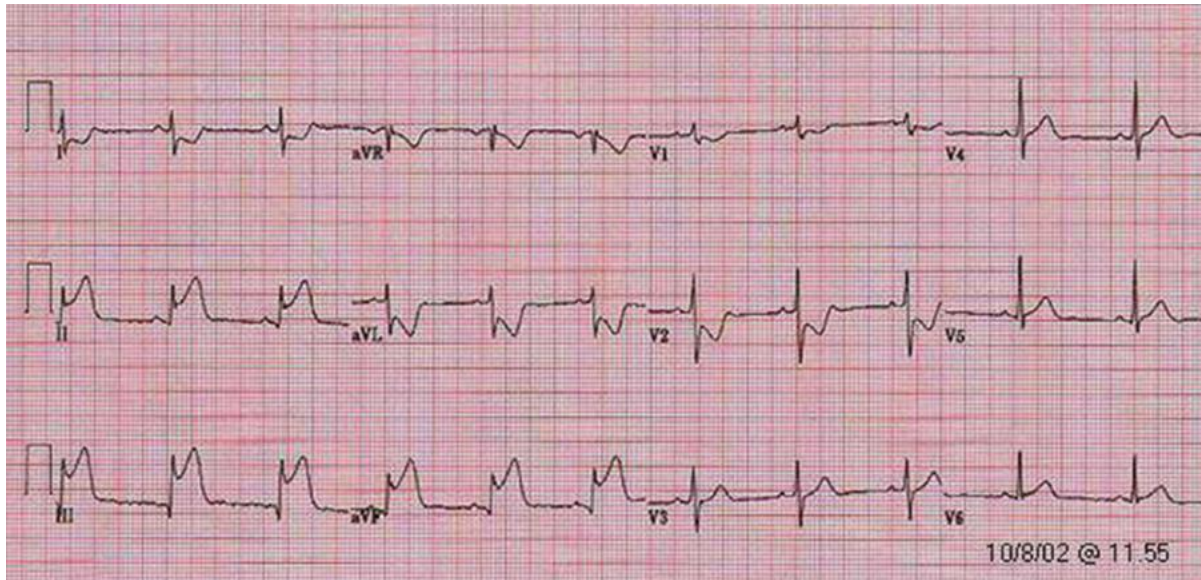
Fatima undergoes an uneventful elective laparoscopic fundoplication. On the evening of her surgery while on the surgical ward, Fatima's EWS has risen from a baseline before surgery of 0 to 5.

The patient is reviewed and is experiencing central crushing chest pain radiating to her left arm. Her observations are pulse 110/minute, blood pressure 110/76 mmHg, O2 saturations 100% on air, respiratory rate 22/minute, temperature 36.5°C. Cardiorespiratory and abdominal examination are unremarkable.

h) What are the possible causes of Fatima's new onset symptoms?

i) What immediate actions should be taken at the bedside? State three.

High flow oxygen is administered and intravenous access obtained. An ECG is shown below.



- j) What complication has Fatima developed?
- k) How should the patient be managed? How does being post-surgery affect the decision to administer thrombolysis?

Session 4

Case 1

A patient has been accepted for admission from the ED to the surgical assessment unit. The admission card indicates the following information:

‘Juri, a 51-year-old male, has a 6-hour history of epigastric pain radiating through to his back. He has vomited twice and last opened his bowels earlier that morning. He has no past medical history of note. For the last three weeks, he has self-medicated a course of ibuprofen for a painful shoulder. He drinks 20 units of alcohol per week but does not smoke. He is allergic to Penicillin.’

- a. State four differential diagnoses for this patient.

On examination he appears unwell with dry mucous membranes and is clearly in pain. His observations are pulse 105/minute, blood pressure 145/89mmHg, respiratory rate 17/minute, O₂ saturations 99% on room air, temperature 37.1°C. He weighs 70kg. There is no lymphadenopathy or jaundice, capillary refill time is 2 seconds. Cardiorespiratory examination is unremarkable. On abdominal examination, there is marked epigastric tenderness with guarding.

- b. What is the most likely diagnosis? Explain your reasoning.

c. State three initial investigations for this.

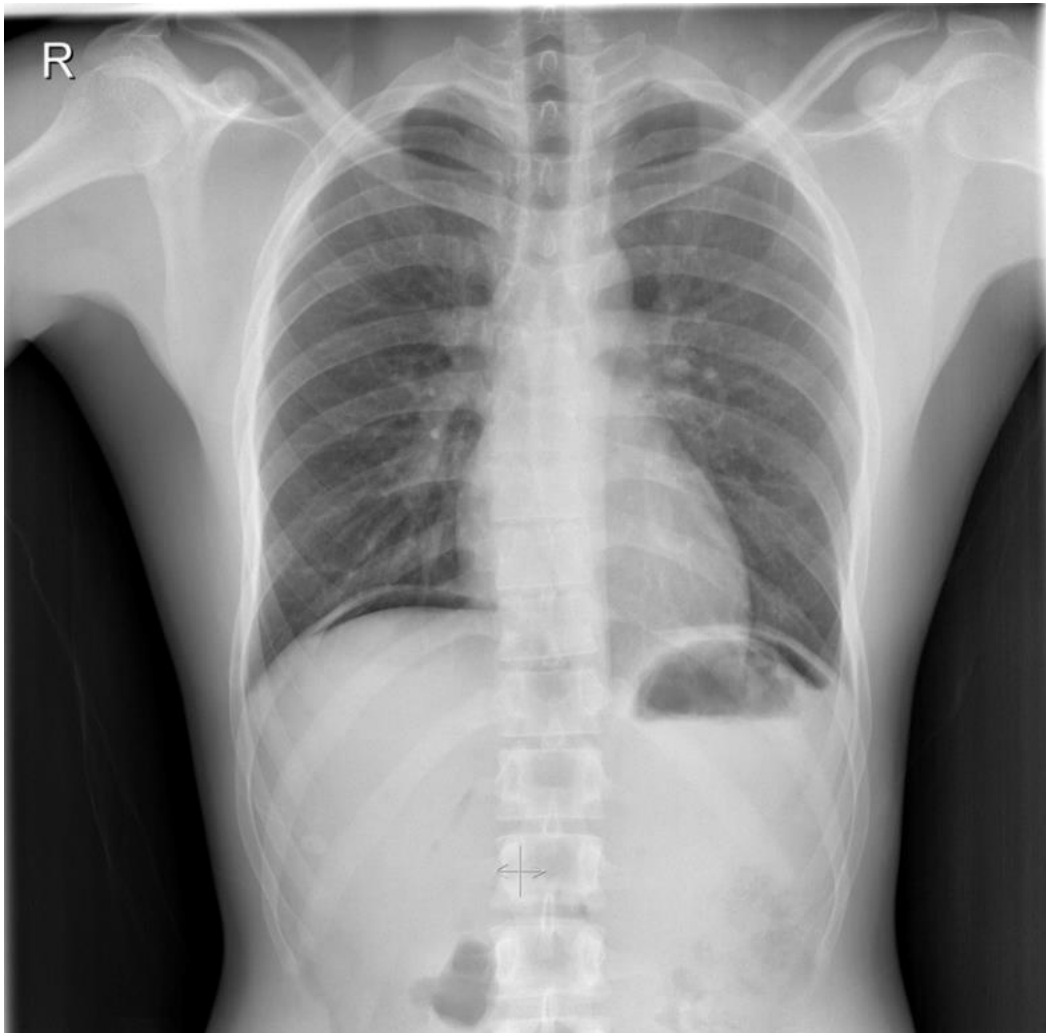
d. State 6 immediate interventions that should be started in this patient.

The investigations are reported as follows:

White Cell Count	18.1	$\times 10^9/L$
Haemoglobin (New Units)	145	g/L
Platelet Count	225	$\times 10^9/L$
Sodium	143	mmol/L
Potassium	4.9	mmol/L
Urea	7.7	mmol/L
Creatinine	80	umol/L
eGFR	88	mL/min/1.73m ²
Albumin	38	g/l
Alkaline Phosphatase(ALP)	99	U/L
Alanine Transaminase(ALT)	70	U/L
Total Bilirubin	20	umol/L
Amylase	128	u/L
CRP	179	mg/l
pH	7.25	
PaO ₂	12.6	kPa
PaCO ₂	3.7	kPa
HCO ₃ ⁻	15	mmol/L
Lactate	11	mmol/L
Urine dip	Normal	

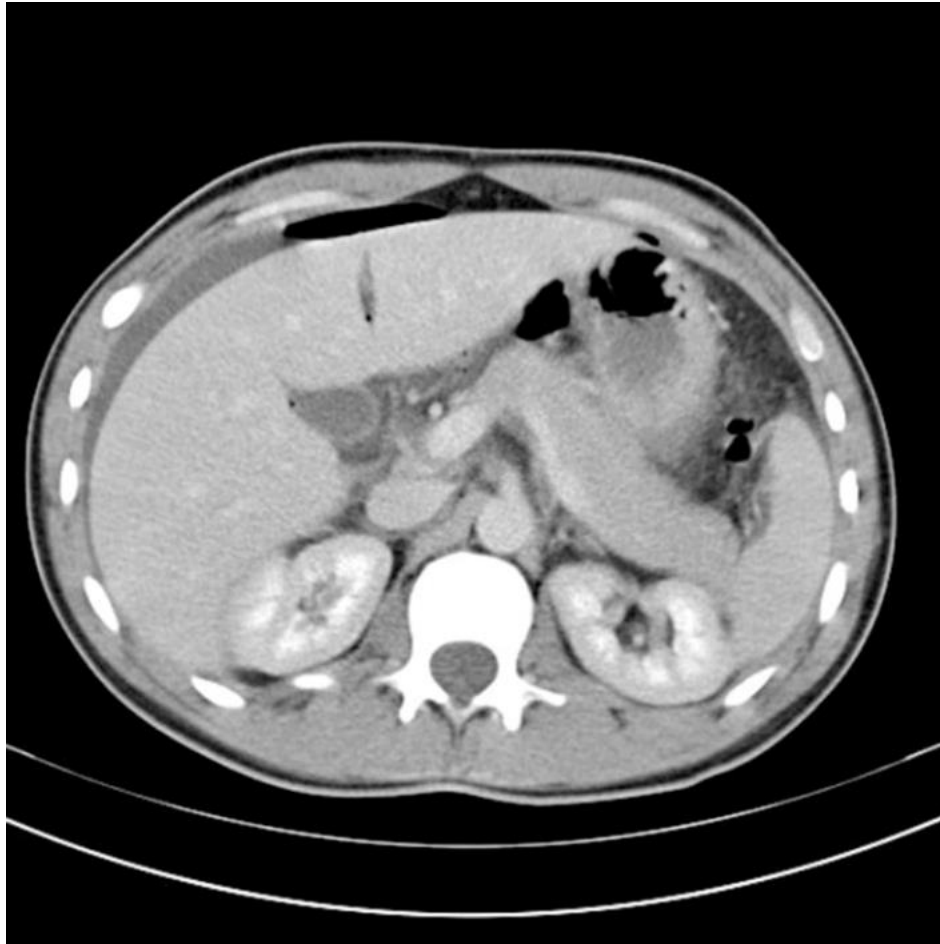
e. Interpret these blood reports and ABG. Explain your reasoning.

f. A chest Xray is taken (below). What does it show?



g. What is the best investigation to confirm the diagnosis?

h. A CT abdomen/pelvis with intravenous contrast is obtained and shown below. What does it indicate?



<https://radiopaedia.org/articles/pneumoperitoneum>

The CT scan is reported as showing a perforated duodenal ulcer. Antibiotics are started.

- i. What is the optimal management for this condition (in this patient)?

- j. Juri is listed for emergency surgery and is reviewed by the on-call anaesthetist. State four modes of anaesthetic, and suggest an appropriate mode for this patient, justifying your answer.

Juri undergoes a laparoscopy and repair of duodenal ulcer under general anaesthetic.

On the fourth post operative day (his planned discharge day), there is concern that the patient's early warning score (EWS) has risen to 7 (from a baseline EWS of 1, 24 hours ago).

On assessment, Juri is noted to be breathless and coughing up green sputum. He is experiencing right sided chest pain. Bedside observations are as follows: temperature 38.1°C, respiratory rate 23/minute, O2 saturations 90% on room air, pulse 92/minute, blood pressure 133/89 mmHg, capillary refill time 2 seconds. Examination reveals a soft abdomen, healing incisions, reduced expansion and air entry to the right lung base, with dullness to percussion at the right lung base, and associated crackles on auscultation.

- k. State three post operative respiratory complications.

- I. What is the most likely cause of his deterioration? How might this have been prevented?

A CT pulmonary angiogram indicates basal atelectasis and consolidation of the right lower lobe, suggestive of a lower respiratory tract infection.

m. Suggest two interventions/treatments for this patient.

n. What 2 lifestyle and drug advice should be provided for Yuri on discharge?

Case 2

Reyansh, a 69-year-old man presents to the ED with a 2-day history of the passage of black tarry stools and an abrupt 4-hour history of frank, bright red haematemesis. He states that he has never had this before but has had mild epigastric pain for the last 4 weeks. He has a past medical history of hypertension and gout. His usual medications are ramipril and allopurinol. He is allergic to penicillin. He lives independently with his wife and is a retired warehouse manager.

- a. State 5 differential diagnoses for this patient's presentation.

On examination he appears very unwell, is pale and sweating. Baseline observations reveal a pulse of 148/minute, blood pressure 69/38mmHg, respiratory rate 32/minute, O2 saturations 96% on room air, capillary refill time 5 seconds, temperature 36.3°C. His BM is 7.3 mmol/l. Chest and abdominal examination are unremarkable. Rectal examination reveals melaena. The ED team are concerned that this patient is in shock.

b. Define 'Shock'.

c. What form of shock does this patient have? Justify your answer.

d. What are the other forms of shock? State their defining features.

e. State 4 immediate management steps for this patient.

Hypovolaemic (haemorrhagic) shock is suspected. Two 16-gauge (grey) cannulas are placed, one in each antecubital fossa, blood is taken for laboratory investigations, and the patient is cross matched 4 units of blood.

Initial crystalloid fluid resuscitation is started, and an arterial blood gas is sampled. Laboratory investigations are indicated below:

White Cell Count	15.1	$\times 10^9/\text{L}$
Haemoglobin (New Units)	55	g/L
Platelet Count	455	$\times 10^9/\text{L}$
Sodium	143	mmol/L
Potassium	4.9	mmol/L
Urea	17.7	mmol/L
Creatinine	70	umol/L
eGFR	88	mL/min/1.73m ²
Albumin	38	g/l
Alkaline Phosphatase(ALP)	99	U/L
Alanine Transaminase(ALT)	70	U/L
Total Bilirubin	20	umol/L
CRP	39	mg/l
pH	7.18	
PaO ₂	9.4	kPa
PaCO ₂	3.3	kPa
HCO ₃ ⁻	15.4	mmol/L
Lactate	7.3	mmol/L

f. Describe the acid-base status of the patient.

g. In light of these blood results, and given the patient's history, what is the most likely diagnosis?

The most likely diagnosis is considered to be a bleeding duodenal ulcer. The patient responds appropriately to initial resuscitation.

h. What are the next steps in this patient's management?

i. Suggest a mode of anaesthesia for this patient.

The on-call endoscopist is contacted and the patient undergoes urgent upper GI endoscopy under conscious sedation. A bleeding duodenal ulcer is diagnosed and a combination of cautery and adrenaline injection into the ulcer applied.

- j. What two additional pharmacological measures should be employed to reduce the chance of the ulcer re-bleeding?

Session 5

Case 1

Mary, a 71 year old woman, presents to the outpatient clinic with a 1-month history of bleeding per rectum. She states that the blood is associated with opening her bowels and can be found in the pan. Sometimes she passes mucus only. She has not lost any weight, and has no abdominal or pelvic pain. Her past medical history comprises a myocardial infarction 10 years earlier, and a stroke 6 years ago. Her medications comprise bisoprolol, clopidogrel, losartan, omeprazole, simvastatin. She has no drug allergies. She has made a good functional recovery following the stroke and lives independently, with her two pet cats. She is an ex-smoker and does not drink alcohol.

- a. What are the anatomical sites of potential bleeding in this patient?
- b. State the three most likely differential diagnoses for the bleeding?
- c. What would be the significance of fresh red rectal bleeding or melaena?

On examination, she appears well with normal observations. Abdominal examination unremarkable. Rectal examination reveals soft stool.

- d. What is the most appropriate diagnostic investigation for this patient? Justify your answer.

At flexible sigmoidoscopy, Mary is found to have a large, irregular polyp in the mid rectum, 12 cm from the anal verge. A picture is provided below.



Biopsies indicate rectal adenocarcinoma. Mary has been informed of the cancer diagnosis in the “new diagnosis” clinic in the presence of colorectal consultant and colorectal cancer specialist nurse.

- e. What are the most appropriate staging investigations for this patient? Where should the results be discussed?

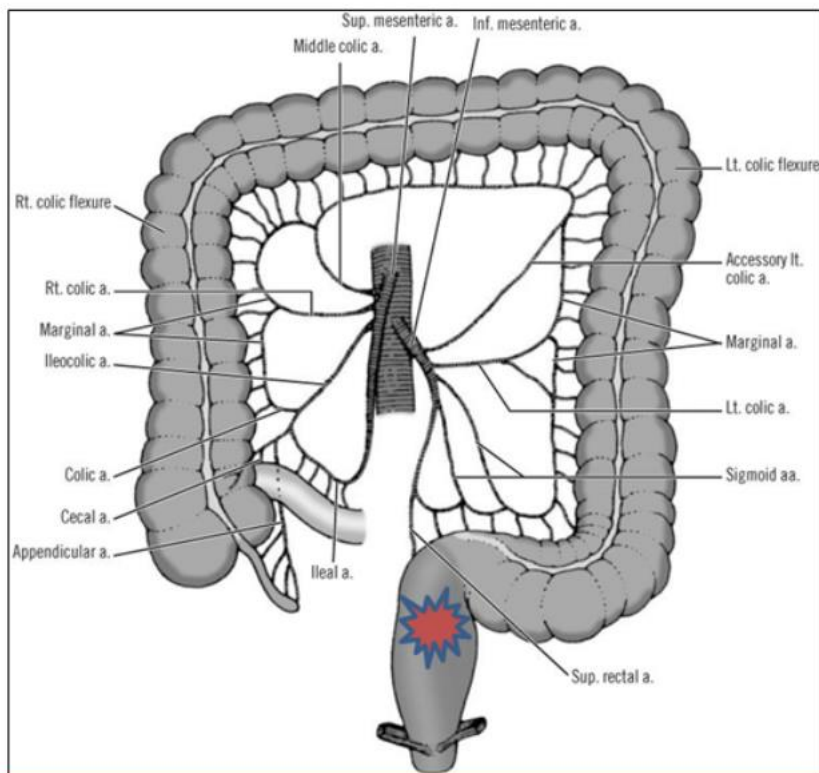
The patient is discussed at the colorectal cancer MDT and the outcome is indicated below:

MDT outcome 2nd February: T3a N0 M0 rectal moderately differentiated adenocarcinoma.
Performance status 1. Treatment plan – for surgical resection.

The aim of surgery in this context is to remove the cancer and the draining lymph nodes.

f. Which lymph nodes drain the left side of the colon?

g. Mary's tumour is indicated in the diagram below. Which blood vessel must be divided in order to achieve maximal lymph node harvest.



h. Mary is listed for surgery under general anaesthesia. How should her anti-platelet medication be managed in the days before surgery?

- i. An operation is performed, removing the cancer, joining (anastomosing) the two ends of the colon back together. A “covering” ileostomy is also performed. What is the name given to the operation that has been performed? What is the purpose of the covering ileostomy?

Mary initially made an uneventful recovery following the surgery. She has been eating and drinking, has been mobilising around the ward, her pain has been well controlled, and her ileostomy had started to function (500ml over a 24-hour period on day 2).

On the 3rd postoperative day, Mary experiences nausea and has vomited 600ml of bile-stained fluid. Observations comprise pulse 92/minute, blood pressure 145/88mmHg, O2 saturations 97% on room air, respiratory rate 16/minute, temperature 36.8°C. Respiratory and cardiac examination are unremarkable. Abdominal examination reveals abdominal distension, but no tenderness or guarding. Her wounds appear healthy. Bowel sounds are absent. The stoma appears healthy, but there are no contents in the stoma bag. On review of the chart, the stoma has not been active over the last 12 hours.

- j. What is the most likely cause of Mary's deterioration?

A diagnosis of ileus is made.

- k. What is the life-threatening complication of an untreated ileus, and what bedside intervention will reduce the risk of this complication? Name 2 additional interventions to manage the ileus?

- l. Mary is kept nil by mouth until her gut function resumes. Blood tests taken by the bedside are given below. Suggest a 24-hour fluid prescription for this patient (fluid, rate, volume).

White Cell Count	8.1	$\times 10^9/L$
Haemoglobin (New Units)	125	g/L
Platelet Count	455	$\times 10^9/L$
Sodium	143	mmol/L
Potassium	4.9	mmol/L
Urea	3.7	mmol/L
Creatinine	57	umol/L
eGFR	88	mL/min/1.73m ²
Albumin	38	g/l
Alkaline Phosphatase(ALP)	99	U/L
Alanine Transaminase(ALT)	70	U/L
Total Bilirubin	20	umol/L
CRP	39	mg/l
pH	7.38	
PaO2	14.4	kPa
PaCO2	4.3	kPa
HCO3-	25.4	mmol/L
Lactate	0.3	mmol/L

Case 2

Robert, a 67-year old retired accountant, has been referred to the surgical clinic by his GP with a six week history of “loose stools”. The patient states that he has not had diarrhoea *per se*, but whereas he used to open his bowels just once a day, he now does so 3 to 4 times, per day. He has not noticed any bleeding or weight loss. He is a keen hill walker, and for the last two months has noticed that he has struggled to keep up with other group members on long climbs.

Examination, including rectal examination is unremarkable.

His initial tests performed in primary care indicated a Haemoglobin of 97g/L, with an MCV of 79fl. A faecal immunochemical test (FIT) was positive at 125mg/g.

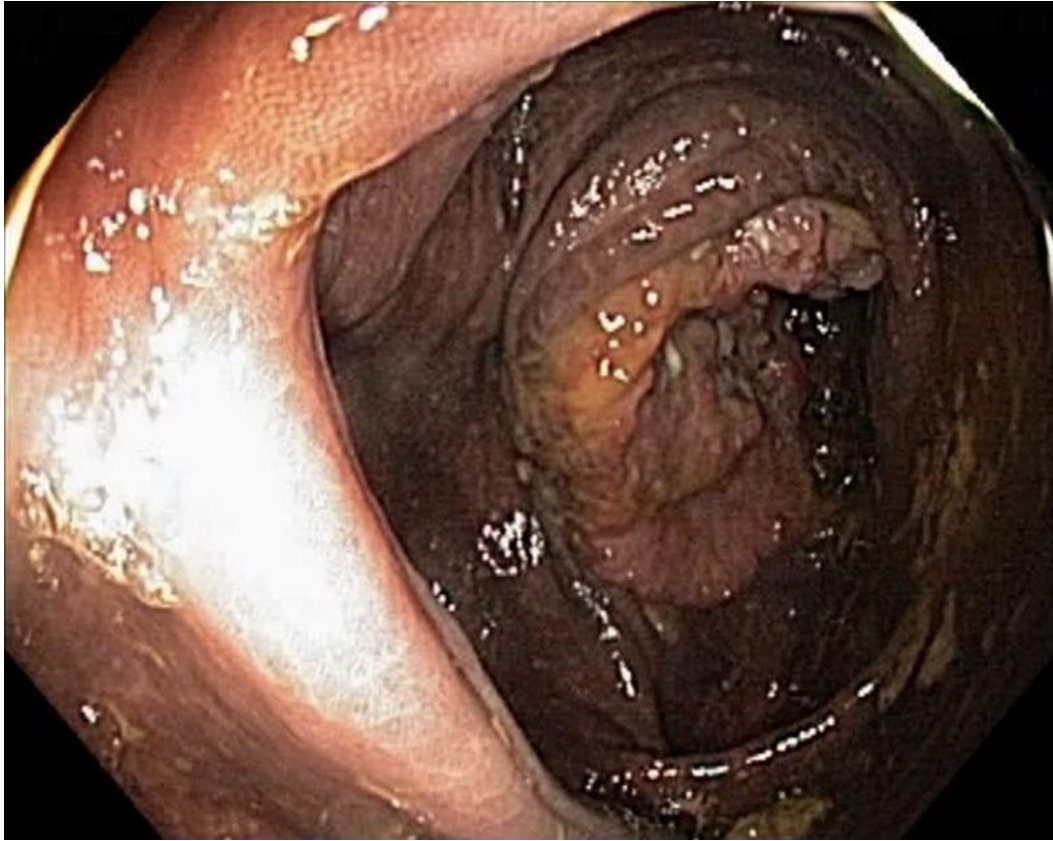
a) State 4 differential diagnoses for this patient's abnormalities.

b) What is the most appropriate diagnostic investigation for this patient?

Robert is referred for a colonoscopy.

- c) What is the difference between flexible sigmoidoscopy and colonoscopy?
- d) What bowel cleansing (preparation) is needed for these investigations? What are the risks of these bowel preparations?
- e) When consenting for colonoscopy what are three common risks of this procedure?

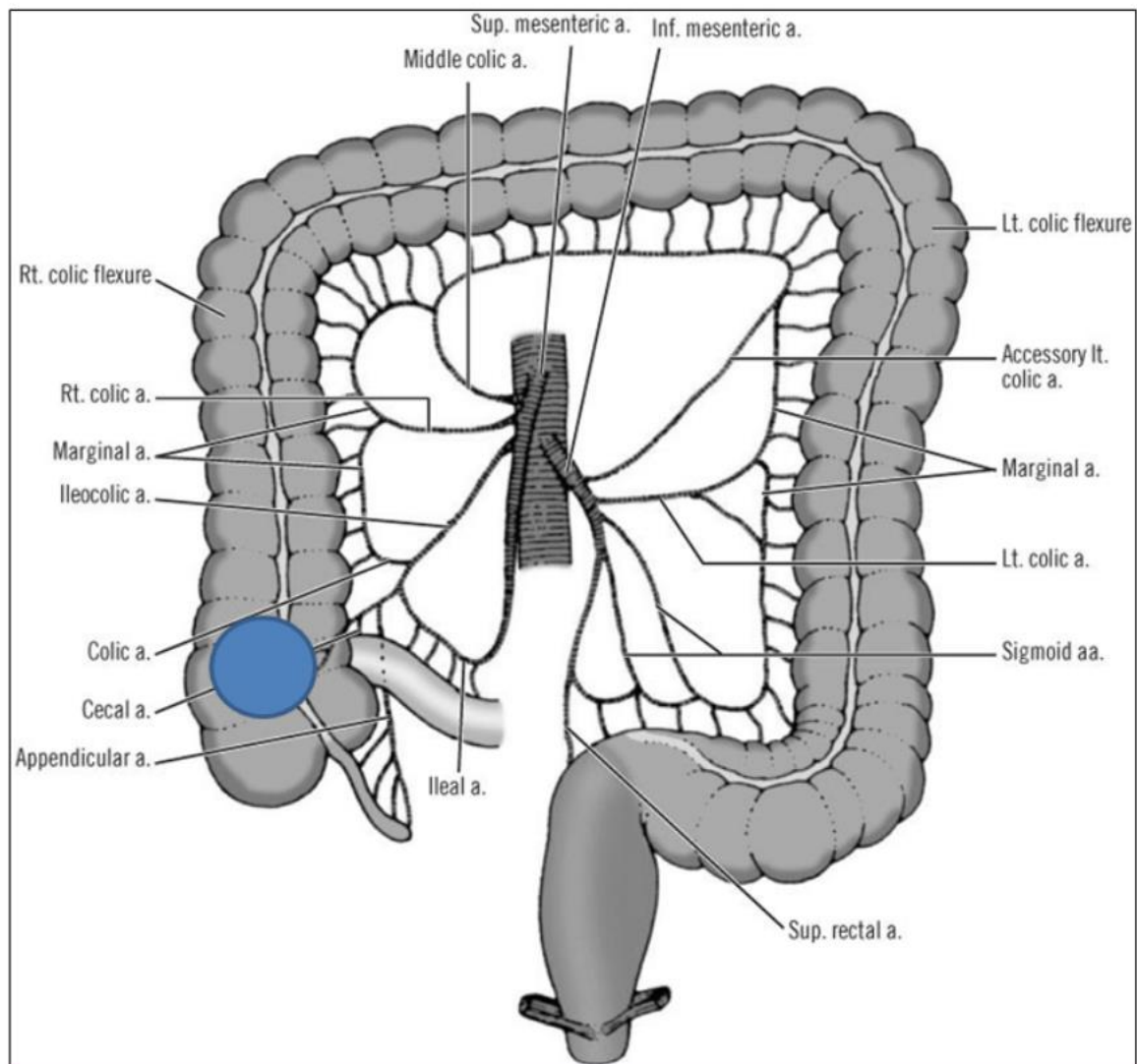
At colonoscopy, Robert is found to have the following abnormality in the caecum.



Biopsy reveals a poorly differentiated adenocarcinoma.

- f) What staging investigation is required for this patient?

- g) Robert's tumour is indicated on the image below. Which blood vessels must be divided in order to remove this patient's cancer and draining regional lymph nodes?



h) What is the name of the operation that should be carried out in this patient?

Robert undergoes a laparoscopic assisted right hemicolectomy. His post-operative management is according to an enhanced recovery after surgery (ERAS) protocol.

After an initial uneventful recovery, Robert deteriorates with increasing abdominal pain and is reviewed on the fourth post operative day.

On examination his observations are pulse 144/minute (irregular), blood pressure 92/55mmHg, respiratory rate 22/minute, O2 saturations 96% on room air, temperature 38.2°C, capillary refill time 2 seconds. Abdominal examination reveals generalised tenderness with marked guarding over the right side of the abdomen.

The results of initial laboratory investigations are indicated:

White Cell Count	18.3	$\times 10^9/L$
Haemoglobin (New Units)	122	g/L
Platelet Count	355	$\times 10^9/L$
Sodium	139	mmol/L
Potassium	4.9	mmol/L
Urea	9.9	mmol/L
Creatinine	175	umol/L
eGFR	34.9	mL/min/1.73m ²
pH	7.22	
PaO2	12.3	kPa
PaCO2	2.5	kPa
HCO3-	16.3	mmol/L
Lactate	6.7	mmol/L
BE	-7.1	mEq/L

i) What is the most likely cause of Robert's acute deterioration?

j) What is the investigation of choice to confirm the diagnosis?

A CT scan of the abdomen/pelvis with intravenous contrast reveals free fluid and air in the abdomen, consistent with an anastomotic leak. The patient is booked for an emergency laparotomy.

k) What additional pharmacological treatment should be offered to this patient while on the ward?

Session 6

Case 1

Janet Brigston, a 35-year old female, presents to the surgical assessment unit with a three-day history of worsening right upper quadrant (RUQ) pain radiating through to her right shoulder blade. She states that these pains come and go in waves. The pain is associated with vomiting. Her bowels are opening normally, she has no urinary symptoms. The patient finished their last menstrual period 5 days ago. She is a type 1 diabetic, taking glargine and novorapid (a basal bolus regimen) daily. The past medical history is otherwise unremarkable and there are no allergies.

- a. What further questions will help in making a diagnosis?

On additional questioning, Janet says her pain always comes on 30-45 minutes after eating. There are no other associated relieving or exacerbating factors. The pain is severe and dull in nature.

Observations are temperature 37.1°C, pulse 83/minute, blood pressure 119/68mmHg, respiratory rate 18/minute, O₂ saturations 98% on room air. The patient has dry mucous membranes and is comfortable. Capillary refill is 1 second.

Her body mass index is 38 Kg/m². Abdominal examination reveals a soft abdomen with no scars. There is tenderness on palpation in the RUQ. Murphy's sign is negative. No cough impulses are felt over the hernial orifices.

b. Define Murphy's sign? What is the significance of this sign?

c. State four differential diagnoses for this patient. Justify your answers.

d. State four initial investigations for this patient (including one radiological investigation). Indicate the rationale for each.

- e. State two initial pharmacological treatments that should be prescribed for this patient?

Initial laboratory investigations indicate:

White Cell Count	9.2	$\times 10^9/L$
Haemoglobin (New Units)	139	g/L
Mean Cell Volume	90	fL
Platelet Count	254	$\times 10^9/L$
Sodium	138	mmol/L
Potassium	4.5	mmol/L
Urea	5.0	mmol/L
Creatinine	82	umol/L
eGFR	>90	mL/min/1.73m ²
Albumin	40	g/l
Alkaline Phosphatase(ALP)	106	U/L
Alanine Transaminase(ALT)	49	U/L
Total Bilirubin	10	umol/L
Amylase	60	u/L
CRP	<5	mg/l

Urinalysis and urinary pregnancy testing are normal.

Erect Chest Xray is unremarkable

f. Interpret the blood results. What is the most likely diagnosis?

An ultrasound abdomen is performed:

US – Abdomen Report:

Multiple gallstones in a thin-walled gallbladder. Normal intra-hepatic ducts. Common bile duct 5mm in diameter. The liver, spleen and both kidneys appear normal.

- g. What is the significance of a thin-walled gall bladder and a common bile duct of 5 mm?

The patient is diagnosed with biliary colic and discharged home with a view to elective day case laparoscopic cholecystectomy.

Two months after her admission, Janet attends the Emergency department complaining of severe abdominal pain. The patient is nauseated and has vomited three times over the last 24 hours. The pain is now constant and radiates to the right shoulder. She has also noticed that her urine is now dark. She has had bouts of uncontrollable shivering. Her partner has noticed that her skin appears darker and that her eyes appear “yellow”.

Observations are temperature 38.3°C, pulse 124/minute, blood pressure 88/61mmHg, respiratory rate 23/minute, saturations 97% on room air. On examination she is jaundiced. Abdominal examination reveals guarding in the right upper quadrant.

- h. What is the most likely diagnosis?

- i. What is the name given to this constellation of clinical features?

- j. The clinical team suspect this patient has sepsis. Define sepsis.

k. State 6 immediate bedside actions to treat the sepsis. What are these 6 actions collectively called?

l. What is the pathophysiology of sepsis in this patient?

m. Janet is kept nil by mouth. How should her diabetic medication be managed during this period?

Janet receives initial resuscitation and treatment in the ED.

- n. What is the most appropriate radiological test(s) for this patient. State two.

Janet undergoes CT of the abdomen and pelvis. This is reported as a dilated CBD (at 9mm) with a stone in the distal CBD. Janet is diagnosed with ascending cholangitis secondary to a likely CBD stone. The patient is admitted to the High Dependency Unit for ongoing resuscitation.

- o. After resuscitation and initial treatment, how should the condition be managed? State two definitive interventions.

- p. Name two potential complications of each of these procedures.

- q. The patient undergoes ERCP, sphincterotomy and stone removal. What further intervention is required to prevent further biliary complications in this patient?

Case 2

David Smyth, a 47-year-old man, is admitted to the surgical assessment unit with a 12-hour history of severe abdominal pain and vomiting. The pain radiates through to the back. He has a past medical history of high cholesterol, asthma, and he admits to alcohol excess, drinking one bottle of vodka per day. He does not take any regular medications and has no drug allergies.

Observations are: temperature 37.6°C, pulse 90/minute, blood pressure 147/90mmHg, respiratory rate 22/minute and O2 saturations 98% on room air. On examination there is marked epigastric tenderness with guarding. The clinical team suspect acute pancreatitis.

a) State two pathognomonic eponymous signs of this condition. How often are these encountered in clinical practice?

b) State four initial bedside steps in managing this patient.

Initial laboratory investigations indicate:

White Cell Count	16.0	$\times 10^9/L$
Haemoglobin (New Units)	138	g/L
Platelet Count	380	$\times 10^9/L$
Sodium	130	mmol/L
Potassium	4.4	mmol/L
Urea	16.1	mmol/L
Creatinine	195 (baseline 105)	umol/L
eGFR	38	mL/min/1.73m ²
Albumin	37	g/l
Alkaline Phosphatase(ALP)	390	U/L
Alanine Transaminase(ALT)	40	U/L
Total Bilirubin	19	umol/L
Amylase	1872	u/L
CRP	237	mg/l
pH	7.32	
PaO2	8	kPa
PaCO2	2.9	kPa
HCO3-	14.9	mmol/L
Blood glucose	12.1	mmol/L
Adjusted calcium	2.1	mmol/L
Lactate dehydrogenase	376	lu/L

c) Interpret these blood tests including the acid-base balance.

d) State two radiological investigations that would confirm a diagnosis of acute pancreatitis in this patient. Are radiological investigations required to make a diagnosis of acute pancreatitis?

e) What scoring systems can be used to classify the severity of this condition?
Calculate the score for this patient using one of these scoring systems?

f) What is the likely cause of acute pancreatitis in this patient? State 6 other causes.

Despite regular paracetamol and intravenous tramadol, David is still complaining of significant pain and nausea.

- g) What escalation in analgesia could be considered for the patient? Which clinical team would you be the most appropriate to advise on this?

Twenty-four hours after admission to the surgical assessment unit the patient deteriorates with observations as follows: temperature 37.5°C, pulse 123/minute, blood pressure 105/72 mmHg, respiratory rate 30/minute, saturations 92% on high flow oxygen via a non rebreathe mask.

- h) Given the patient's clinical appearance, what is the most appropriate next step in this patient's management?

The patient is moved to the high dependency unit for a higher level of care.

i) What is meant by this term “higher level of care” and how can it be categorised?

j) What level of care is likely to be required by this patient?

Following a stay on HDU, David recovers and is now abstinent from alcohol. He is seen 2 months later in the outpatient clinic. He now complains ongoing upper abdominal discomfort.

An ultrasound demonstrates an 8cm cystic mass arising from the tail of the pancreas.

k) What complication has this patient now developed?

l) Suggest two possible treatment options for this complication.

m) State two other long-term complications of pancreatitis?

Seminar 7

Case 1

Stephen, a 76-year old retired HGV driver, is reviewed on the surgical assessment unit. He complains of worsening back pain and yellowing of the skin for the last five days. On more detailed discussion, the patient tells you that he has had a decrease in his appetite and 5Kg loss in weight over the last 3 months. He also states that he has a past medical history of two myocardial infarctions, the last being 2 years ago, and takes aspirin regularly, along with simvastatin, ramipril and bisoprolol.

On examination: temperature 36.5°C, pulse 80/minute, blood pressure 127/88mmHg, respiratory rate 14/minute. He appears dehydrated and is visibly jaundiced. Abdominal examination reveals a smooth palpable mass in the right upper quadrant 8cm in diameter, which you can get below but not above. There is no tenderness or guarding. There are no hernias. Rectal examination is normal.

a) State three differential diagnoses for this patient.

b) What initial laboratory investigations should be performed? Justify each investigation.

The following laboratory investigations are returned:

White Cell Count	10.1	$\times 10^9/\text{L}$
Haemoglobin (New Units)	104	g/L
Platelet Count	355	$\times 10^9/\text{L}$
Sodium	143	mmol/L
Potassium	4.3	mmol/L
Urea	17.7	mmol/L
Creatinine	280	$\mu\text{mol/L}$
eGFR	20	mL/min/1.73m^2
Albumin	29	g/l
Alkaline Phosphatase(ALP)	698	U/L
Alanine Transaminase(ALT)	189	U/L
Total Bilirubin	293	$\mu\text{mol/L}$
Amylase	107	u/L
CRP	25	mg/l
INR	3.5	mmol/L

c) Interpret these blood results. Why is the INR above the normal range?

d) How can the causes of jaundice be classified or sub-divided? What type of jaundice does this demonstrate?

e) What is the relevance of the palpable mass in the right upper quadrant? How does this relate to Courvoisier's law?

f) State an appropriate pharmacological intervention for this patient in light of the deranged INR.

g) State the most appropriate initial radiological investigation for this patient?

A CT of the abdomen and pelvis with IV contrast is requested.

h) The radiologist suggests correction of this renal failure prior to his CT. Why is this?

After fluid optimisation, Stephen's eGFR improves to 40 mls/min/1.73m².

His CT is report as follows:

Portal-venous phase.

Lung bases are clear.

There is no free fluid, free air or signs of perforation.

There is marked intra and extra-hepatic bile duct dilatation down to a narrowing in the distal CBD, adjacent to a 45mm mass lesion in the head of the pancreas. There is invasion of the portal vein, multiple enlarged regional lymph nodes, bilobar liver metastases and at least three pulmonary metastases. The kidneys, spleen, unprepared bowel and adrenals are normal.

Conclusion: T4 N2 M1 pancreatic cancer. Suggest referral to the hepatobiliary MDT.

- i) State a definitive treatment for jaundice in this patient.

Case 2

Reginald, a 72-year old retired builder, is reviewed in the surgical outpatient department with a 3-month history of a lump in the right groin. He states that this lump bulges out when he coughs or strains but can be reduced when he lies down. He has had no vomiting or abdominal pain and is otherwise well. He denies any weight loss, urinary symptoms or change in bowel habit. His past medical and surgical history is unremarkable aside from a DVT 3 months ago after a long-haul flight. He takes warfarin and has no allergies. He has a 30-pack year smoking history.

On examination: temperature 36.5°C, pulse 80/minute, blood pressure 127/88mmHg, respiratory rate 14/minute. Body mass index is 31 Kg/m². He appears clinically well with a soft, reducible mass in the right groin above the inguinal ligament, immediately superior and medial to the pubic tubercle. The abdomen is otherwise soft and the testicles normal.

- State five differential diagnoses for this patient's lump in the groin.
- Define a hernia?
- How are femoral and inguinal hernias differentiated clinically? Is this patient likely to have a femoral or inguinal hernia?

d. State three risk factors for developing an inguinal hernia in this patient.

The clinical team diagnose an inguinal hernia.

- e. State a definitive intervention for this patient.
- f. State five common complications of inguinal hernia repair that this patient should be warned of when consenting for intervention.

The patient is consented for a repair of his right sided inguinal hernia and given an elective date for repair in 3 months' time.

However, three weeks after review in the clinic, Reginald is admitted as an emergency to the surgical assessment unit, with severe right sided groin pain. He states that for the last 24 hours the hernia has been "stuck out," and he cannot reduce it as before. He has been vomiting and has not opened his bowels for 2 days.

On examination: temperature 36.5°C, pulse 82/minute, blood pressure 126/78mmHg, respiratory rate 16/minute, saturations 98% on room air. His abdomen is soft and has no tenderness.

There is a right sided mass in the right groin as before, but it is now tender, and irreducible. There are no skin changes visible.

g. What complication has arisen in this patient's hernia?

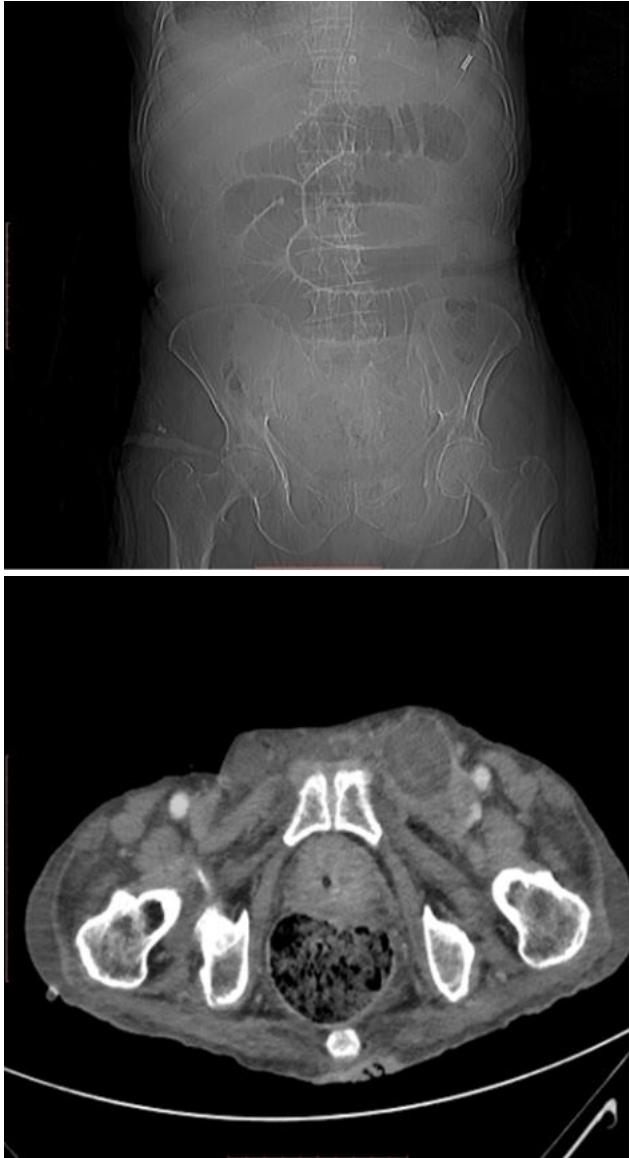
h. Name four initial management steps in the surgical assessment unit?

The following laboratory investigations are returned:

White Cell Count	10.1	$\times 10^9/\text{L}$
Haemoglobin (New Units)	145	g/L
Platelet Count	255	$\times 10^9/\text{L}$
Sodium	143	mmol/L
Potassium	4.9	mmol/L
Urea	7.7	mmol/L
Creatinine	80	$\mu\text{mol/L}$
eGFR	90	mL/min/1.73m^2
Albumin	38	g/l
Alkaline Phosphatase(ALP)	99	U/L
Alanine Transaminase(ALT)	70	U/L
Total Bilirubin	20	$\mu\text{mol/L}$
Amylase	128	u/L
CRP	22	mg/l
pH	7.38	
PaO ₂	15.4	kPa
PaCO ₂	5.3	kPa
HCO ₃ ⁻	24.4	mmol/L
Lactate	1.3	mmol/L
INR	5.2	

- i. Interpret the blood results and acid-base status of the patient.

The patient has a CT of the abdomen and pelvis with IV contrast. Images are visible below:



j. Interpret the CT scan. What are the radiological findings?

k. How should this patient be managed?

Reginald is consented for an emergency inguinal hernia repair.

- I. Given his INR, name a pharmacological intervention to allow him to proceed safely to surgery?

Case 3

Jason, a 70-year-old retired farmer is reviewed in the surgical outpatient clinic. He complains of a 12-month history of mild intermittent abdominal discomfort at the site of a known midline hernia. He has previously undergone two open paraumbilical hernia repairs 15 and 18 years ago. His medical history comprises hypertension for which he takes amlodipine. Review of his primary care records reveals that he has not consulted for over five years. He has no known allergies

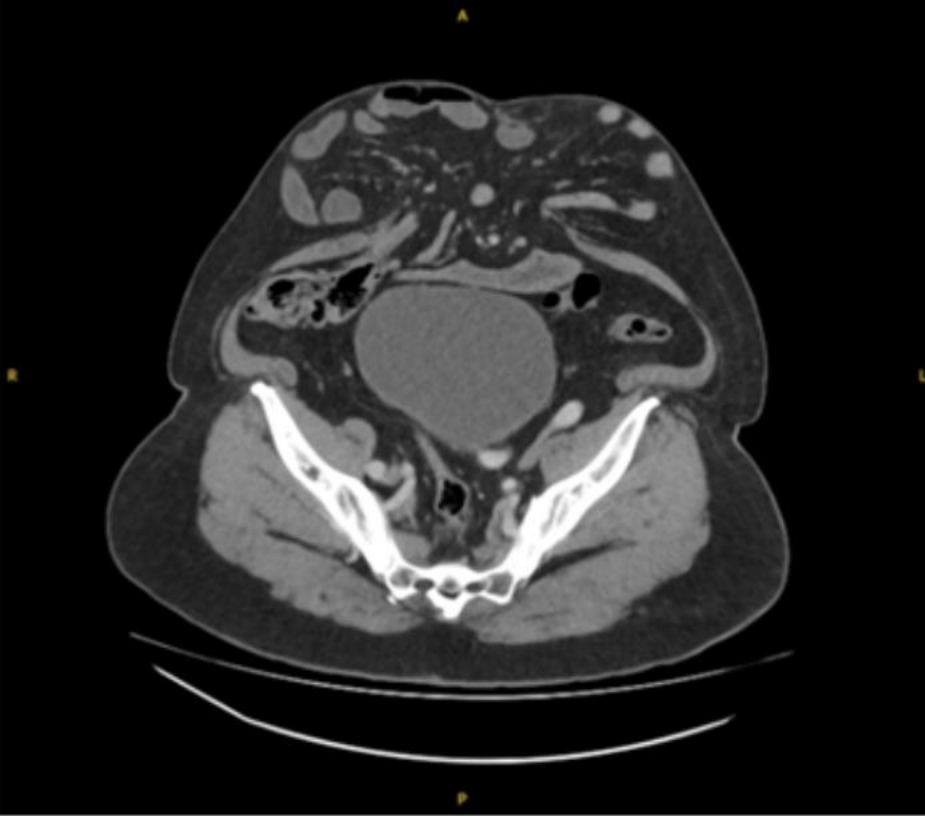
On examination: temperature 36.5°C, pulse 80/minute, blood pressure 127/88mmHg, respiratory rate 14/minute. Body mass index is 51 Kg/m². He has a large non-reducible, non-tender abdominal wall incisional hernia.

a) State three risk factors for developing an incisional hernia in this patient?

b) State an appropriate radiological investigation for assessing this hernia?

The patient is sent for a CT of the abdomen and pelvis. The images are shown below.

c) What are the contents of the hernia? Justify your answer.



The patient would like to explore what treatment options are feasible.

- d) What are the potential treatment options for this patient's hernia?
- e) How would you establish "fitness for surgery" in this patient? Suggest three dynamic tests of fitness and the principle behind each one.
- f) What scoring systems can be used to grade "fitness for anaesthesia/surgery"? State three.
- g) What factors in this patient increase perioperative risk?

h) How can these risk factors be managed in the pre-operative setting?

Seminar 8

Case1

Abdulla, a 44-year-old man, presents to the surgical assessment unit with an eight-hour history of severe, constant, pain in the anal region. He does not complain of any bleeding or discharge per rectum. He has type 1 diabetes mellitus and takes Humulin I 14 units BD and Novorapid 6-8 units before breakfast, lunch and dinner. He does not smoke or drink alcohol. He lives with his wife. He has no allergies.

On examination: temperature 36.5°C, pulse 80/minute, blood pressure 127/88mmHg, respiratory rate 14/minute. Body mass index is 21 Kg/m².

There is an erythematous, fluctuant and tender swelling palpable on left side of the perianal region (8 o'clock) 2cm from the anal verge.

- a. State four differential diagnoses for this patient.

The clinical team diagnose a perianal abscess and commence antibiotics.

- b. State a definitive intervention to treat this abscess.
- c. The patient is consented for incision and drainage of the abscess. State three common complications that the patient should be warned about when taking consent.
- d. How should the patients diabetes be managed in the perioperative setting?

Case 2

Linda, an 85-year old woman, is reviewed on the surgical assessment unit. She states that for the last 2 days she has been suffering with multiple episodes of vomiting and has not opened her bowels to stool or flatus. She has central colicky abdominal pain, which is vague in nature. She has a past medical history of hypertension and atrial fibrillation. She takes amlodipine and apixaban regularly. She underwent an open hysterectomy for fibroids 30 years ago. She lives independently alone at home. She has no allergies.

On examination: temperature 36.5°C, pulse 88/minute, blood pressure 129/83mmHg, respiratory rate 14/minute. Body mass index is 23 Kg/m2. The patient appears alert and dehydrated. Abdominal examination demonstrates a distended abdomen with no tenderness. Hernial orifices and PR examination are normal. On auscultation, tinkling bowel sounds are heard.

The clinical team suspect small bowel obstruction.

- a. State four causes of small bowel obstruction.
- b. What is the most likely cause of obstruction in this patient? Justify your answer.
- c. What is the most appropriate diagnostic investigation for this patient?

A CT abdomen and pelvis with IV contrast is requested. Images from this investigation are visible below:



d. Interpret the CT images. What is the diagnosis?

e. State four initial management steps.

The patient is administered IV fluid and analgesics. A nasogastric tube is placed and NG gastrograffin is administered. Following 24 hours of conservative management the patient is reviewed on the ward. The clinical team find that the patient's abdominal pain has worsened. Observations are repeated and given as follows: temperature 39.0°C, pulse 110/minute, blood pressure 100/63mmHg, respiratory rate 20/minute.

Laboratory investigations are reported as below:

White Cell Count	18.6	x10 ⁹ /L
Haemoglobin (New Units)	129	g/L
Platelet Count	254	x10 ⁹ /L
Sodium	138	mmol/L
Potassium	4.5	mmol/L
Urea	16.0	mmol/L
Creatinine	260	umol/L
eGFR	32	mL/min/1.73m ²
Amylase	60	u/L
CRP	127	mg/l
pH	7.32	
PaO2	10.3	kPa
PaCO2	3.9	kPa
HCO3-	19.7	mmol/L
Lactate	4.7	mmol/L

- g. Interpret the acid-base status and renal function of this patient. How should this patient now be managed?
- h. Operative intervention is indicated within 6 hours. How should the patient's anticoagulation be managed?

The patient is consented for an emergency midline laparotomy and is taken to theatre. At laparotomy a necrotic segment of small bowel secondary to adhesions is discovered and resected. The surgical team decide that anastomosis is not favourable given the acid-base disturbance. A double-barrelled ileostomy is spouted.

- i. State two common complications of ileostomy formation?

Case 3

Khalil, a 43-year-old with a known history of terminal ileal Crohn's disease, is reviewed on the gastroenterology ward by the surgical team. He has spent the last 5 days admitted under the gastroenterology team with a 3-month history of worsening right iliac fossa pain, weight loss and diarrhoea. He has a known history of ileocaecal Crohn's disease and has been prescribed 40mg of prednisolone daily for the last 6 weeks. He has no allergies and has a body mass index of 17kg/m². He lives independently at home with his partner.

A CT abdomen and pelvis has been performed demonstrating a localised perforation of the terminal ileum within a short segment of terminal ileal Crohn's disease. The surgical team have decided to take this patient to theatre and resect this segment of bowel via midline laparotomy.

a) State 4 clinical and pathological differences between Crohn's disease and ulcerative colitis?

b) How should Khalil's steroid prescription be managed after surgery?

c) State four common risks for this procedure the patient should be when taking consent?

d) In UK law, what 4 four domains of capacity does a patient require to have the ability to consent ?