

A HIGH-YIELD GUIDE FOR MEDICAL STUDENTS

The Surgery Clerkship Handbook

Everything you need to look sharp on your surgery rotation:
the wards, the OR, the acute abdomen, the post-op patient,
and the questions you will be asked.

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FIRST EDITION

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The Surgery Clerkship Handbook: A High-Yield Guide for Medical Students. First Edition.

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This book is for education only. It is not medical advice.

This handbook is written for medical students as a study and orientation aid for the surgery clerkship. It is not a substitute for supervised clinical training, institutional protocols, current clinical practice guidelines, or the judgment of a licensed physician. Medicine changes; drug doses, thresholds, and management recommendations in this book reflect widely taught principles at the time of writing and may differ from your institution's protocols or from the most recent guidelines. Always verify management decisions, drug doses, and thresholds against current guidelines, your institutional resources, and your supervising physician before applying them to any patient.

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How to Use This Book

Read Part 1 before your first day. It tells you how the service runs, how to scrub, how to present, and how to look after a patient after an operation, which is most of what a student is judged on in the first week.

Read Part 2 one presentation at a time, ideally the night before you expect to see it. The acute abdomen chapter is the spine of the rotation; everything else in Part 2 hangs off it.

Read Part 3 when you are on the service, matching each chapter to the cases on your list. The emergencies chapter is the one to know cold.

Use Part 4 on the wards. The pimp questions and the quick reference are meant to be opened at the nursing station, not read cover to cover.

Use Part 5 to test yourself. Eighty board-style questions at the level of the MCCQE Part I and the USMLE Step 2 CK, each with a full explanation. Cover the answer, commit, then read.

Throughout, **pearls** are marked as short bold lines and **warnings** as blockquotes. Numbers that vary by guideline or by lab are labelled approximate. When a number matters for a patient, check it against your institution's protocol.

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Part 1: Succeeding on the Rotation

Chapter 1: The Surgery Clerkship Day

Surgery is the rotation where students feel most lost and are judged most quickly. The reason is structural. The team moves fast, the day starts before the rest of the hospital wakes up, and half the work happens in a room you have never been in. The good news is that the structure is predictable. Once you know the shape of a surgical day, you can be useful on day two.

The shape of the day

Pre-rounds (05:30 to 06:30). The junior resident and the students see every patient on the list before the team rounds. Your job is to see your patients, gather the overnight events, vitals, intake and output, drain output, labs, and the state of the wound and abdomen, and have a one-line plan ready. Two or three patients is a normal load for a student.

Rounds (06:30 to 07:15). The team walks the list. Presentations are short and structured: a sentence of who the patient is, the post-operative day, overnight events, vitals and exam, and the plan. Decisions are made in seconds. Write them down; you will be asked to carry them out.

The OR (07:30 onward). First cases start early. The student is expected to know the patient, the operation, and the relevant anatomy before scrubbing. Between cases you help turn the room over, check on ward patients, and write notes.

Clinic. One or two half days a week. New consults and post-operative follow-ups. This is where you learn the elective decisions: who gets an operation and who does not.

Consults. The surgical service is asked to see patients in the emergency department and on the medical wards. The student often sees the consult first, which is the best learning on the rotation.

Call. Overnight in most programs. Emergency department consults, sick post-operative patients, and the occasional emergency operation. Sleep when you can; nobody is impressed by a student who stays awake to look keen.

Sign-out. The day team hands the list to the night team. Listen to how the residents summarize patients; the format is the one you should copy.

What the team wants from a student

- **Know your patients better than anyone.** Vitals, drain outputs, the most recent labs, whether they passed flatus. A student who knows the numbers is trusted with more.
- **Be where the work is.** In the OR before the patient arrives. On the ward when a patient is unwell. Ask "what can I do" once, then do it.
- **Read for the case, not for the exam.** The night before, know the indication, the steps, the anatomy, and the two most common complications of tomorrow's operation.
- **Own a task to completion.** If you are asked to chase a CT result, chase it, then tell the resident what it showed. Half-done tasks are worse than none.

- **Speak up about what you do not know.** "I do not know, I will find out" is the correct answer to most questions. Guessing on the ward is dangerous; guessing in the OR is worse.

Pearl: the single most useful habit is writing a one-line problem list for every patient on the service, not just yours, and updating it at sign-out. You will be the only student who can answer a question about any patient.

The vocabulary you will hear in the first week

- **NPO:** nil per os, nothing by mouth. Ask from when: midnight, or a fixed number of hours before the operation.
- **POD:** post-operative day. The day of surgery is POD 0.
- **NG:** nasogastric tube. To decompress the stomach in obstruction or ileus, or to feed.
- **Foley:** urinary catheter. Watch the hourly output in a sick patient.
- **JP, Blake, Penrose:** drains. JP and Blake are closed suction drains; a Penrose is an open passive drain.
- **Bowel function:** flatus first, then stool. "Has he passed gas" is the most common question on post-operative rounds.
- **I and Os:** intake and output over 24 hours.
- **Ex-lap:** exploratory laparotomy. **Lap chole, lap appy:** laparoscopic cholecystectomy and appendectomy.
- **Anastomosis:** the surgical joining of two hollow structures, usually bowel.
- **Ostomy:** a bowel opening brought to the skin. Ileostomy (small bowel, liquid output, right lower quadrant), colostomy (colon, formed stool, usually left).
- **Peritonitis:** inflammation of the peritoneum; the exam finding is involuntary guarding and rebound tenderness.
- **Dehiscence:** the wound coming apart. **Evisceration:** bowel coming through the open wound. The second is an emergency.

What to carry

A pen that works, a small notebook or a phone list, trauma shears if the service allows them, a stethoscope you will rarely use, and a pocket card of the fluids, drains, and antibiotic prophylaxis tables in Chapter 23. Do not carry a textbook.

Chapter 2: Scrubbing, the OR, Instruments, and Sutures

The operating room has rules that nobody explains and everybody enforces. Learn them before your first case, and you will be allowed to do more in your second.

Before you enter

Change into hospital scrubs, put on a cap that covers all your hair, and a mask that covers your nose and mouth. Remove watches, rings, and bracelets. Eye protection is required when you scrub. Introduce yourself to the circulating nurse and the anesthesiologist by name and role, and write your name on the board if the room has one.

The sterile field, in three rules

1. Anything blue or green that is draped is sterile. Do not touch it unless you are scrubbed and gowned.
2. Below the waist, behind your back, and above the shoulders are not sterile even when you are scrubbed. Keep your hands in front of you, between chest and waist.
3. If you are not sure whether you contaminated something, say so. A new glove costs nothing. An infection costs the patient weeks.

How to scrub

Open your gown and gloves onto the sterile table with the scrub nurse's permission, or ask them to open yours. Use the scrub sink. A full scrub with a brush is used for the first case of the day in many institutions; an alcohol-based hand rub is used between cases if hands are visibly clean. Follow the posted instructions to the second; they vary by hospital. Keep your hands above your elbows so water runs from clean fingers to dirty elbows. Enter the room with hands up and dry them with the sterile towel, one hand per side, before gowning.

Gowning and gloving are done with the scrub nurse's help the first few times. Closed gloving, where your hands stay inside the gown cuffs until the gloves are on, is the standard. Once gloved, keep your hands clasped in front of you until you are needed.

Where to stand and what to do

Stand where the surgeon or the resident puts you, usually opposite the surgeon or at the foot of the table. Your jobs, in order of frequency: hold retractors exactly where they are placed and do not drift, suction where the surgeon is looking, cut sutures when asked (leave the tail the length you are told; 3 to 5 mm for most absorbable sutures, longer for silk ties), and keep the field clear of instruments. Never reach across the field or take an instrument from the tray; ask the scrub nurse.

Pearl: the best student assistant is quiet, watches the surgeon's hands, and anticipates the next retraction. The second best asks one good question per case, at a calm moment.

The instruments you will be handed

- **Scalpel:** number 10 blade for skin, 11 for stab incisions, 15 for fine work. Pass it handle first, or use a neutral zone.
- **Forceps:** DeBakey (atraumatic, used on bowel and vessels), Adson (fine, with teeth, for skin), toothed and non-toothed tissue forceps.
- **Scissors:** Metzenbaum (curved, for tissue), Mayo (heavier, for sutures and fascia), suture scissors.
- **Clamps:** hemostat (mosquito, Kelly, Crile) to control bleeding vessels; Kocher (toothed, for fascia); Allis (for grasping tissue to be removed); Babcock (atraumatic, for bowel).
- **Retractors:** Army-Navy, Richardson, Deaver, malleable, and the self-retaining Balfour and Bookwalter for laparotomy.
- **Needle driver:** holds the needle at two thirds of the way from its tip.
- **Electrocautery:** monopolar (the "Bovie", needs a grounding pad, cut and coagulate modes) and bipolar (current passes between the two tips, safer near nerves and in the hand).
- **Staplers:** linear cutting staplers for bowel division and anastomosis, circular staplers for low anastomoses, skin staplers for closure.
- **Laparoscopic set:** trocars, a 5 mm or 10 mm camera, graspers, hook cautery, clip applier, and the insufflator that keeps the abdomen at about 12 to 15 mmHg of carbon dioxide.

Sutures in one page

Sutures are described by material, absorbability, structure, and size.

- **Absorbable:** plain and chromic gut (fast), polyglactin (Vicryl, absorbed over about two to three months, the workhorse for subcutaneous tissue, bowel, and fascia in some hands), polydioxanone (PDS, monofilament, holds strength for months, used for fascia), poliglecaprone (Monocryl, monofilament, fast, used for subcuticular skin closure).
- **Non-absorbable:** silk (braided, handles well, ties vessels and drains), nylon (monofilament, skin), polypropylene (Prolene, monofilament, vascular anastomoses and hernia mesh), polyester (braided, strong).
- **Size:** the more zeros, the finer. 0 and 1 for fascia; 2-0 and 3-0 for bowel and subcutaneous tissue; 4-0 and 5-0 for skin and small vessels; 6-0 and finer for microvascular and facial work.
- **Needle:** cutting needles for skin, taper needles for bowel and vessels.

Knots: learn the two-handed tie, then the one-handed tie, then the instrument tie, before your first case. Practise on a shoelace. A square knot with three throws is the default; monofilament needs more throws.

Skin closure: interrupted or running sutures, staples, or a subcuticular running suture with adhesive strips. Ask the surgeon which they want before you start.

Laparoscopy basics you will be asked about

Carbon dioxide is used because it is non-flammable and rapidly absorbed. Insufflation pressure of about 12 to 15 mmHg raises intra-abdominal pressure, which reduces venous return and can cause hypercapnia; the anesthesiologist adjusts ventilation. Entry is by open (Hasson) technique or a Veress needle. The camera is held by the student in many cases: keep the horizon level, keep the target in the centre, and follow the instruments, not the anatomy.

OR etiquette that matters

Do not lean on the patient. Do not talk while the surgeon is concentrating on a critical step. Tell the circulating nurse if you feel faint, and step back from the field before you fall; it happens to everyone once. Say thank you to the scrub nurse at the end. Ask the surgeon one question after the case, not during the closure.

Chapter 3: Presenting a Surgical Patient

A surgical presentation is shorter than a medical one and has a different centre of gravity. Medicine asks what the diagnosis is. Surgery asks whether this patient needs an operation, and when.

The new patient or consult

Ninety seconds, in this order:

1. **One-line summary.** Age, sex, relevant background, presenting complaint, duration. "A 58-year-old man with a history of diverticulosis presenting with 36 hours of left lower quadrant pain and fever."
2. **History that matters.** Onset, character, location, radiation, associated symptoms (nausea, vomiting, last bowel movement, flatus, fever), and the surgical history, including every previous abdominal operation. Anticoagulants and antiplatelets. Allergies. Last oral intake.
3. **Examination that matters.** Vitals with a comment on whether they are stable. The abdomen: distension, scars, tenderness by quadrant, guarding, rebound, bowel sounds, hernial orifices, and the rectal examination when indicated. The relevant systemic findings only.
4. **Investigations.** White cell count, hemoglobin, creatinine, lactate, lipase, liver enzymes, and the imaging with the finding that matters.
5. **Assessment.** The working diagnosis and two alternatives. Say what you think it is.
6. **Plan.** Resuscitation, analgesia, antibiotics if indicated, imaging if not yet done, NPO status, and the operative decision: operate now, operate soon, observe, or discharge with follow-up.

Pearl: end with a question you cannot answer. "I was not sure whether the CT finding of free fluid changes the timing." That shows you thought about it.

The post-operative patient on rounds

Thirty seconds:

"Mr. Lee, 64, POD 2 after a laparoscopic right hemicolectomy for cancer. Overnight: afebrile, one episode of nausea, no vomiting. Vitals stable, heart rate 84. Passing flatus, no stool. Tolerating clear fluids. Abdomen soft, mildly tender at the port sites, no distension. JP drain 40 mL serous. Urine output adequate. Hemoglobin 112, stable. Plan: advance to full fluids, mobilize, remove Foley, continue prophylactic heparin, check electrolytes tomorrow."

The order is fixed: identity and operation, post-operative day, events, vitals, function (bowel, diet, mobility), examination, tubes and drains, labs, plan.

Writing the note

The daily surgical note is short and structured. Subjective (events, pain, bowel function, diet), objective (vitals, exam, drains and tubes with outputs, labs), assessment (post-operative day and course), plan (diet, activity, lines, drugs, disposition). Sign with your name and role and have the resident co-sign.

Answering questions on rounds

Be brief and be honest. If you are asked a number you do not know, say you will check and come back with it before the team leaves the floor. If you are asked a management question, give your best answer and your reasoning in one sentence. The team is testing whether you think, not whether you have memorized.

Chapter 4: Pre-operative Assessment and Consent

The pre-operative assessment answers two questions. Does this patient need this operation, and can this patient tolerate it?

History and examination

- **The indication.** Restate it in one sentence. An operation without a clear indication should not happen.
- **Cardiopulmonary reserve.** Functional capacity is the single most useful question: can the patient climb two flights of stairs or walk four blocks without stopping? That corresponds to roughly four metabolic equivalents and predicts tolerance of most operations. Ask about angina, heart failure, prior infarction, stents, and arrhythmias.
- **Airway and anesthesia history.** Previous anesthetics, difficult intubation, family history of malignant hyperthermia, obstructive sleep apnea.
- **Medications.** Anticoagulants and antiplatelets (when to hold, whether bridging is needed), diabetes agents, steroids (stress dosing), and herbal supplements that affect bleeding.
- **Allergies,** including reactions to antibiotics and latex.
- **Bleeding history** and previous transfusions.
- **Smoking, alcohol, and substance use.** Smoking cessation even four weeks before surgery improves wound and pulmonary outcomes.
- **Pregnancy** in any patient who could be pregnant.
- **Nutrition.** Recent weight loss, albumin, and the ability to eat matter for wound healing and anastomotic integrity.

Risk stratification

The American Society of Anesthesiologists physical status class is used everywhere: class 1 is a healthy patient, class 2 has mild systemic disease, class 3 has severe systemic disease, class 4 has severe disease that is a constant threat to life, class 5 is a moribund patient not expected to survive without the operation, and class 6 is a brain-dead organ donor. Add E for emergency.

Cardiac risk is estimated with a clinical index such as the Revised Cardiac Risk Index (high-risk surgery, ischemic heart disease, heart failure, cerebrovascular disease, insulin-treated diabetes, creatinine above about 177 micromoles per litre), combined with functional capacity. A patient with poor functional capacity and multiple risk factors having a major operation may need cardiology assessment before an elective case; an emergency operation proceeds regardless.

Investigations, only when they change management

Routine testing of every patient is not recommended. Order what the patient and the operation require: a complete blood count for any major operation, electrolytes and creatinine for patients with renal disease or on relevant drugs, a coagulation profile for anticoagulated patients or a bleeding history, a type and screen or crossmatch for operations with expected blood loss, an ECG for patients with cardiac risk factors or over a locally defined age, a chest radiograph only for active pulmonary disease, and a pregnancy test where relevant. Glucose and hemoglobin A1c for diabetic patients.

Preparation

- **Fasting.** Typical rules are clear fluids until two hours before, light meals until six hours before, and a full meal until eight hours before; institutions vary.
- **Antibiotic prophylaxis.** A single dose within 60 minutes before incision for clean-contaminated operations (bowel, biliary, urologic, gynecologic) and for clean operations with an implant. Cefazolin is the usual agent; add anaerobic cover for colorectal surgery. Redose for long operations and large blood loss.
- **Venous thromboembolism prophylaxis.** Mechanical devices and low-molecular-weight or unfractionated heparin for most inpatients having major surgery, risk-stratified with a tool such as the Caprini score.
- **Bowel preparation.** Mechanical preparation with oral antibiotics before elective colorectal surgery in most current protocols; ask what your service does.
- **Glucose control** and **steroid stress dosing** where relevant.
- **Marking the site** and the team **time-out** before incision: patient, procedure, side, allergies, antibiotics, expected blood loss, concerns.

Consent

Consent is the surgeon's responsibility, but the student should understand what it contains and will often witness it. Valid consent requires capacity, disclosure, voluntariness, and understanding. Disclosure means the diagnosis, the proposed operation in plain language, the material risks (the common ones and the serious ones, including the ones this particular patient would want to know), the benefits, the alternatives including no treatment, and what happens if the patient declines. Document the discussion. In an emergency where the patient lacks capacity and no substitute decision-maker is available, treatment proceeds in the patient's best interest.

Pearl: if a patient asks you a consent question, the correct answer is to bring the surgeon back. Do not answer risk questions yourself.

Chapter 5: Post-operative Care: Fluids, Pain, Tubes, Drains, and Fever

Most of the surgical clerkship is post-operative care, and most of post-operative care is a small number of decisions made every day.

The post-operative order set

Diet, activity, vitals frequency, intravenous fluids, analgesia, antiemetics, venous thromboembolism prophylaxis, antibiotics if continuing, home medications to resume, glucose monitoring, drains and tubes with instructions, wound care, laboratory tests for the morning, and the parameters that should trigger a call to the resident.

Fluids

Maintenance requirement in an adult is about 25 to 30 mL per kilogram per day of water, with about 1 mmol per kilogram of sodium and potassium; a common shortcut for hourly rates is the 4-2-1 rule (4 mL per kilogram per hour for the first 10 kg, 2 for the next 10, 1 for each kilogram after). Balanced crystalloid (Ringer's lactate or a similar solution) is preferred to normal saline for most patients because large volumes of saline cause hyperchloremic acidosis.

Losses beyond maintenance are replaced according to their source: nasogastric output and vomiting lose acid and chloride and are replaced with saline plus potassium; diarrhea and ileostomy output are replaced with balanced crystalloid; third-space losses after major abdominal surgery are the reason a patient may need more than maintenance for the first 24 to 48 hours.

The best measure of adequate resuscitation on the ward is urine output of at least 0.5 mL per kilogram per hour. A patient who is tachycardic, oliguric, and has a rising creatinine is under-resuscitated until proven otherwise; a patient with crackles, edema, and a positive fluid balance of several litres is over-resuscitated. Both are common, and the daily weight and the fluid balance sheet tell you which.

Pearl: stop maintenance fluids as soon as the patient is drinking. Intravenous fluids running into a patient who is eating breakfast are a common cause of edema and ileus.

Pain

Multimodal analgesia is the standard: scheduled acetaminophen, a non-steroidal anti-inflammatory drug when renal function and bleeding risk allow, and opioids for breakthrough pain rather than as the foundation. Patient-controlled analgesia after major open surgery; epidural analgesia for large laparotomies and thoracotomies where available; regional blocks and local anesthetic infiltration for many operations. Assess pain on every round. Under-treated pain causes splinting, atelectasis, and immobility. Over-treated pain causes sedation, respiratory depression, ileus, and urinary retention.

Diet and bowel function

After most abdominal operations, early feeding is safe and shortens ileus. Clear fluids the day of or the day after surgery, advancing as tolerated. A patient who is nauseated, distended, and not passing flatus has an ileus and needs the diet held, fluids continued, and, if vomiting, a nasogastric tube. Chewing gum, mobilization, minimizing opioids, and correcting potassium and magnesium all help. Ileus that persists beyond about five days, or the return of vomiting after bowel function had returned, raises the question of mechanical obstruction or an intra-abdominal problem.

Tubes and drains

- **Nasogastric tube.** Decompresses the stomach. Record the output; replace it with fluid. Remove when output falls and bowel function returns. Do not place one routinely after elective bowel surgery.
- **Urinary catheter.** Remove as early as possible, usually POD 1 to 2, to reduce infection. Watch for retention after removal, particularly in older men and after pelvic surgery.
- **Closed suction drains.** Placed near an anastomosis, a dissected bed, or a fluid collection. Record the volume and character every shift. Serous fluid that falls in volume is expected. Feculent, bilious, or purulent output, or output that rises, needs the resident's attention. Drains come out when the output is low and the character is clean; the surgeon decides.
- **Chest tubes.** Water seal with or without suction; watch for an air leak and the daily output; remove when the lung is up and the output is low.
- **Ostomies.** A new ileostomy starts producing within a day or two; high output (more than about 1.5 litres a day) causes dehydration and needs treatment. Check the stoma colour on every round: pink and moist is healthy, dusky or black means ischemia and needs the surgeon now.

The post-operative fever, by day

The mnemonic of the five Ws is old but useful: wind, water, wound, walking, wonder drugs.

- **POD 0 to 1.** Atelectasis is the traditional explanation, though the evidence is weak; the important early fevers are necrotizing soft tissue infection of the wound (rare, rapid, look at the wound), a transfusion reaction, malignant hyperthermia, and an anastomotic or bowel injury declaring early.
- **POD 2 to 3.** Pneumonia, urinary tract infection (especially with a catheter), intravenous line infection.
- **POD 3 to 5.** Wound infection; anastomotic leak begins to declare itself, often with tachycardia, ileus, and pain out of proportion before the fever.
- **POD 5 to 7.** Anastomotic leak, intra-abdominal abscess, deep venous thrombosis and pulmonary embolism.
- **Any day.** Drug fever, Clostridioides difficile colitis after antibiotics, and the fever that has no source and needs a full examination and a chest radiograph, urine and blood cultures, and, if the abdomen is the suspect, a CT with contrast.

Pearl: the sickest post-operative patients are the ones with a rising heart rate and a normal temperature. Tachycardia is the earliest sign of a leak, a bleed, and a pulmonary embolus.

Prophylaxis that continues after the operation

Venous thromboembolism prophylaxis until mobile, or extended for four weeks after major cancer and pelvic surgery. Stress ulcer prophylaxis only for patients with risk factors (mechanical ventilation, coagulopathy, prior bleeding). Early mobilization on POD 0 or 1 for almost everyone. Incentive spirometry and chest physiotherapy after upper abdominal and thoracic surgery. Glucose kept in a moderate range.

Discharge

The patient goes home when pain is controlled on oral medication, diet is tolerated, bowel function has returned or is expected to, the wound is clean, mobility is safe, and the plan for drains, staples, and follow-up is written down. Give clear return precautions: fever, worsening pain, vomiting, wound redness or discharge, calf pain, or shortness of breath.

Key Points

- The surgical day runs from pre-rounds at dawn through the OR, clinic, consults, and sign-out; know the shape and be where the work is.
- The sterile field has three rules; if you doubt whether you contaminated something, say so.
- A surgical presentation asks whether the patient needs an operation and when; ninety seconds for a consult, thirty for a post-operative patient.
- Pre-operative assessment is the indication plus functional capacity plus medications; order tests that change management.
- Post-operative care is fluids, pain, diet, tubes, drains, prophylaxis, and the fever by day; a rising heart rate with a normal temperature is the sign to fear.

Part 2: Approaching the Common Presentations

Chapter 6: The Acute Abdomen

The acute abdomen is the spine of the surgery clerkship. Every other presentation in this part is a branch of it. The question is never "what is the diagnosis" first; it is "does this patient need an operation, and how soon". Learn to answer that in the first five minutes, then refine the diagnosis.

The first five minutes

Look at the patient before you touch them. A patient lying still with knees drawn up has peritonitis until proven otherwise. A patient writhing and unable to find a comfortable position has colic (ureteric, biliary, or bowel). A patient who is grey, sweating, and hypotensive has a surgical catastrophe (ruptured aneurysm, perforated viscus with sepsis, mesenteric ischemia, ruptured ectopic pregnancy) and needs resuscitation running before the history is complete.

Vitals, then the abdomen. Heart rate over 100, temperature over 38, or a systolic pressure under 100 changes the tempo of everything that follows.

History

- **Pain.** Onset (sudden to the minute suggests perforation, rupture, or torsion; gradual over hours suggests inflammation; colicky suggests obstruction of a hollow tube), location and migration (periumbilical to right lower quadrant is appendicitis; epigastric to the back is pancreatitis), character, radiation, severity, and what makes it better or worse (peritonitis hurts with movement; colic does not settle with position).
- **Vomiting.** Its relationship to pain (pain first then vomiting is surgical; vomiting first is more often medical), content (bilious means distal to the ampulla; feculent means distal obstruction), and frequency.
- **Bowels.** Last bowel movement and last flatus. Absolute constipation (no stool and no flatus) is the hallmark of complete obstruction. Diarrhea points away from obstruction but does not exclude appendicitis or ischemia.
- **Associated symptoms.** Fever, anorexia (almost universal in appendicitis), jaundice, urinary symptoms, vaginal bleeding, and the last menstrual period in every woman of reproductive age.
- **Past history.** Previous abdominal operations (adhesions), known hernias, gallstones, diverticular disease, inflammatory bowel disease, peptic ulcer, atrial fibrillation (emboli to the mesenteric vessels), and vascular disease.
- **Medications.** Steroids and immunosuppressants blunt the signs of peritonitis. Non-steroidal anti-inflammatory drugs and anticoagulants matter. Opioids may mask pain.

Examination

Expose the abdomen from nipples to knees. Inspect for distension, scars, visible peristalsis, discolouration, and hernias. Ask the patient to cough and to point to where it hurts before you touch.

Palpate gently, starting away from the pain.

- **Tenderness** localizes the process.
- **Guarding** is contraction of the abdominal wall over the inflamed area. Voluntary guarding is the patient tensing; involuntary guarding (rigidity) is a reflex and means peritonitis.
- **Rebound tenderness** and, more reliably, pain on percussion or on coughing mean peritoneal irritation.
- **Bowel sounds** are high-pitched and tinkling in early obstruction and absent in ileus and late peritonitis. They are the least reliable sign.
- **Special signs.** Murphy's (inspiratory arrest on right upper quadrant palpation, cholecystitis), McBurney's point tenderness, Rovsing's (right lower quadrant pain on left-sided palpation), psoas and obturator signs (retrocecal and pelvic appendicitis), Cullen's and Grey Turner's (retroperitoneal hemorrhage, seen late in severe pancreatitis).
- **Hernial orifices**, both groins, every time.
- **Rectal examination** when the differential includes obstruction, bleeding, pelvic abscess, or prostatic disease.
- **Pelvic examination** in women when the differential includes gynecological causes.

Investigations

- **Bloods.** Complete blood count, electrolytes, creatinine, glucose, liver enzymes, lipase, lactate, coagulation, group and screen, and a beta-hCG in every woman of reproductive age. A normal white cell count does not exclude appendicitis or perforation. A raised lactate means hypoperfusion or ischemia until proven otherwise.
- **Urinalysis** for infection and blood.
- **Upright chest radiograph** for free air under the diaphragm (present in about three quarters of perforated viscera; its absence does not exclude perforation).
- **Abdominal radiographs** for dilated bowel loops and air-fluid levels in obstruction; largely replaced by CT.
- **Ultrasound** first for right upper quadrant pain (gallstones, wall thickening, pericholecystic fluid), for pelvic pain in women, in pregnancy, in children with suspected appendicitis, and for the aorta at the bedside in a hypotensive older patient.
- **CT of the abdomen and pelvis with intravenous contrast** is the workhorse for the undifferentiated acute abdomen in an adult: appendicitis, diverticulitis, obstruction with its transition point, perforation, abscess, ischemia (with CT angiography), and pancreatitis complications.

Pearl: do not send an unstable patient to the scanner. Resuscitate, involve the senior, and take them to the operating room if the diagnosis is clear enough.

The differential by region

Region	Think first	Then
Right upper quadrant	Biliary colic, cholecystitis, cholangitis	Hepatitis, liver abscess, right lower lobe pneumonia, perforated duodenal ulcer, pyelonephritis
Epigastrium	Pancreatitis, peptic ulcer, perforated ulcer	Myocardial infarction, gastritis, early appendicitis, aortic aneurysm
Left upper quadrant	Splenic pathology, pancreatitis	Gastric ulcer, pneumonia, renal colic
Right lower quadrant	Appendicitis	Ectopic pregnancy, ovarian torsion or cyst, Crohn's disease, mesenteric adenitis, cecal diverticulitis, renal colic, testicular torsion (examine the scrotum)
Left lower quadrant	Diverticulitis	Ectopic pregnancy, ovarian pathology, colitis, renal colic
Central and diffuse	Obstruction, early appendicitis, gastroenteritis	Mesenteric ischemia (pain out of proportion), ruptured aneurysm, perforation with generalized peritonitis, diabetic ketoacidosis
Suprapubic	Urinary retention, cystitis	Pelvic inflammatory disease, ectopic pregnancy

Non-surgical causes that mimic the acute abdomen

Inferior myocardial infarction, lower lobe pneumonia, diabetic ketoacidosis, sickle cell crisis, porphyria, hypercalcemia, adrenal insufficiency, herpes zoster before the rash, and the abdominal wall hematoma in an anticoagulated patient. Ask about them when the abdomen does not fit.

The decision

- **Operate now:** generalized peritonitis, free air with peritonitis, hemodynamic instability with a surgical cause, strangulated hernia or bowel, mesenteric ischemia, ruptured aneurysm, ruptured ectopic pregnancy.
- **Operate soon, after resuscitation and imaging:** appendicitis, cholecystitis in a fit patient, complete obstruction that does not resolve, perforated diverticulitis with abscess not amenable to drainage.
- **Observe and reassess:** early or uncertain presentations, partial adhesive obstruction, uncomplicated diverticulitis, pancreatitis. Serial examination by the same examiner is a legitimate and powerful test. Keep the patient NPO with fluids and analgesia running. Analgesia does not mask peritonitis; give it.
- **Discharge with a plan:** non-specific abdominal pain with normal findings and a clear return plan.

Warning: the three diagnoses that kill quietly are mesenteric ischemia (pain out of proportion to the examination, atrial fibrillation, raised lactate), ruptured abdominal aortic aneurysm (older patient, back

or flank pain, hypotension, a pulsatile mass you may not feel), and ectopic pregnancy (any woman of reproductive age with abdominal pain and no pregnancy test yet). Ask about each one every time.

Chapter 7: Right Upper Quadrant Pain and Biliary Disease

Gallstones are present in about 10 to 15 percent of adults, most never cause symptoms, and the ones that do produce a spectrum of illness from a few hours of pain to a life-threatening infection. The clinical task is to place the patient on that spectrum.

Anatomy in four lines

The gallbladder sits under the liver and drains through the cystic duct into the common bile duct, which is joined by the pancreatic duct at the ampulla of Vater. The cystic artery arises from the right hepatic artery and runs in the triangle of Calot (bounded by the cystic duct, the common hepatic duct, and the inferior liver edge). The critical view of safety in a laparoscopic cholecystectomy means the triangle is cleared of fat, the lower third of the gallbladder is separated from the liver bed, and only two structures enter the gallbladder: the cystic duct and the cystic artery. That is what prevents bile duct injury.

The spectrum

Condition	What is happening	Clinical picture	Key test	Management
Biliary colic	Transient cystic duct obstruction by a stone	Right upper quadrant or epigastric pain, often after a fatty meal, lasting under 6 hours, resolves; no fever, normal bloods	Ultrasound: stones, no wall thickening	Analgesia; elective laparoscopic cholecystectomy
Acute cholecystitis	Persistent cystic duct obstruction with gallbladder inflammation	Pain over 6 hours, fever, Murphy's sign, raised white cells; liver enzymes mildly raised or normal	Ultrasound: stones, wall thickening over about 4 mm, pericholecystic fluid, sonographic Murphy's	NPO, fluids, analgesia, antibiotics; cholecystectomy during the same admission (ideally within 72 hours); percutaneous cholecystostomy in patients too sick to operate
Choledocholithiasis	Stone in the common bile duct	Colicky pain, jaundice, pale stool, dark urine; raised bilirubin, alkaline phosphatase, and gamma-glutamyl transferase	Ultrasound shows a dilated duct (over about 6 mm) and sometimes the stone; MRCP or endoscopic ultrasound if unsure	ERCP with sphincterotomy and stone extraction, then cholecystectomy; or cholecystectomy with bile duct exploration
Acute cholangitis	Infection of an obstructed biliary tree	Charcot's triad: fever, jaundice, right upper quadrant pain; Reynolds' pentad adds hypotension and confusion	Bloods, ultrasound or CT; blood cultures	Resuscitation, intravenous antibiotics, and urgent biliary decompression (ERCP first choice)
Gallstone pancreatitis	Stone transiently obstructs the ampulla	Epigastric pain to the back, vomiting, lipase over three times normal	Lipase, ultrasound for stones, liver enzymes	Supportive care; ERCP only if cholangitis or persistent obstruction; cholecystectomy on the same admission once pancreatitis settles in mild disease
Gallstone ileus	Large stone erodes into the	Small bowel obstruction in an	CT: pneumobilia, obstruction, ectopic	Enterolithotomy

Condition	What is happening	Clinical picture	Key test	Management
	duodenum and obstructs the terminal ileum	older patient	stone (Rigler's triad)	

Acalculous cholecystitis

Occurs in critically ill, fasting, or parenterally fed patients without stones. Suspect it in an intensive care patient with unexplained sepsis. Ultrasound shows a thick wall without stones. Treated with antibiotics and cholecystostomy or cholecystectomy.

Investigations that matter

Liver enzymes tell you which pattern you are in. Alanine and aspartate transaminases rise most in hepatocellular injury; alkaline phosphatase and gamma-glutamyl transferase rise most in obstruction; bilirubin rises with obstruction of the common duct. Lipase separates pancreatitis. Ultrasound is the first imaging test for right upper quadrant pain: it finds stones with high sensitivity, measures the duct, and looks at the gallbladder wall. CT is better for complications (perforation, abscess, gangrene) and for the pancreas. MRCP maps the duct without intervention; ERCP treats what it finds and carries a pancreatitis risk of a few percent.

Laparoscopic cholecystectomy: what a student should know

Indications: symptomatic gallstones, cholecystitis, gallstone pancreatitis after recovery, choledocholithiasis after clearance, gallbladder polyps over about 1 cm, and porcelain gallbladder. Asymptomatic stones are usually left alone.

Steps: pneumoperitoneum, four ports, retract the fundus over the liver, dissect the triangle of Calot to the critical view of safety, clip and divide the cystic artery and cystic duct, dissect the gallbladder off the liver bed, retrieve it in a bag. Conversion to open occurs in a few percent for dense inflammation, unclear anatomy, or bleeding.

Complications to know: bile duct injury (the one that matters, about 0.3 to 0.5 percent), bile leak from the cystic duct stump or a duct of Luschka, retained stone, bleeding, port-site hernia, and post-cholecystectomy diarrhea.

Pearl: a patient who is unwell, jaundiced, or has bile in the drain after cholecystectomy has a bile duct injury or leak until proven otherwise; get the liver enzymes, an ultrasound, and the surgeon.

Chapter 8: Right Lower Quadrant Pain and Appendicitis

Appendicitis is the most common surgical emergency of the abdomen and the diagnosis a student will be asked about most. The classic story is recognizable, the atypical story is common, and the cost of a missed perforation is high.

The story

Vague periumbilical pain (visceral, from distension of the appendix) that migrates over 12 to 24 hours to the right lower quadrant (somatic, from parietal peritoneal irritation), with anorexia, nausea, low-grade fever, and one or two episodes of vomiting after the pain. Pain on walking or coughing. In the classic case the patient is quiet, flexes the right hip, and is tender at McBurney's point, one third of the way from the anterior superior iliac spine to the umbilicus.

The atypical stories: retrocecal appendicitis with flank or psoas pain and little anterior tenderness; pelvic appendicitis with suprapubic pain, diarrhea, and urinary frequency; appendicitis in pregnancy with the pain higher and more lateral; appendicitis in the elderly and the immunosuppressed with minimal signs and a high perforation rate; appendicitis in children with a shorter history and earlier perforation.

Differential

Mesenteric adenitis in children, Meckel's diverticulitis, terminal ileitis (Crohn's or Yersinia), cecal diverticulitis, right-sided colitis, ovarian cyst rupture or torsion, ectopic pregnancy, pelvic inflammatory disease, endometriosis, renal colic, pyelonephritis, testicular torsion, and inguinal hernia. Examine the scrotum in men and do a pregnancy test in women; those two steps are the ones most often skipped.

Scoring and imaging

The Alvarado score (migration, anorexia, nausea, right lower quadrant tenderness, rebound, fever, leukocytosis, left shift) stratifies probability but does not replace imaging in adults. Ultrasound is the first test in children and pregnancy (a non-compressible appendix over about 6 mm). CT with contrast is the standard in adults: a dilated appendix with wall thickening, periappendiceal fat stranding, and sometimes an appendicolith; it also identifies abscess, perforation, and the alternative diagnoses. MRI is used in pregnancy when ultrasound is inconclusive.

Management

- **Uncomplicated appendicitis:** NPO, intravenous fluids, analgesia, a single pre-operative antibiotic dose covering gram-negatives and anaerobes, and laparoscopic appendectomy, usually within 24 hours of diagnosis. Antibiotics alone are an option in selected adults with uncomplicated disease and no appendicolith, with a recurrence rate that approaches a third over a few years; the decision belongs to the surgeon and the patient.

- **Perforated appendicitis with generalized peritonitis:** resuscitation, antibiotics, urgent operation.
- **Perforated appendicitis with a contained abscess or phlegmon:** intravenous antibiotics, percutaneous drainage of a drainable abscess, and either delayed (interval) appendectomy after six to eight weeks or colonoscopy in older patients to exclude a cecal cancer masquerading as an abscess.
- **A normal appendix at operation:** remove it anyway in most practices and look for the alternative cause (Meckel's diverticulum, terminal ileum, ovaries).

Complications

Wound infection, intra-abdominal abscess (fever and ileus around POD 5 to 7), stump leak, ileus, and, later, small bowel obstruction from adhesions.

Pearl: the appendix perforates in roughly one in five adults and more often in children and the elderly, and the risk rises with time from symptom onset. A patient with 48 hours of pain and a rigid abdomen has perforated until proven otherwise.

Chapter 9: Bowel Obstruction and Hernias

Obstruction is the presentation where the clerkship's two questions separate cleanly: where is the block, and is the bowel alive?

Small bowel obstruction

Causes, in order in the Western world: adhesions from previous surgery (the majority), hernias (the most common cause in a patient who has never had an operation), and malignancy. Then Crohn's strictures, intussusception, gallstone ileus, volvulus, and foreign bodies.

Presentation. Colicky central abdominal pain in waves every few minutes, vomiting (early and bilious in proximal obstruction, late and feculent in distal), distension (more with distal obstruction), and absolute constipation (late). Bowel sounds are high-pitched early and quiet late. Look for scars and examine every hernial orifice.

Investigations. Bloods including lactate and electrolytes (vomiting causes hypokalemic, hypochloremic metabolic alkalosis). Abdominal radiographs show dilated small bowel loops (over about 3 cm) with air-fluid levels and little colonic gas. CT with contrast confirms the diagnosis, shows the transition point, and identifies the signs of ischemia: thickened bowel wall, reduced wall enhancement, mesenteric edema, free fluid, pneumatosis, and portal venous gas. A closed loop obstruction (a segment obstructed at both ends, as in a volvulus or an internal hernia) is a surgical emergency because it strangulates early.

Management. Resuscitation with intravenous fluids and correction of potassium; NPO; a nasogastric tube to decompress the stomach and relieve vomiting; analgesia; and a Foley catheter to monitor output. Adhesive small bowel obstruction without signs of strangulation is managed non-operatively for 48 to 72 hours in most cases, often with a water-soluble contrast challenge: if contrast reaches the colon within about 8 to 24 hours, the obstruction is likely to resolve; if not, the patient needs an operation. Any obstruction with signs of strangulation (fever, tachycardia, peritonitis, rising lactate, CT signs of ischemia) or a complete closed loop goes to the operating room. Obstruction in a patient with no previous surgery and no hernia needs an explanation, and that explanation is often a tumour.

Warning: the four signs of strangulation are fever, tachycardia, peritonitis, and a rising white cell count or lactate. Any one of them ends the period of observation.

Large bowel obstruction

Causes. Colorectal cancer (the majority), volvulus (sigmoid in older institutionalized patients, cecal in younger patients), and diverticular stricture. Pseudo-obstruction (Ogilvie syndrome) mimics it in sick, immobile, or recently operated patients.

Presentation. Gradual distension, crampy pain, absolute constipation, and vomiting that comes late. A history of change in bowel habit or rectal bleeding points to cancer.

The ileocecal valve. If it is competent, the colon becomes a closed loop and the cecum distends; a cecal diameter over about 10 to 12 cm on imaging carries a high risk of perforation. If the valve is incompetent, the small bowel distends too and the picture is less urgent.

Investigations. CT with contrast shows the level and the cause. A water-soluble contrast enema is used in some centres to distinguish mechanical obstruction from pseudo-obstruction.

Management. Resuscitation and decompression as for small bowel obstruction. Sigmoid volvulus is decompressed endoscopically with a flexible sigmoidoscope and a rectal tube, then resected electively during the same admission because recurrence is common; cecal volvulus needs an operation. Obstructing cancer is managed with resection (with or without a primary anastomosis, often with a stoma) or with an endoscopic stent as a bridge to surgery or as palliation. Pseudo-obstruction is treated by correcting electrolytes and stopping opioids and anticholinergics, then neostigmine or colonoscopic decompression if the cecum is dangerously distended.

Hernias

A hernia is a protrusion of a viscus or part of it through the wall of the cavity that contains it. The vocabulary: **reducible** (goes back), **irreducible or incarcerated** (does not), **obstructed** (bowel within it is blocked), **strangulated** (the blood supply is compromised; the hernia is tense, tender, and the patient is unwell). Strangulation is the emergency.

Inguinal hernia is the most common. Indirect hernias pass through the deep ring, lateral to the inferior epigastric vessels, and follow the cord; they are congenital in origin and can descend into the scrotum. Direct hernias push through the posterior wall of the canal (Hesselbach's triangle), medial to the inferior epigastric vessels, and rarely reach the scrotum. The distinction matters less than the repair, which is a mesh repair, open (Lichtenstein) or laparoscopic, for symptomatic hernias; watchful waiting is acceptable in asymptomatic men.

Femoral hernia passes below the inguinal ligament, medial to the femoral vein, through the femoral canal. More common in women, and far more likely to strangulate because the neck is narrow, so it is repaired when found.

Umbilical and paraumbilical hernias in adults are repaired if symptomatic or if the neck is narrow.

Incisional hernias follow previous operations and are repaired with mesh, often laparoscopically.

Epigastric, Spigelian, obturator (older women, pain on the medial thigh, the Howship-Romberg sign), and **parastomal** hernias round out the list.

Examination. Stand the patient up. Look, then ask them to cough. Feel for the cough impulse. Try to reduce the hernia gently with the patient lying down. Never try to reduce a hernia that is tender, discoloured, or associated with obstruction; that is a strangulated hernia and reducing it puts dead bowel back into the abdomen.

Pearl: examine the groins of every patient with a bowel obstruction. A small femoral hernia in an older woman is the diagnosis that gets missed.

Key Points

- The acute abdomen is a decision about the operation before it is a diagnosis; unstable patients do not go to the scanner.
- Mesenteric ischemia, ruptured aneurysm, and ectopic pregnancy are the quiet killers; ask about each every time.
- Biliary disease is a spectrum from colic to cholangitis; liver enzymes tell you the pattern and ultrasound is the first test.
- Appendicitis migrates from the periumbilical region to the right lower quadrant; the elderly, the immunosuppressed, and the pregnant present atypically and perforate more.
- Small bowel obstruction is adhesions until proven otherwise, and the four signs of strangulation end the period of observation.
- Every bowel obstruction gets a groin examination; a femoral hernia is the one that gets missed.

Chapter 10: Gastrointestinal Bleeding

Gastrointestinal bleeding is common, frightening, and mostly manageable if you do three things in the right order: resuscitate, locate, and stop it.

First, how sick is the patient

Heart rate, blood pressure, and postural drop tell you the volume lost before the hemoglobin does, because the hemoglobin lags by hours. A resting tachycardia means roughly 15 percent loss; hypotension means 30 percent or more. Two large-bore intravenous lines, bloods including a crossmatch, and fluid or blood as the numbers dictate. Transfuse to a hemoglobin of about 70 g/L in most patients and higher (about 80) in those with cardiac disease. Correct coagulopathy. Reverse anticoagulants when the bleeding is life-threatening.

Upper or lower

The ligament of Treitz divides them. Hematemesis (fresh blood or coffee grounds) is upper. Melena (black, tarry, sticky, foul) is almost always upper, or occasionally right colonic with slow transit. Hematochezia (fresh red blood per rectum) is usually lower, but a brisk upper bleed can present with red blood and instability; a nasogastric aspirate with blood confirms an upper source, though a clear aspirate does not exclude a duodenal one. A raised urea out of proportion to creatinine suggests an upper source (digested blood protein).

Upper gastrointestinal bleeding

Causes. Peptic ulcer disease (the most common), erosive gastritis and esophagitis, esophageal and gastric varices, Mallory-Weiss tear (after retching), malignancy, angiodysplasia, Dieulafoy lesion, and aortoenteric fistula in a patient with a previous aortic graft.

History. Non-steroidal anti-inflammatory drugs, aspirin, anticoagulants, alcohol, liver disease, previous ulcer or *Helicobacter pylori*, weight loss, retching before the bleed, and a previous aortic operation.

Management. Resuscitate. Start an intravenous proton pump inhibitor. If varices are suspected (known cirrhosis, stigmata of liver disease), add a vasoactive drug such as octreotide, prophylactic antibiotics, and arrange urgent endoscopy. Endoscopy within 24 hours for most patients and sooner for the unstable: it makes the diagnosis and treats the bleeding with clips, injection, and thermal coagulation for ulcers, and banding for varices. Risk scores (the Glasgow-Blatchford score before endoscopy, the Rockall score after) guide disposition. Surgery is reserved for bleeding that cannot be controlled endoscopically or by interventional radiology (angiographic embolization), and for perforation.

The ulcer that bleeds. Posterior duodenal ulcers erode the gastroduodenal artery. Endoscopic stigmata predict rebleeding: active spurting and a visible vessel are high risk, an adherent clot is intermediate, and a clean base is low. After the acute episode, test and treat *Helicobacter pylori*, stop the offending drug, and continue the proton pump inhibitor.

Lower gastrointestinal bleeding

Causes. Diverticular bleeding (the most common cause of major lower bleeding, painless, from the right colon in about half), angiodysplasia (older patients, right colon, often chronic), colitis (ischemic, infectious, inflammatory bowel disease), colorectal cancer and polyps, hemorrhoids and anal fissure (small volume, bright red, on the paper or in the bowl), post-polypectomy bleeding, and Meckel's diverticulum in the young.

Management. Resuscitate. Exclude an upper source in any unstable patient with hematochezia. Colonoscopy after a rapid bowel preparation is the first test in most stable patients and treats what it finds. CT angiography is the test for brisk active bleeding (it detects bleeding at rates of about 0.3 to 0.5 mL per minute) and directs angiographic embolization. Tagged red cell scans are used in some centres for slower intermittent bleeding. Surgery is the last resort, and the segment to resect must be localized first; a blind subtotal colectomy is the operation for the patient who is bleeding to death with no localization.

Pearl: most lower gastrointestinal bleeding stops on its own. The job is to keep the patient safe while it does, and to find the cause afterwards, which in anyone over about 45 means a colonoscopy to exclude cancer.

Chapter 11: Left Lower Quadrant Pain, Diverticulitis, and the Perianal Problems

Diverticular disease

Diverticula are outpouchings of mucosa through the muscular wall of the colon at the points where blood vessels penetrate, most often in the sigmoid. They are common with age and mostly silent.

Diverticulitis is inflammation of a diverticulum, usually from micro-perforation. The classic patient is over 50 with left lower quadrant pain over a day or two, fever, and a raised white cell count; some have urinary symptoms from bladder irritation, and some have a palpable mass.

Classification. Uncomplicated diverticulitis is inflammation without abscess, perforation, fistula, or obstruction. Complicated disease is graded by the Hinchey classification: I, pericolic abscess; II, pelvic or distant abscess; III, purulent peritonitis; IV, feculent peritonitis.

Investigation. CT with contrast is the test: wall thickening, pericolic fat stranding, and any abscess, free air, or fistula. Do not perform colonoscopy in the acute phase because of the perforation risk.

Management. - Uncomplicated: outpatient treatment with a liquid diet and, in many current protocols, no antibiotics in well patients without comorbidity; antibiotics for those with fever, comorbidities, or immunosuppression. Admission for those who cannot tolerate oral intake. - Abscess: intravenous antibiotics, and percutaneous drainage for collections over about 3 to 4 cm. - Purulent or feculent peritonitis: resuscitation and an emergency operation. The traditional operation is a Hartmann procedure (sigmoid resection with an end colostomy and a closed rectal stump, reversed months later); resection with primary anastomosis and a diverting loop ileostomy is used in selected patients, and laparoscopic lavage has a role in purulent peritonitis in some centres. - After recovery: a colonoscopy six to eight weeks later to exclude a cancer that presented as diverticulitis. Elective resection is considered after complicated disease, after recurrent episodes that affect quality of life, in the immunosuppressed, and for fistula or stricture, and is not automatic after a second uncomplicated episode.

Complications to name. Abscess, perforation, fistula (colovesical is the most common, with pneumaturia and fecaluria; also colovaginal and coloenteric), stricture with obstruction, and bleeding (which typically occurs in the absence of inflammation).

Perianal problems

Hemorrhoids are vascular cushions. Internal hemorrhoids are above the dentate line, painless, and bleed bright red blood; they are graded I (bleed, no prolapse), II (prolapse and reduce spontaneously), III (need manual reduction), and IV (irreducible). External hemorrhoids are below the dentate line, are covered by skin, and hurt when thrombosed. Treatment: fibre, fluids, and avoidance of straining for everyone; rubber band ligation for grade I to III internal hemorrhoids; hemorrhoidectomy for grade IV, mixed disease, and failures. A thrombosed external hemorrhoid is excised under local anesthetic if seen within about 72 hours; otherwise it is treated with analgesia and sitz baths.

Anal fissure is a tear in the anoderm, almost always posterior in the midline. Severe pain with defecation that lasts for an hour afterwards and a streak of blood. A sentinel skin tag marks a chronic fissure. Treatment: fibre, sitz baths, topical nitroglycerin or diltiazem to relax the internal sphincter; botulinum toxin or lateral internal sphincterotomy for chronic fissures. A fissure that is off the midline, multiple, or painless raises the possibility of Crohn's disease, malignancy, or infection.

Perianal abscess presents with throbbing pain, a tender fluctuant swelling, and sometimes fever. Classified by location: perianal, ischiorectal, intersphincteric, and supralelevator. Treatment is incision and drainage; antibiotics alone do not cure an abscess and are added for cellulitis, immunosuppression, or systemic illness. About a third to a half develop a fistula.

Fistula-in-ano is a track between the anal canal and the perianal skin, usually after an abscess. Goodsall's rule predicts the internal opening: anterior external openings track straight in, posterior ones curve to the posterior midline. Simple low fistulas are laid open (fistulotomy); complex or high fistulas that involve much of the sphincter are managed with a seton and staged procedures to preserve continence. Recurrent or multiple fistulas suggest Crohn's disease.

Pilonidal disease is a midline natal cleft sinus with hair, presenting as an abscess or a chronic draining sinus; drainage for the abscess, and excision or a flap procedure for chronic disease.

Warning: perianal pain in an immunosuppressed or diabetic patient with fever and a rapidly spreading erythema is Fournier gangrene until proven otherwise. That is an operation within the hour, not an antibiotic prescription.

Chapter 12: The Breast Lump

Breast complaints on a surgical service are three: a lump, a discharge, and pain. The lump is the one that matters.

Triple assessment

Every breast lump is evaluated by three things together: clinical examination, imaging, and tissue sampling. The three must agree; if any one is suspicious, the lump is treated as suspicious.

Examination. Inspect with arms down, raised, and hands on hips: asymmetry, skin dimpling, nipple retraction, peau d'orange (edema from lymphatic obstruction), and ulceration. Palpate all four quadrants and the axillary tail with the flat of the fingers, then the nipple for discharge, then the axillary and supraclavicular nodes. Describe a lump by size, location on a clock face and distance from the nipple, consistency, mobility, and whether it is fixed to skin or chest wall.

Imaging. Mammography for women over about 30 to 40 (age thresholds vary), ultrasound for younger women, for cystic lesions, and to guide biopsy; MRI for selected cases (dense breasts, implants, high-risk screening, extent of disease). Findings are reported on the BI-RADS scale from 1 (negative) to 5 (highly suggestive of malignancy), with 6 for biopsy-proven cancer and 0 for incomplete.

Tissue. Core needle biopsy is the standard; it distinguishes invasive from in situ disease and provides receptor status. Fine needle aspiration is used for cysts and axillary nodes. Excisional biopsy is rarely the first step.

The common lumps

- **Fibroadenoma:** young women, smooth, firm, mobile ("breast mouse"), well defined on ultrasound. Observe if concordant on triple assessment and under about 2 to 3 cm; excise if growing, symptomatic, or the patient prefers.
- **Cyst:** fluctuates with the cycle, often in the 40s; anechoic on ultrasound; aspirate if symptomatic; send fluid for cytology only if bloody or a residual mass remains.
- **Fibrocystic change:** lumpy, tender, cyclical, bilateral; reassurance.
- **Fat necrosis:** after trauma or surgery; can mimic cancer clinically and on imaging; biopsy if doubt.
- **Abscess:** lactating women (*Staphylococcus aureus*) or non-lactating (periductal mastitis in smokers); antibiotics and aspiration or drainage; an abscess that does not resolve in a non-lactating woman needs a biopsy of the wall to exclude inflammatory cancer.
- **Cancer:** hard, irregular, fixed, painless, with skin or nipple changes and axillary nodes in advanced disease.

Nipple discharge

Bilateral, multiduct, milky or green discharge is physiological or from duct ectasia. Unilateral, single-duct, spontaneous, bloody or serous discharge needs investigation: intraductal papilloma is the most common cause, and carcinoma the one to exclude. Duct excision (microdochectomy) is diagnostic and therapeutic.

Breast cancer in one page

Risk factors. Age, female sex, family history and BRCA1 or BRCA2 mutations, previous breast cancer or atypical hyperplasia, early menarche, late menopause, nulliparity or late first pregnancy, hormone replacement therapy, alcohol, obesity after menopause, and chest irradiation in youth.

Types. Invasive ductal carcinoma (no special type) is the majority; invasive lobular is the next; ductal carcinoma in situ is non-invasive and is treated to prevent invasion; lobular carcinoma in situ is a marker of risk rather than a precursor to be excised; inflammatory breast cancer presents with a red, swollen, warm breast and is aggressive; Paget disease of the nipple is an eczema-like change that signals an underlying carcinoma.

Staging. TNM. Tumour size and skin or chest wall involvement, nodal status (the strongest prognostic factor), and metastases (bone, liver, lung, brain). Sentinel lymph node biopsy stages a clinically negative axilla; axillary dissection is reserved for a positive axilla in most settings.

Receptors. Estrogen and progesterone receptor status predicts response to endocrine therapy (tamoxifen before menopause, aromatase inhibitors after). HER2 overexpression predicts response to trastuzumab. Triple-negative disease has none of the three and is treated with chemotherapy.

Treatment. Surgery is breast-conserving (lumpectomy with clear margins followed by radiation) or mastectomy, with equivalent survival when appropriately selected; the choice depends on tumour size relative to the breast, multicentric disease, prior radiation, and patient preference. Reconstruction can be immediate or delayed. Adjuvant therapy is chosen by stage and receptor status. Neoadjuvant chemotherapy is used to downstage large or inflammatory tumours and to convert mastectomy candidates to conservation.

Pearl: a mobile lump in a 25-year-old is a fibroadenoma until the triple assessment says otherwise, and it still gets the triple assessment.

Chapter 13: The Thyroid Nodule and the Neck Lump

The thyroid nodule

Thyroid nodules are common (palpable in about 5 percent of adults, found on ultrasound in far more) and about 5 to 10 percent are malignant. The evaluation is a fixed sequence.

1. **History and examination.** Rapid growth, hoarseness, dysphagia, a hard fixed nodule, cervical lymphadenopathy, a history of neck irradiation, and a family history of thyroid cancer or multiple endocrine neoplasia raise the risk. Symptoms of hyper- or hypothyroidism are asked about but are rarely present.
2. **Thyroid-stimulating hormone.** If suppressed, the nodule may be autonomous (a "hot" nodule on a radionuclide scan), which is almost never malignant and is managed as hyperthyroidism. If normal or raised, proceed to ultrasound.
3. **Ultrasound** characterizes the nodule (size, solid or cystic, echogenicity, margins, microcalcifications, taller-than-wide shape, vascularity) and the neck nodes, and assigns a risk category (TI-RADS or a similar system) that determines whether biopsy is needed and at what size.
4. **Fine needle aspiration** under ultrasound guidance, reported by the Bethesda system: I non-diagnostic, II benign, III atypia of undetermined significance, IV follicular neoplasm, V suspicious, VI malignant. Follicular lesions cannot be called benign or malignant on cytology because the distinction is capsular or vascular invasion, which needs the whole nodule; molecular testing or a diagnostic lobectomy resolves them.

Thyroid cancers. Papillary is the most common (about 80 percent), spreads to lymph nodes, and has an excellent prognosis; follicular spreads by blood to bone and lung; medullary arises from parafollicular C cells, produces calcitonin, and can be part of multiple endocrine neoplasia type 2 (test for RET mutation and exclude pheochromocytoma before operating); anaplastic is rare, occurs in the elderly, and is rapidly fatal. Treatment for differentiated cancer is lobectomy or total thyroidectomy depending on size and risk, with central neck dissection for nodal disease, radioactive iodine for higher-risk disease, and thyroid-stimulating hormone suppression.

Thyroidectomy complications. Recurrent laryngeal nerve injury (hoarseness if unilateral, airway obstruction if bilateral), superior laryngeal nerve injury (loss of voice pitch), hypocalcemia from parathyroid injury (perioral tingling, Chvostek and Trousseau signs; check calcium and treat), and the post-operative neck hematoma that compresses the airway, which is treated by opening the wound at the bedside and returning to the operating room.

The neck lump

Location and age narrow the differential quickly.

- **Midline:** thyroglossal duct cyst (moves with tongue protrusion; excised with the central hyoid by the Sistrunk procedure), thyroid nodule or goitre, dermoid cyst.
- **Anterior triangle:** lymph node (reactive, infectious, lymphoma, metastatic), branchial cleft cyst (young adult, anterior border of sternocleidomastoid, often after an upper respiratory infection), carotid body tumour (pulsatile, mobile side to side but not up and down), salivary gland tumour (submandibular or parotid tail).
- **Posterior triangle:** lymph node, cystic hygroma (lymphangioma, in children), lipoma.
- **Parotid:** pleomorphic adenoma (most common, benign), Warthin tumour (older male smokers, sometimes bilateral), and malignant tumours (facial nerve weakness is a red flag).

Rules. A persistent neck node in an adult over 40 is a metastasis from an upper aerodigestive tract squamous cell carcinoma until proven otherwise, and the workup is an examination of the mouth, pharynx and larynx, a fine needle aspiration of the node, and imaging; an open biopsy of the node comes last, not first, because it compromises later treatment. Supraclavicular nodes suggest a chest or abdominal primary (Virchow's node on the left with gastric cancer). Fine needle aspiration is safe for almost every neck mass except a suspected carotid body tumour or a pulsatile mass.

Chapter 14: Trauma: The Primary Survey and the First Hour

The trauma patient is managed by a sequence that does not change, so that the injury that kills fastest is found first. Students on a surgical service will be part of trauma calls; know the sequence and your position.

Preparation and the team

The trauma team assembles before the patient arrives with the pre-hospital report: mechanism, injuries, signs, treatment given, and estimated arrival. Roles are assigned (leader, airway, primary survey, procedures, scribe). Put on gloves, gown, eye protection, and lead if imaging will be done in the bay. The student is usually assigned to help with exposure, logrolling, and running samples; watch everything.

The primary survey

A: Airway with cervical spine protection. Can the patient speak? A clear voice means a patent airway. Look for obstruction, stridor, facial burns, and expanding neck hematoma. Jaw thrust, suction, adjuncts, and a definitive airway (intubation) for a Glasgow Coma Scale of 8 or less, for inability to protect the airway, or for impending obstruction. Keep the neck immobilized in a collar until cleared.

B: Breathing. Expose the chest. Look, feel, listen. The immediately life-threatening chest injuries are tension pneumothorax (deviated trachea, absent breath sounds, hyperresonance, distended neck veins, hypotension; decompress with a needle or finger thoracostomy then a chest tube, before imaging), open pneumothorax (three-sided dressing, then chest tube), massive hemothorax (chest tube; over 1,500 mL immediately or more than about 200 mL per hour for several hours is an indication for thoracotomy), flail chest with pulmonary contusion (analgesia, oxygen, ventilation if failing), and cardiac tamponade (Beck's triad: hypotension, distended neck veins, muffled heart sounds; ultrasound confirms; pericardiocentesis is a bridge to thoracotomy).

C: Circulation with hemorrhage control. Pulse, blood pressure, skin, and mental state. Stop external bleeding with direct pressure and, for limbs, a tourniquet. Two large-bore lines; bloods including crossmatch and lactate. Blood is the resuscitation fluid in hemorrhagic shock; give balanced ratios of red cells, plasma, and platelets through a massive transfusion protocol, and tranexamic acid within three hours of injury. Find the bleeding: chest (radiograph and ultrasound), abdomen (FAST ultrasound: pericardium, right and left upper quadrants, pelvis), pelvis (radiograph; bind an unstable pelvis), long bones (splint), and the floor (external bleeding). Hemorrhagic shock is classified by the volume lost; a heart rate over 120 with a narrowed pulse pressure means about 30 percent of blood volume is gone.

D: Disability. Glasgow Coma Scale, pupils, lateralizing signs, and glucose. A deteriorating score or unequal pupils means an expanding intracranial hematoma; get the CT once the patient is stable enough.

E: Exposure and environment. Undress completely, logroll to examine the back, then cover and warm. Hypothermia worsens coagulopathy and acidosis, the lethal triad.

Adjuncts to the primary survey

Continuous monitoring, pulse oximetry, ECG, urinary catheter (not before a rectal and perineal examination if urethral injury is possible: blood at the meatus, perineal bruising, a high-riding prostate), nasogastric or orogastric tube (orogastric if a basal skull fracture is suspected), arterial blood gas and lactate, chest and pelvic radiographs, and FAST.

The secondary survey

Only after the primary survey is complete and the patient is responding to resuscitation. A head-to-toe examination, an AMPLE history (allergies, medications, past history, last meal, events), and the imaging the injuries require, most often a CT of the head, cervical spine, chest, abdomen and pelvis with contrast in a stable patient with significant mechanism. Tetanus prophylaxis. Repeated reassessment; the patient who was stable can stop being stable.

Specific injuries a student should know

- **Head injury.** Glasgow Coma Scale of 13 to 15 is mild, 9 to 12 moderate, 8 or less severe. CT rules such as the Canadian CT Head Rule decide who is scanned. Epidural hematoma (lucid interval, lens-shaped on CT, arterial), subdural (crescent-shaped, venous, elderly and anticoagulated), diffuse axonal injury (coma with a relatively normal CT). Avoid hypotension and hypoxia, which double mortality.
- **Cervical spine.** Cleared clinically by rules such as the Canadian C-Spine Rule in alert, non-intoxicated patients without midline tenderness or neurology; otherwise imaged with CT.
- **Chest.** Rib fractures (analgesia is treatment; multiple fractures in the elderly carry a high pneumonia risk), pulmonary contusion, aortic injury (widened mediastinum after deceleration; CT angiography), and diaphragmatic rupture.
- **Abdomen.** Blunt injury to the spleen and liver is graded on CT and managed non-operatively in stable patients with angioembolization as an adjunct; instability with a positive FAST is a laparotomy. Penetrating injury: gunshot wounds to the abdomen are explored; stab wounds are managed selectively with local wound exploration, serial examination, and CT in stable patients, and laparotomy for peritonitis, evisceration, or instability. Hollow viscus and pancreatic injuries can be missed on the first CT; repeated examination catches them.
- **Pelvis.** Fractures bleed; bind the pelvis, and use angioembolization or preperitoneal packing for ongoing hemorrhage.
- **Extremities.** Check the pulses and the compartments. Compartment syndrome is pain out of proportion, pain on passive stretch, and a tense compartment; pulses are lost late. Fasciotomy is the treatment and it is urgent.
- **Burns.** Airway first (inhalational injury). Estimate the surface area by the rule of nines (adult: head 9, each arm 9, each leg 18, front of trunk 18, back 18, perineum 1) and resuscitate by a formula such as 2

to 4 mL per kilogram per percent burned over 24 hours, half in the first eight hours from the time of injury, titrated to urine output. Circumferential full-thickness burns need escharotomy.

Pearl: in trauma, the sequence is the safety net. When a patient deteriorates, go back to A and start again.

Key Points

- Gastrointestinal bleeding is resuscitate, locate, stop; upper sources present with hematemesis or melena and are treated endoscopically, lower sources mostly stop on their own and need a colonoscopy afterwards.
- Diverticulitis is graded by the Hinchey classification; uncomplicated disease can be treated without an operation and complicated disease with drainage or resection; colonoscopy follows recovery.
- Perianal disease is common and benign until it is Fournier gangrene, which is an operation within the hour.
- Every breast lump gets a triple assessment, and every thyroid nodule gets a thyroid-stimulating hormone, an ultrasound, and a fine needle aspiration when indicated.
- A neck node in an adult over 40 is a metastasis until proven otherwise; do not open-biopsy it first.
- Trauma is A, B, C, D, E in that order, and when the patient deteriorates you start again at A.

Part 3: The Core Conditions

Chapter 15: Vascular Surgery Essentials: Claudication, Aneurysm, Ischemia, and Venous Disease

Vascular surgery on a general surgery rotation comes down to four presentations: the leg that hurts on walking, the aorta that is too wide, the limb that is suddenly cold, and the leg that is swollen.

Peripheral arterial disease and claudication

Claudication is reproducible muscle pain brought on by walking a fixed distance and relieved by rest within minutes. Calf claudication means femoropopliteal disease; buttock and thigh claudication with erectile dysfunction means aortoiliac disease (Leriche syndrome). Distinguish it from neurogenic claudication of spinal stenosis, which is relieved by sitting or bending forward rather than by standing still.

Examination. Pulses at the femoral, popliteal, posterior tibial, and dorsalis pedis; bruits; hair loss, shiny skin, thickened nails, and dependent rubor with pallor on elevation (Buerger's test); ulcers on the toes and pressure points (arterial ulcers are punched out, painful, and pale); gangrene.

Ankle-brachial index. Ankle systolic pressure divided by brachial. Normal is about 0.9 to 1.3; under 0.9 is arterial disease; under 0.5 suggests critical ischemia; over 1.3 means calcified incompressible vessels (diabetes, renal failure) and the test is unreliable, so use toe pressures.

Management of claudication is medical first: stop smoking (the single most effective intervention), supervised exercise (walking to the point of pain and beyond, which improves walking distance as much as many procedures), antiplatelet therapy, a statin, and control of blood pressure and diabetes. Cilostazol helps some patients. Revascularization (angioplasty with or without stenting, or bypass) is for lifestyle-limiting claudication that fails medical therapy and for critical limb-threatening ischemia.

Chronic limb-threatening ischemia is rest pain (pain in the foot at night, relieved by hanging the leg over the bed), non-healing ulcers, or gangrene. It threatens the limb and needs urgent imaging (duplex, CT angiography, or catheter angiography) and revascularization or, when that is impossible, amputation.

Diabetic foot. Neuropathy, arterial disease, and infection together. Ulcers on pressure points; probe to bone means osteomyelitis; imaging and vascular assessment for every ulcer; debridement, offloading, antibiotics, and revascularization as needed.

Acute limb ischemia

Sudden loss of perfusion to a limb, from an embolus (atrial fibrillation, recent infarction, aneurysm) into a previously normal vessel, or thrombosis of a diseased artery or a graft.

The six Ps: pain, pallor, pulselessness, paresthesia, paralysis, and poikilothermia (cold). Paresthesia and paralysis mean nerve and muscle ischemia and predict limb loss. The limb is threatened after about six

hours.

Management. Immediate heparin, analgesia, and a vascular surgeon. Imaging if it does not delay treatment. Embolectomy with a balloon catheter for an embolus, catheter-directed thrombolysis or bypass for thrombosis, fasciotomy for reperfusion swelling, and amputation for a non-viable limb (fixed mottling, rigid muscles, absent sensation and movement). Watch for reperfusion injury: hyperkalemia, myoglobinuria, and acidosis.

Abdominal aortic aneurysm

A dilatation of the aorta to 3 cm or more, mostly infrarenal, in older men who smoke. Most are asymptomatic and found on imaging for something else or on screening (a one-time ultrasound for men aged 65 to 75 who have ever smoked is recommended in many jurisdictions).

Rupture presents with sudden abdominal, back, or flank pain, hypotension, and a pulsatile mass, and about half of patients die before reaching hospital. A hypotensive older patient with abdominal or back pain has a ruptured aneurysm until proven otherwise; bedside ultrasound confirms the aneurysm, and a stable patient can have a CT to plan repair; an unstable patient goes to the operating room. Permissive hypotension (a systolic pressure around 80 to 100 mmHg) until the aorta is controlled is the resuscitation strategy.

Elective repair is offered when the diameter reaches about 5.5 cm in men (about 5 cm in women), when it grows faster than about 1 cm a year, or when it becomes symptomatic. Endovascular repair (a stent graft through the femoral arteries) has lower early mortality and needs lifelong surveillance for endoleak; open repair is durable and is chosen for unsuitable anatomy and younger patients. Smaller aneurysms are watched with ultrasound at intervals set by size.

Carotid disease

Transient ischemic attack or stroke in the territory of a carotid stenosis of 50 to 99 percent is treated with carotid endarterectomy, ideally within two weeks of symptoms, plus antiplatelet and statin therapy. Asymptomatic stenosis is treated medically in most patients, with surgery in selected fit patients with severe stenosis. The complications of endarterectomy to know are stroke, cranial nerve injury (hypoglossal, marginal mandibular), neck hematoma, and hyperperfusion syndrome.

Venous disease

Deep venous thrombosis. Risk factors follow Virchow's triad: stasis (immobility, surgery, long travel), endothelial injury (surgery, trauma, lines), and hypercoagulability (cancer, pregnancy, oral contraceptives, inherited thrombophilia). Presents with unilateral calf swelling, pain, and warmth, or not at all. The Wells score guides testing: a low probability with a negative D-dimer excludes it; otherwise, compression ultrasound. Treatment is anticoagulation (a direct oral anticoagulant or low-molecular-weight heparin, then an oral agent) for at least three months; an inferior vena cava filter is used only when anticoagulation is contraindicated. Phlegmasia cerulea dolens is a massively swollen, blue, painful leg from near-total venous outflow obstruction and needs urgent thrombolysis or thrombectomy.

Pulmonary embolism. Sudden dyspnea, pleuritic chest pain, tachycardia, hypoxia, and sometimes syncope or shock. CT pulmonary angiography diagnoses it. Anticoagulate; thrombolyse if there is hemodynamic instability.

Varicose veins. Dilated tortuous superficial veins from valve incompetence, most often the great saphenous system. Symptoms are aching, heaviness, and swelling; complications are superficial thrombophlebitis, bleeding, and the changes of chronic venous insufficiency (edema, hemosiderin staining, lipodermatosclerosis, and venous ulcers above the medial malleolus, which are shallow, irregular, and less painful than arterial ulcers). Treatment is compression, then endovenous ablation (laser or radiofrequency), foam sclerotherapy, or stripping.

Pearl: an ulcer above the medial malleolus is venous, an ulcer on the toe or the heel is arterial, and an ulcer on the sole of a numb foot is neuropathic; the ankle-brachial index must be checked before compression is applied to any leg ulcer.

Chapter 16: Skin and Soft Tissue: Abscess, Cellulitis, and Necrotizing Infection

Cellulitis and erysipelas

Cellulitis is a spreading infection of the dermis and subcutaneous tissue, usually from *Streptococcus pyogenes* or *Staphylococcus aureus*, entering through a break in the skin (tinea between the toes is the classic portal on the leg). Red, warm, tender, and swollen, with indistinct margins; erysipelas is the more superficial streptococcal form with a raised sharply demarcated edge. Fever and lymphangitis in more severe cases. Treatment is an antistaphylococcal and antistreptococcal antibiotic (cefazolin or cephalexin, or clindamycin), elevation, and treatment of the portal. Mark the margin with a pen to judge progress. Admission for systemic illness, failure of oral therapy, immunosuppression, or a suspicion of something deeper. Bilateral "cellulitis" is almost always stasis dermatitis, not infection.

Abscess

A collection of pus in a cavity. Fluctuant, tender, red, and warm, often with a point. Ultrasound helps when fluctuance is unclear. Treatment is incision and drainage: local anesthesia, an incision along skin lines over the point of maximal fluctuance, breaking up loculations with a hemostat, irrigation, and packing or a loose closure with a drain depending on size and site. Antibiotics are added for surrounding cellulitis, systemic illness, immunosuppression, or multiple abscesses; alone they do not cure an abscess. Community-acquired methicillin-resistant *Staphylococcus aureus* is common in recurrent abscesses and is covered with trimethoprim-sulfamethoxazole or doxycycline when antibiotics are used. Send pus for culture.

Specific abscesses to name: perianal (Chapter 11), pilonidal, breast (Chapter 12), hidradenitis suppurativa (recurrent axillary and groin abscesses from apocrine gland occlusion; long-term management, not just drainage), and the injection-site abscess in people who inject drugs, which can hide a pseudoaneurysm; ultrasound before incising anything pulsatile in the groin.

Necrotizing soft tissue infection

The diagnosis that every surgeon fears missing. Infection spreading along fascial planes with tissue death, from group A *Streptococcus* (monomicrobial) or mixed aerobes and anaerobes (polymicrobial, including Fournier gangrene of the perineum), or *Clostridium* (gas gangrene). Risk factors: diabetes, immunosuppression, injection drug use, recent surgery or trauma, and obesity, though it also strikes healthy people after a trivial injury.

Recognition. Pain out of proportion to the skin findings is the earliest and most reliable sign. Then rapid spread beyond the marked margin, skin that is dusky, mottled, or blistered, crepitus, anesthesia over the area, and systemic toxicity that does not fit simple cellulitis: tachycardia, hypotension, confusion. The skin often looks deceptively mild early. Laboratory scores (such as the LRINEC score) can support but do not exclude the diagnosis. Imaging can show gas but must not delay the operation.

Management. Broad-spectrum intravenous antibiotics (including clindamycin for its toxin suppression), aggressive resuscitation, and immediate surgical exploration and debridement of all non-viable tissue, repeated every 24 to 48 hours until the infection is controlled. The finding at operation is "dishwater" fluid, fascia that does not bleed and separates with a finger, and grey non-contractile muscle. Mortality rises with every hour of delay.

Warning: a patient with "cellulitis" who has pain out of proportion, spread over hours, or systemic toxicity needs a surgeon at the bedside now, not a stronger antibiotic.

Wounds and wound healing

Wounds are classified for infection risk: clean (no viscus entered; about 1 to 2 percent infection), clean-contaminated (a viscus entered under control; about 3 to 10 percent), contaminated (gross spillage, fresh trauma; about 10 to 20 percent), and dirty (established infection or perforation; over 20 percent).

Healing by primary intention (edges approximated), secondary intention (left open to granulate), or delayed primary closure (left open for a few days, then closed). Contaminated and dirty wounds are left open or closed later.

Factors that impair healing: infection, ischemia, diabetes, smoking, malnutrition, steroids and immunosuppression, radiation, foreign bodies, and tension. Wound infection presents around POD 3 to 7 with redness, warmth, pain, and discharge; open the wound, culture, pack, and give antibiotics only for surrounding cellulitis or systemic signs.

Dehiscence is the separation of fascial layers, usually around POD 5 to 10, heralded by serosanguineous drainage from the wound; it can lead to evisceration, which is treated by covering the bowel with saline-soaked gauze and returning to the operating room.

Skin lesions a surgeon removes

- **Basal cell carcinoma:** pearly papule with telangiectasia, rolled edge, central ulceration, on sun-exposed skin; locally invasive, rarely metastasizes; excision with a narrow margin.
- **Squamous cell carcinoma:** scaly, keratotic, ulcerating nodule; can metastasize to nodes; excision with a wider margin; actinic keratosis is the precursor.
- **Melanoma:** the ABCDE rule (asymmetry, border irregularity, colour variation, diameter over 6 mm, evolution). Excisional biopsy with a narrow margin first, never a shave; then wide excision with margins set by Breslow thickness, and sentinel lymph node biopsy for lesions over about 0.8 to 1 mm or with adverse features.
- **Lipoma, epidermal inclusion cyst, sebaceous cyst, dermatofibroma:** benign, excised when symptomatic or for diagnosis.

Chapter 17: Surgical Oncology Basics: Colorectal, Gastric, Pancreatic, and Esophageal

Students are not expected to manage cancer, but they are expected to recognize it, know how it is staged, and understand what the operation is for. Four gastrointestinal cancers cover most of what you will see.

Principles

- **Staging before treatment.** TNM: tumour depth, nodal involvement, distant metastases. Staging combines imaging (CT of chest, abdomen and pelvis; MRI for rectal cancer; endoscopic ultrasound for esophageal and some gastric cancers; PET for selected cases) with pathology.
- **The multidisciplinary tumour board** decides sequencing: surgery first, or neoadjuvant chemotherapy or chemoradiation to shrink the tumour, then surgery, then adjuvant therapy.
- **The operation** removes the primary with a margin, the draining lymph nodes en bloc with their vascular pedicle, and reconstructs continuity where possible. Lymph node yield matters for staging.
- **Palliation** relieves obstruction, bleeding, or pain when cure is not possible: stents, bypasses, diverting stomas.

Colorectal cancer

The most common gastrointestinal cancer and the one most likely to be encountered on a general surgery service.

Presentation. Change in bowel habit, rectal bleeding, iron deficiency anemia (a right-sided cancer in an older patient until proven otherwise), obstruction (left-sided), weight loss, or an incidental finding on screening. Screening by fecal immunochemical test or colonoscopy from about age 45 to 50 in average-risk adults, earlier with family history, inflammatory bowel disease, or hereditary syndromes (familial adenomatous polyposis, Lynch syndrome).

Workup. Colonoscopy with biopsy of the whole colon (synchronous lesions in a few percent), CT of the chest, abdomen and pelvis, carcinoembryonic antigen as a baseline for follow-up, and pelvic MRI for rectal cancer to define the relationship to the mesorectal fascia.

Operations. Right hemicolectomy (cecum to hepatic flexure, ileocolic anastomosis), extended right, transverse colectomy, left hemicolectomy, sigmoid colectomy, and for the rectum a low anterior resection with total mesorectal excision (sphincter preserved, often with a temporary diverting ileostomy) or an abdominoperineal resection with a permanent colostomy for tumours involving the sphincter. Laparoscopic and robotic approaches are standard. Rectal cancer beyond the early stages receives neoadjuvant chemoradiation or total neoadjuvant therapy before surgery.

Adjuvant chemotherapy for stage III (node-positive) disease and selected high-risk stage II. Liver metastases can be resected with curative intent in selected patients.

Follow-up. Carcinoembryonic antigen, CT, and colonoscopy at intervals for five years.

Gastric cancer

Adenocarcinoma, associated with *Helicobacter pylori*, smoking, salted and smoked foods, pernicious anemia, and previous gastric surgery. Presents late with weight loss, epigastric pain, early satiety, dysphagia (proximal tumours), anemia, and signs of spread (Virchow's node, Sister Mary Joseph nodule at the umbilicus, Krukenberg tumours in the ovaries, a Blumer shelf on rectal examination). Diagnosed by endoscopy and biopsy; staged with CT, endoscopic ultrasound, and often diagnostic laparoscopy to exclude peritoneal disease. Treated with perioperative chemotherapy and a subtotal or total gastrectomy with D2 lymphadenectomy and a Roux-en-Y reconstruction. Early lesions confined to the mucosa may be resected endoscopically.

Pancreatic cancer

Adenocarcinoma of the head presents with painless obstructive jaundice, weight loss, a palpable non-tender gallbladder (Courvoisier's sign), new-onset diabetes, and back pain when the tumour invades the retroperitoneum. Body and tail tumours present later with pain and weight loss. CT with a pancreatic protocol stages the tumour and defines its relationship to the superior mesenteric vein, superior mesenteric artery, and celiac axis, which determines resectability. About one in five patients is resectable at presentation. The operation for a head tumour is a pancreaticoduodenectomy (Whipple procedure): removal of the pancreatic head, duodenum, distal bile duct, gallbladder, and often the distal stomach, with three anastomoses. Its feared complication is a pancreatic fistula. Distal pancreatectomy with splenectomy for body and tail tumours. Neoadjuvant or adjuvant chemotherapy is standard. Biliary stenting relieves jaundice in unresectable disease and when surgery will be delayed.

Esophageal cancer

Squamous cell carcinoma (upper and middle esophagus; smoking and alcohol) and adenocarcinoma (lower esophagus and junction; Barrett's esophagus from chronic reflux, obesity). Progressive dysphagia, first to solids then liquids, with weight loss. Endoscopy with biopsy, then CT, endoscopic ultrasound, and PET for staging. Treatment for locally advanced disease is neoadjuvant chemoradiation followed by esophagectomy (transhiatal, Ivor Lewis, or three-field), with a gastric conduit pulled up into the chest or neck. Anastomotic leak and respiratory complications are the major risks. Stenting palliates dysphagia in unresectable disease.

Other tumours you will hear about

Gastrointestinal stromal tumours (submucosal, KIT-positive, treated with resection and imatinib), neuroendocrine tumours of the small bowel and pancreas, appendiceal neoplasms found at

appendectomy, and hepatocellular carcinoma in cirrhotic livers (resection, ablation, or transplant depending on function and tumour burden).

Pearl: iron deficiency anemia in a man or a post-menopausal woman is colorectal cancer until the colon has been looked at.

Key Points

- Claudication is treated by stopping smoking and walking; critical limb ischemia and acute limb ischemia are treated by a vascular surgeon today.
- A hypotensive older patient with back or abdominal pain has a ruptured aneurysm until proven otherwise.
- Ulcer location tells you the cause: medial malleolus venous, toes and heel arterial, sole neuropathic.
- Pain out of proportion in a soft tissue infection means necrotizing infection until the surgeon has looked.
- Gastrointestinal cancers are staged before they are treated, decided at a tumour board, and removed en bloc with their nodes; iron deficiency anemia gets a colonoscopy.

Chapter 18: Bariatric, Foregut, and Elective Hernia Surgery

Elective general surgery is where the reasoning is slowest and the teaching is best. Three groups of operations fill most elective lists.

Gastroesophageal reflux and hiatus hernia

Reflux is common; surgery is for a minority. Typical symptoms are heartburn and regurgitation; alarm features (dysphagia, weight loss, bleeding, anemia, vomiting) demand endoscopy. Investigations before any operation: endoscopy (esophagitis, Barrett's, hiatus hernia), 24-hour pH monitoring to prove acid exposure correlates with symptoms, and manometry to exclude a motility disorder such as achalasia, which a fundoplication would make worse.

Surgery (a laparoscopic Nissen or partial fundoplication with repair of the hiatus) is offered to patients whose reflux is proven and who either fail or do not want lifelong proton pump inhibitors, or who have volume regurgitation or a large hiatus hernia. Complications: dysphagia, gas-bloat syndrome, and recurrence. Paraesophageal hernias, where the stomach rolls into the chest beside the esophagus, are repaired when symptomatic because of the risk of volvulus and strangulation.

Achalasia is failure of the lower esophageal sphincter to relax with absent peristalsis; dysphagia to solids and liquids, regurgitation of undigested food, and a bird's beak on contrast swallow. Manometry confirms it. Treatment is pneumatic dilatation, laparoscopic Heller myotomy with a partial fundoplication, or peroral endoscopic myotomy.

Peptic ulcer surgery

Rare now that *Helicobacter pylori* and proton pump inhibitors exist, but its complications still come to the surgeon: perforation (sudden epigastric pain, a rigid abdomen, free air; treated by resuscitation, antibiotics, and laparoscopic or open omental patch repair), bleeding that fails endoscopy (oversewing of the vessel), and gastric outlet obstruction from chronic scarring (endoscopic dilatation or a drainage procedure). Gastric ulcers are biopsied because a proportion are cancers.

Bariatric surgery

Offered to patients with a body mass index of 40 or more, or 35 or more with obesity-related disease (diabetes, sleep apnea, hypertension), who have failed medical management and are prepared for lifelong follow-up. Thresholds are lower in some guidelines and populations.

- **Sleeve gastrectomy:** the greater curvature is stapled off, leaving a narrow tube; restrictive and hormonal; the most common operation; complications include staple line leak (tachycardia is the first sign) and worsened reflux.

- **Roux-en-Y gastric bypass:** a small gastric pouch drains into a Roux limb of jejunum; restrictive and malabsorptive; better for reflux and diabetes; complications include anastomotic leak, marginal ulcer, internal hernia (intermittent pain, often with a normal CT), dumping syndrome, and micronutrient deficiencies (iron, vitamin B12, folate, vitamin D, calcium, thiamine).
- **Adjustable gastric band:** largely abandoned because of slippage, erosion, and poor durability.

Expected weight loss is roughly a quarter to a third of total body weight, with remission or improvement of diabetes in most patients. Every bariatric patient needs lifelong supplementation and follow-up.

Warning: tachycardia over 120 in a post-bariatric patient is a leak until proven otherwise, even with a normal temperature and a soft abdomen. Get the surgeon.

Elective hernia repair

Covered in Chapter 9 for diagnosis. The operations: open mesh repair (Lichtenstein) for inguinal hernia, with chronic groin pain in about a tenth of patients as the complication that matters; laparoscopic repair (totally extraperitoneal or transabdominal preperitoneal) for bilateral or recurrent hernias and for faster recovery; open or laparoscopic mesh repair for umbilical and incisional hernias, with component separation for large defects. Recurrence and infection are the risks of every mesh repair; mesh infection often means mesh removal.

Cholecystectomy, revisited

The most common elective abdominal operation, covered in Chapter 7. The student's question on the list is always the same: was the critical view of safety obtained, and what were the indications for an intraoperative cholangiogram (jaundice, dilated duct, abnormal liver enzymes, or unclear anatomy).

Splenectomy

Elective splenectomy for immune thrombocytopenia refractory to medical therapy, hereditary spherocytosis, and some hematological malignancies; emergency splenectomy for trauma that cannot be managed non-operatively. Vaccinate against encapsulated organisms (pneumococcus, meningococcus, Haemophilus influenzae type b) at least two weeks before elective splenectomy or after recovery from an emergency one, and counsel about overwhelming post-splenectomy infection, which is rare but rapidly fatal and needs immediate antibiotics for any fever.

Chapter 19: Common Post-operative Complications and How to Manage Them

Chapter 5 covered the daily care of the post-operative patient. This chapter covers what to do when it goes wrong, organized by the system that fails.

Bleeding

Early post-operative bleeding is a technical problem (a slipped tie, a raw surface) or a coagulopathy (hypothermia, dilution, consumption, an anticoagulant not held). Signs: tachycardia, falling blood pressure, falling urine output, a rising drain output that is frank blood, a distending abdomen or a swelling neck, and a falling hemoglobin that lags behind. Management: two lines, bloods including coagulation and a crossmatch, fluid then blood, correct coagulopathy, reverse anticoagulants, and a decision about returning to the operating room, which is the surgeon's and is made early rather than late. A neck hematoma after thyroid surgery is opened at the bedside if the airway is threatened.

The wound

Infection (POD 3 to 7): open, culture, pack, antibiotics only for cellulitis or systemic illness. Seroma and hematoma: usually observe, aspirate if large or symptomatic. Dehiscence (POD 5 to 10, serosanguineous discharge): examine the fascia; evisceration goes to the operating room. Necrotizing infection: recognized by pain out of proportion and rapid spread, treated by immediate debridement (Chapter 16).

The lungs

Atelectasis is common after upper abdominal surgery: mild fever, reduced breath sounds at the bases; treated with analgesia, mobilization, and deep breathing. **Pneumonia** (POD 2 to 5): fever, productive cough, an infiltrate; culture and antibiotics. **Pulmonary embolism** (any day, most often POD 5 to 10): sudden dyspnea, tachycardia, hypoxia; CT pulmonary angiography and anticoagulation. **Aspiration** in patients with ileus or reduced consciousness. **Respiratory failure** from any of these plus fluid overload and opioid excess.

The heart

Myocardial infarction after surgery is often silent or presents as hypotension, dyspnea, or arrhythmia rather than chest pain; troponin and ECG for any unexplained post-operative deterioration in a patient with risk factors. Atrial fibrillation is common after major thoracic and abdominal surgery; correct electrolytes, treat the cause (sepsis, fluid shifts), rate control, and consider anticoagulation.

The kidneys

Oliguria (under 0.5 mL per kilogram per hour) is pre-renal (hypovolemia, bleeding, sepsis) until proven otherwise; assess volume status and give fluid. Then consider renal causes (contrast, aminoglycosides,

non-steroidal anti-inflammatory drugs, rhabdomyolysis) and post-renal causes (a blocked catheter is the most common; flush it, then bladder scan for retention). Acute kidney injury is staged by the rise in creatinine; stop nephrotoxins, correct volume, and monitor potassium.

Urinary retention after spinal anesthesia, pelvic surgery, and in older men: bladder scan, catheterize, and trial of void later.

The gut

Ileus is expected for two to three days after bowel surgery and longer after extensive handling, opioids, electrolyte disturbance, and intra-abdominal inflammation. Nausea, distension, absent flatus. Manage with bowel rest, nasogastric decompression if vomiting, fluid and electrolyte correction (potassium and magnesium), mobilization, and minimal opioids. Ileus beyond about POD 5, or vomiting that returns after bowel function had resumed, needs a CT to distinguish it from mechanical obstruction and to look for a leak or abscess.

Anastomotic leak (POD 3 to 7, sometimes later): tachycardia first, then fever, pain, ileus, peritonitis, and feculent or purulent drain output; raised white cells and C-reactive protein. CT with contrast (oral or rectal contrast for colorectal anastomoses) shows extraluminal air, fluid, or contrast. Contained leaks in a well patient are treated with antibiotics and drainage; generalized peritonitis needs reoperation with washout, repair or takedown of the anastomosis, and diversion.

Intra-abdominal abscess (POD 5 to 10): swinging fever, ileus, localized tenderness; CT; percutaneous drainage and antibiotics.

Clostridioides difficile colitis: diarrhea after antibiotics; toxin assay; oral vancomycin or fidaxomicin; fulminant colitis with toxic megacolon is a surgical emergency.

Stress ulcer bleeding in critically ill patients; prophylaxis for those at risk.

Sepsis

Suspect it in any post-operative patient with a new fever or hypothermia, tachycardia, tachypnea, confusion, or hypotension. Cultures (blood, urine, wound, drain, sputum), lactate, broad-spectrum antibiotics within the hour, fluid resuscitation, and source control, which in a surgical patient means finding the collection, the leak, the necrotic tissue, or the infected line and dealing with it. Antibiotics without source control fail.

The brain

Delirium in the elderly: fluctuating attention and consciousness, worse at night. Look for the cause (infection, drugs especially opioids and anticholinergics, hypoxia, electrolyte disturbance, pain, retention, constipation, withdrawal from alcohol or benzodiazepines). Treat the cause, reorient, restore sleep, avoid restraints, and use antipsychotics only for dangerous agitation. **Alcohol withdrawal** peaks at 48 to 72 hours; benzodiazepines by symptom-triggered protocol and thiamine.

Lines and tubes

Line infection (remove the line, culture the tip), thrombophlebitis, and the nasogastric tube that is in the wrong place or blocked. Catheter-associated urinary infection: remove the catheter as early as possible.

Pearl: the two questions to ask of every deteriorating post-operative patient are "is this a leak" and "is this a bleed". They account for most of the early deaths that can be prevented.

Chapter 20: The Surgical Emergencies You Must Never Miss

These are the diagnoses where a delay of hours changes the outcome. Know the trigger, the confirmation, and the first action for each.

Emergency	Trigger to think of it	Confirmation	First actions
Ruptured abdominal aortic aneurysm	Older patient, abdominal or back pain, hypotension, collapse	Bedside ultrasound; CT only if stable	Two lines, crossmatch, permissive hypotension, vascular surgeon, operating room
Perforated viscus	Sudden severe pain, rigid abdomen, free air on upright radiograph or CT	Upright chest radiograph, CT	NPO, fluids, antibiotics, analgesia, operating room
Mesenteric ischemia	Pain out of proportion to examination, atrial fibrillation or vascular disease, raised lactate	CT angiography	Fluids, heparin, antibiotics, urgent revascularization or laparotomy
Strangulated hernia or bowel	Irreducible tender hernia, obstruction with fever, tachycardia, peritonitis, rising lactate	Clinical, CT	Do not force reduction; fluids, antibiotics, operating room
Ectopic pregnancy	Any woman of reproductive age with abdominal pain or collapse	Beta-hCG, transvaginal ultrasound	Two lines, crossmatch, gynecology, operating room if unstable
Testicular torsion	Sudden severe scrotal pain, high-riding testis, absent cremasteric reflex, often adolescent	Clinical; ultrasound only if it does not delay	Urology, scrotal exploration within six hours
Necrotizing soft tissue infection	Pain out of proportion, rapid spread, crepitus, toxicity	Clinical; surgical exploration	Antibiotics including clindamycin, resuscitation, immediate debridement
Acute limb ischemia	Sudden pain, pallor, pulselessness, paresthesia, paralysis, cold	Clinical, Doppler, CT angiography	Heparin, analgesia, vascular surgeon within hours
Cholangitis	Fever, jaundice, right upper quadrant pain, with or without hypotension and confusion	Bloods, ultrasound	Resuscitation, antibiotics, urgent ERCP
Tension pneumothorax	Respiratory distress, hypotension, absent breath sounds, tracheal deviation	Clinical, never a radiograph first	Needle or finger decompression, then chest tube
Cardiac tamponade	Penetrating chest trauma, hypotension, distended neck veins, muffled sounds	Bedside ultrasound	Pericardiocentesis as a bridge, thoracotomy
Compartment syndrome	Pain out of proportion, pain on passive stretch, tense compartment after fracture, crush, reperfusion, or a tight cast	Clinical; compartment pressure if unsure	Remove the cast or dressing, keep the limb at heart level, urgent fasciotomy
Toxic megacolon	Colitis with abdominal distension, fever, tachycardia, colon over 6 cm	Radiograph, clinical	Fluids, steroids or antibiotics as appropriate, surgical

Emergency	Trigger to think of it	Confirmation	First actions
	on radiograph		review, colectomy if failing
Post-operative hemorrhage	Tachycardia, hypotension, oliguria, blood in the drain, expanding swelling	Hemoglobin lags; clinical	Fluids and blood, correct coagulation, return to the operating room early
Anastomotic leak	POD 3 to 7, tachycardia, fever, ileus, pain, peritonitis, feculent drain	CT with contrast	Antibiotics, drainage or reoperation with diversion
Evisceration	Serosanguineous wound discharge then bowel through the wound	Clinical	Cover with saline-soaked gauze, operating room
Massive gastrointestinal hemorrhage	Hematemesis or hematochezia with instability	Endoscopy, CT angiography	Two lines, blood, proton pump inhibitor or vasoactive agent, endoscopy or embolization
Fournier gangrene	Perineal pain, swelling, crepitus, toxicity, especially diabetic or immunosuppressed	Clinical	Antibiotics, resuscitation, immediate debridement, urology and general surgery

Pearl: every row in this table shares one feature: the clinical picture is enough to start treatment. Imaging confirms; it does not give permission.

Key Points

- Elective foregut, bariatric, and hernia operations are chosen after investigation proves the diagnosis and excludes the mimics; a bariatric patient with tachycardia has a leak until proven otherwise.
- Post-operative complications are approached by system; the two questions for every deteriorating patient are "is this a leak" and "is this a bleed".
- Sepsis in a surgical patient needs source control; antibiotics alone fail.
- The emergencies table is the one to memorize; for every row, the clinical picture is enough to start.

Part 4: The Practical Toolkit

Chapter 21: Labs and Imaging for the Surgical Patient

The bloods that matter and what they mean

- **Hemoglobin.** Lags behind acute bleeding by hours; trend it. Transfuse at about 70 g/L in most patients, about 80 with cardiac disease.
- **White cell count.** Raised in infection, inflammation, and after steroids; normal in many cases of appendicitis and perforation. A left shift and a rising count over hours are more useful than one number.
- **Electrolytes.** Hypokalemia and hypomagnesemia prolong ileus and cause arrhythmias; vomiting and nasogastric losses drive them. Hyponatremia after surgery is usually excess free water. Hyperkalemia after reperfusion, rhabdomyolysis, or renal failure is an emergency.
- **Creatinine and urea.** Rising creatinine is acute kidney injury; a urea rising out of proportion suggests dehydration or an upper gastrointestinal bleed.
- **Lactate.** Raised in hypoperfusion, sepsis, and ischemia; a rising lactate in a patient with abdominal pain is mesenteric ischemia or strangulation until proven otherwise; a falling lactate is the best sign that resuscitation is working.
- **Liver enzymes.** Transaminases for hepatocellular injury; alkaline phosphatase, gamma-glutamyl transferase, and bilirubin for obstruction.
- **Lipase.** Three times the upper limit of normal diagnoses pancreatitis; the height does not predict severity.
- **C-reactive protein.** Rises over 24 to 48 hours; useful for trend after bowel surgery (a rise on POD 3 to 5 raises the question of a leak).
- **Coagulation.** International normalized ratio, partial thromboplastin time, platelets, and fibrinogen before major surgery in anticoagulated patients and in bleeding.
- **Albumin.** A marker of nutrition and inflammation; low albumin predicts wound and anastomotic problems.
- **Glucose and hemoglobin A1c.** Poor control raises infection risk.
- **Beta-hCG** in every woman of reproductive age with abdominal pain.
- **Blood gas.** Acid-base status and lactate in the sick patient.
- **Type and screen or crossmatch** before any operation with expected blood loss.

Imaging: which test first

Question	First test	Then
Free air	Upright chest radiograph	CT
Right upper quadrant pain	Ultrasound	CT for complications; MRCP for the duct
Undifferentiated abdominal pain in an adult	CT with intravenous contrast	
Appendicitis in a child or in pregnancy	Ultrasound	MRI in pregnancy
Bowel obstruction	CT with contrast (radiograph as a screen)	Water-soluble contrast study
Mesenteric ischemia	CT angiography	Catheter angiography
Pancreatitis complications after about 72 hours	CT with contrast	
Gastrointestinal bleeding, brisk	CT angiography	Angiographic embolization
Abdominal aortic aneurysm	Bedside ultrasound; CT angiography if stable	
Pulmonary embolism	CT pulmonary angiography	Ventilation-perfusion scan if contrast is contraindicated
Deep venous thrombosis	Compression ultrasound	
Trauma, unstable	FAST and chest and pelvic radiographs	Operating room
Trauma, stable with significant mechanism	CT of head, spine, chest, abdomen and pelvis	
Breast lump	Mammography over about 40, ultrasound under; core biopsy	MRI selectively
Thyroid nodule	Ultrasound	Fine needle aspiration
Biliary duct anatomy without intervention	MRCP	ERCP to treat

Contrast cautions. Intravenous contrast and renal function (hydrate; the risk in modern practice is lower than once taught but real in severe kidney disease); metformin around contrast; previous contrast reaction (premedicate or choose another test); pregnancy (ultrasound and MRI first, and a single CT is justified when the diagnosis matters).

Radiation. A CT of the abdomen and pelvis is roughly the dose of a few years of background radiation; justified when it changes management, and the reason ultrasound and MRI come first in children and pregnancy.

Reading a chest radiograph in ten seconds

Airway central, breathing (lung fields, pneumothorax at the edges, effusions at the costophrenic angles), cardiac size and mediastinal width, diaphragm (free air under it, elevation), everything else (bones, lines, tubes, and the nasogastric tube below the diaphragm).

Reading an abdominal radiograph

Bowel gas pattern (small bowel central with valvulae across the lumen, over 3 cm dilated; large bowel peripheral with haustra, over 6 cm dilated, cecum over 9 to 10 cm at risk), air-fluid levels on an erect film, free air (upright chest film is better), calcifications (stones, aneurysm wall, pancreas), and foreign bodies. Most abdominal radiographs are replaced by CT; the exceptions are the screen for obstruction, the position of a tube, and the follow-up of a known obstruction.

Chapter 22: Fifty Questions You Will Actually Get Asked

Q1. What are the boundaries of the triangle of Calot, and why do we care? The cystic duct, the common hepatic duct, and the inferior edge of the liver. The cystic artery runs through it. Clearing it to the critical view of safety is what prevents bile duct injury during cholecystectomy.

Q2. Where is McBurney's point? One third of the way along a line from the anterior superior iliac spine to the umbilicus. It is the surface marking of the appendix base and the site of maximal tenderness in classic appendicitis.

Q3. What are the layers you go through in a midline laparotomy? Skin, subcutaneous fat, linea alba (the fused aponeuroses of the rectus sheath), transversalis fascia and extraperitoneal fat, and peritoneum. There is no muscle in the midline, which is why the incision is bloodless and fast.

Q4. What is the difference between a direct and an indirect inguinal hernia? An indirect hernia exits through the deep inguinal ring, lateral to the inferior epigastric vessels, and follows the cord. A direct hernia pushes through the posterior wall of the canal, medial to the inferior epigastric vessels, in Hesselbach's triangle.

Q5. Why do femoral hernias strangulate more often? The femoral canal has a narrow, rigid neck bounded by the inguinal ligament, the lacunar ligament, the femoral vein, and the pectineal ligament, so bowel that enters it is easily trapped.

Q6. What are the borders of Hesselbach's triangle? The inferior epigastric vessels laterally, the lateral edge of the rectus sheath medially, and the inguinal ligament inferiorly.

Q7. What are the signs of strangulation in a bowel obstruction? Fever, tachycardia, peritonitis, and a rising white cell count or lactate. Any one ends non-operative management.

Q8. What is the most common cause of small bowel obstruction? Of large bowel obstruction? Adhesions from previous surgery for the small bowel; colorectal cancer for the large bowel.

Q9. What is Charcot's triad? Reynolds' pentad? Fever, jaundice, and right upper quadrant pain in cholangitis. Reynolds' pentad adds hypotension and confusion and signals septic shock.

Q10. What is Murphy's sign? Inspiratory arrest when the examiner's fingers are pressed under the right costal margin, from the inflamed gallbladder descending onto them. It is a sign of cholecystitis, not of biliary colic.

Q11. What is Courvoisier's law? A palpable, non-tender gallbladder in a jaundiced patient is unlikely to be due to stones, because a stone-bearing gallbladder is fibrotic and does not distend; suspect a malignant obstruction of the distal bile duct.

Q12. What are the causes of acute pancreatitis? Gallstones and alcohol account for most. Then hypertriglyceridemia, hypercalcemia, drugs, ERCP, trauma, infection, autoimmune, hereditary, and

idiopathic.

Q13. What is the critical view of safety? The hepatocystic triangle is cleared of fat and fibrous tissue, the lower third of the gallbladder is separated from the liver bed, and only two structures are seen entering the gallbladder.

Q14. What does free air under the diaphragm mean? Perforation of a hollow viscus until proven otherwise. It is also normal for several days after laparotomy or laparoscopy.

Q15. What is the difference between guarding and rigidity? Guarding is contraction of the abdominal wall when palpated and may be voluntary. Rigidity is involuntary, board-like, and indicates peritonitis.

Q16. Name the five Ws of post-operative fever. Wind (atelectasis, pneumonia), water (urinary infection), wound, walking (venous thromboembolism), and wonder drugs (drug fever). Add the sixth: the abdomen (leak, abscess).

Q17. When does an anastomotic leak typically present? Post-operative day 3 to 7, with tachycardia first, then fever, pain, ileus, and peritonitis.

Q18. What is the first sign of a leak after bariatric surgery? Persistent tachycardia, often over 120, before any fever or abdominal sign.

Q19. What are the classes of hemorrhagic shock? Class I under 15 percent loss, minimal signs; class II 15 to 30 percent, tachycardia and narrowed pulse pressure; class III 30 to 40 percent, hypotension and confusion; class IV over 40 percent, profound hypotension and lethargy.

Q20. What is the lethal triad in trauma? Hypothermia, acidosis, and coagulopathy. Each worsens the others.

Q21. What is Beck's triad? Hypotension, distended neck veins, and muffled heart sounds, in cardiac tamponade.

Q22. What are the immediately life-threatening chest injuries? Airway obstruction, tension pneumothorax, open pneumothorax, massive hemothorax, flail chest with contusion, and cardiac tamponade.

Q23. What is the rule of nines? Adult body surface area: head 9 percent, each arm 9, each leg 18, anterior trunk 18, posterior trunk 18, perineum 1. Used to estimate burn size for fluid resuscitation.

Q24. What is the Parkland formula? Four millilitres of crystalloid per kilogram per percent of body surface burned over 24 hours, half in the first eight hours from the time of injury; many centres now use two to four millilitres and titrate to urine output.

Q25. What are the six Ps of acute limb ischemia? Pain, pallor, pulselessness, paresthesia, paralysis, and poikilothermia.

Q26. What is a normal ankle-brachial index? About 0.9 to 1.3. Under 0.9 is peripheral arterial disease; under 0.5 suggests critical ischemia; over 1.3 means calcified vessels and an unreliable test.

Q27. At what size is an abdominal aortic aneurysm repaired electively? About 5.5 cm in men and about 5 cm in women, or growth faster than about 1 cm a year, or symptoms.

Q28. What is Virchow's triad? Stasis, endothelial injury, and hypercoagulability, the three drivers of venous thrombosis.

Q29. What is the difference between a venous and an arterial leg ulcer? Venous ulcers sit above the medial malleolus, are shallow and irregular with surrounding stasis changes, and are less painful. Arterial ulcers are on the toes, heel, and pressure points, punched out, pale, and painful.

Q30. What is the triple assessment of a breast lump? Clinical examination, imaging (mammography and ultrasound), and tissue sampling (core biopsy). All three must agree.

Q31. What is the most common type of breast cancer? Invasive ductal carcinoma of no special type.

Q32. What is the strongest prognostic factor in breast cancer? Axillary lymph node status.

Q33. Which thyroid cancer is the most common, and how does it spread? Papillary carcinoma, which spreads to cervical lymph nodes and carries an excellent prognosis. Follicular spreads hematogenously.

Q34. What are the complications of thyroidectomy? Recurrent laryngeal nerve injury, superior laryngeal nerve injury, hypocalcemia from parathyroid injury, and neck hematoma with airway compromise.

Q35. What are Chvostek and Trousseau signs? Chvostek: facial twitching when the facial nerve is tapped. Trousseau: carpal spasm when a blood pressure cuff is inflated above systolic for a few minutes. Both indicate hypocalcemia.

Q36. What is a Hartmann procedure? Resection of the sigmoid colon with an end colostomy and closure of the rectal stump, used in perforated diverticulitis and obstructing cancer when an anastomosis is unsafe. It can be reversed months later.

Q37. What is the Hinchey classification? Stages of perforated diverticulitis: I pericolic abscess, II pelvic or distant abscess, III purulent peritonitis, IV feculent peritonitis.

Q38. What is Goodsall's rule? For an anal fistula, an external opening anterior to a transverse line through the anus tracks radially to the nearest crypt; a posterior opening tracks in a curve to the posterior midline.

Q39. What is the difference between an ileostomy and a colostomy on inspection? An ileostomy is usually in the right lower quadrant, spouted, with liquid output. A colostomy is usually on the left, flush, with formed stool.

Q40. What is dumping syndrome? Rapid gastric emptying after gastric surgery: early (within 30 minutes) with abdominal cramps, diarrhea, and vasomotor symptoms from fluid shifts; late (one to three hours) with hypoglycemia from an exaggerated insulin response.

Q41. What are the wound classes? Clean, clean-contaminated, contaminated, and dirty, with infection risk rising from about 1 to over 20 percent.

Q42. When do you give antibiotic prophylaxis before surgery? A single dose within 60 minutes of incision for clean-contaminated procedures and for clean procedures with an implant; redose during long operations.

Q43. What is the ASA classification? American Society of Anesthesiologists physical status: 1 healthy, 2 mild systemic disease, 3 severe systemic disease, 4 severe disease that is a constant threat to life, 5 moribund, 6 brain dead; E for emergency.

Q44. What is the 4-2-1 rule? Hourly maintenance fluid: 4 mL per kilogram for the first 10 kg, 2 mL for the next 10 kg, 1 mL for each kilogram after that.

Q45. What is the minimum acceptable urine output in an adult? About 0.5 mL per kilogram per hour.

Q46. Why is Ringer's lactate preferred to normal saline for resuscitation? Large volumes of saline cause hyperchloremic metabolic acidosis; balanced crystalloids are closer to plasma.

Q47. What is the sentinel lymph node? The first node that drains a tumour; if it is free of cancer, the rest of the basin is assumed clear and a full dissection is avoided.

Q48. How is melanoma biopsied? By excision with a narrow margin of the whole lesion, never a shave, so that Breslow thickness can be measured.

Q49. What is the most common cause of major lower gastrointestinal bleeding? Diverticular bleeding, which is painless and stops spontaneously in most cases.

Q50. What does a rising lactate mean in a patient with abdominal pain? Hypoperfusion or ischemia: mesenteric ischemia, strangulated bowel, or sepsis. It is an indication to involve the surgeon immediately.

Chapter 23: Quick Reference

1. Fluids

Item	Number	Note
Maintenance water	About 25 to 30 mL per kg per day	4-2-1 rule hourly
Maintenance sodium and potassium	About 1 mmol per kg per day each	Add potassium once urine output is adequate
Minimum urine output	0.5 mL per kg per hour	Below this, assess volume
Fluid bolus	500 mL crystalloid, reassess	Repeat as needed
Transfusion threshold	Hemoglobin about 70 g/L; about 80 with cardiac disease	Bleeding patients: by clinical state

2. Drains and tubes

Tube	Watch for	Remove when
Nasogastric	Output volume; replace losses	Output falling and bowel function returning
Urinary catheter	Hourly output in the sick; infection with time	POD 1 to 2 for most; earlier the better
Closed suction drain	Volume and character every shift; feculent, bilious, purulent, or bloody output	Low output, clean character; surgeon decides
Chest tube	Air leak, output, swinging	Lung up, output low, no leak
Ileostomy	Colour; output over about 1.5 L a day	Not applicable

3. Antibiotic prophylaxis (typical; follow local protocol)

Operation	Agent
Clean with implant, hernia mesh, vascular	Cefazolin
Biliary, upper gastrointestinal, urologic, gynecologic	Cefazolin
Colorectal	Cefazolin plus metronidazole, or a comparable regimen; oral antibiotics with mechanical preparation
Appendectomy	Cefazolin plus metronidazole, or a comparable regimen
Beta-lactam allergy	Clindamycin or vancomycin, with gentamicin for gram-negative cover

Timing: within 60 minutes before incision (vancomycin within 120); redose after about two half-lives or 1.5 L blood loss.

4. Post-operative fever by day

Day	Think
0 to 1	Atelectasis, transfusion reaction, malignant hyperthermia, early necrotizing wound infection, early leak
2 to 3	Pneumonia, urinary infection, line infection
3 to 5	Wound infection, leak declaring
5 to 7	Leak, abscess, deep venous thrombosis, pulmonary embolism
Any	Drug fever, Clostridioides difficile

5. Classifications to recognize

System	Use
ASA 1 to 6	Anesthetic risk
Wound class clean to dirty	Infection risk
Hinchey I to IV	Perforated diverticulitis
Glasgow Coma Scale 3 to 15	Head injury; 8 or less means intubate
Hemorrhagic shock class I to IV	Blood loss estimate
TNM	Cancer staging
Bethesda I to VI	Thyroid cytology
BI-RADS 0 to 6	Breast imaging
Breslow thickness	Melanoma depth and margins

6. Numbers worth memorizing

Value	Number
Small bowel dilated	Over about 3 cm
Large bowel dilated	Over about 6 cm; cecum at risk over 9 to 10 cm
Aneurysm repair threshold	About 5.5 cm men, 5 cm women
Ankle-brachial index normal	About 0.9 to 1.3
Appendix on ultrasound	Non-compressible, over about 6 mm
Common bile duct dilated	Over about 6 mm (wider with age and after cholecystectomy)
Lipase for pancreatitis	Over three times upper limit
Insufflation pressure	About 12 to 15 mmHg
Time to limb loss in acute ischemia	About six hours
Testicular torsion salvage	Best under six hours
Fasting	Clear fluids 2 hours, light meal 6, full meal 8 (varies)

7. The call-the-resident list

Heart rate over 120 or under 50; systolic pressure under 90; oxygen saturation under 92 on oxygen; temperature over 38.5 or under 35.5; urine output under 0.5 mL per kg per hour for two hours; new confusion; chest pain or new dyspnea; frank blood in a drain or a rising drain output; a rigid or newly distended abdomen; serosanguineous discharge from a laparotomy wound; a dusky stoma; calf pain or swelling; any patient the nurse is worried about.

Chapter 24: Your First Week Checklist

Before day one. Read Chapters 1 to 5. Practise a two-handed and an instrument tie. Find out the team's start time, the OR schedule, and the name of the chief resident. Buy comfortable shoes.

Day one. Arrive early. Introduce yourself to everyone including the ward clerk and the scrub nurse. Take two or three patients. Write the one-line problem list for every patient on the service. Ask the resident how they want to be paged.

Day two. Pre-round on your patients with the numbers ready. Present in the thirty-second format. Scrub into a case you read about the night before. Ask one question after the case.

Day three. See a consult in the emergency department first and present it in the ninety-second format. Do a rectal examination and a groin examination on the patients who need them without being asked.

Day four. Follow one patient from consult to operating room to post-operative care and write the story in your notebook. Ask to close skin or tie a knot.

Day five. Review your week: which presentations did you see, which did you miss, and which chapter do you need to reread. Ask the resident for one piece of feedback and write it down.

Every day. Know your patients' numbers. Be in the room before the patient. Say "I do not know, I will find out". Eat something. Go home when you are sent home.

Board-Style Practice Questions (MCCQE and USMLE Level)

This section is a bank of 80 original, single-best-answer clinical vignettes written at the level of the MCCQE Part I and the USMLE Step 2 CK. They are grouped by topic and cover the same material as the chapters you just read, tested the way exams test it: a short clinical story, a focused question, five options, and one best answer.

Each question is written in learning mode. The answer, a full explanation of why the correct choice is right and why each other option is wrong, and a one-line educational objective follow immediately. To self-test, cover everything below the options, commit to an answer, then read on.

These questions are entirely original teaching items written for this book. They are not reproduced from any question bank or examination.

How to use this bank. First pass: do a topic block after reading its chapter, untimed, and read every explanation even when you answer correctly. Second pass: a week later, redo the ones you missed. The educational objective is the single sentence worth memorizing from each item.

Educational use only. These questions are a study aid, not clinical guidance. Confirm every drug, dose, and management choice against current guidelines and your supervising physician before applying it to a patient.

Perioperative Care, Fluids, and Post-operative Management

Question 1

A 72-year-old man is post-operative day 1 after an open right hemicolectomy. He weighs 80 kg. Overnight his urine output was 20 mL per hour for four hours. His heart rate is 108, blood pressure 104/62, and he is alert. His abdomen is soft with appropriate incisional tenderness and the drain contains 30 mL of serous fluid. His creatinine has risen from 80 to 118 micromoles per litre.

Which of the following is the most appropriate next step?

- **A.** Furosemide 40 mg intravenously
- **B.** A 500 mL bolus of balanced crystalloid and reassessment of urine output
- **C.** CT of the abdomen and pelvis with contrast
- **D.** Insertion of a central venous catheter to measure central venous pressure
- **E.** Renal ultrasound

Answer: B

Explanation. Oliguria under 0.5 mL per kilogram per hour with tachycardia, borderline blood pressure, and a rising creatinine on the first post-operative day is pre-renal until proven otherwise; this patient has ongoing third-space losses after a laparotomy and is under-resuscitated. The correct response is a fluid challenge and reassessment. Furosemide would worsen hypovolemia and may convert a pre-renal state into tubular injury. CT is not indicated when the abdomen is benign and the drain is serous; a leak or bleed declares itself with peritonitis, blood in the drain, or a falling hemoglobin. A central line adds little to the bedside assessment here and delays treatment. Renal ultrasound looks for obstruction, which is unlikely with a catheter draining and no other reason; if the catheter is in place, checking that it is not blocked is reasonable but the fluid comes first.

Educational objective. Early post-operative oliguria with tachycardia is hypovolemia until proven otherwise; give a crystalloid bolus and reassess before diuretics or imaging.

Question 2

A 58-year-old woman is being assessed in the pre-admission clinic before an elective laparoscopic cholecystectomy. She has hypertension controlled with amlodipine and no other medical history. She climbs three flights of stairs without stopping. Her examination is normal.

Which of the following pre-operative investigations is most appropriate?

- **A.** Chest radiograph, ECG, complete blood count, electrolytes, coagulation profile, and pulmonary function tests
- **B.** Complete blood count only, with an ECG if the institutional age threshold is met
- **C.** Transthoracic echocardiogram
- **D.** Exercise stress test
- **E.** No investigations

Answer: B

Explanation. Routine pre-operative testing of every patient is not recommended; tests are ordered when the patient's condition or the operation makes them likely to change management. A fit patient with good functional capacity (more than four metabolic equivalents) and controlled hypertension having a low-to-intermediate-risk laparoscopic operation needs, at most, a complete blood count and an ECG if she meets the local age or risk criteria. A full battery including pulmonary function tests and a chest radiograph is unnecessary and generates false positives that delay surgery. Echocardiography and stress testing are reserved for patients with poor functional capacity, active cardiac symptoms, or multiple risk factors having a major operation. Ordering nothing at all is defensible in some protocols, but a baseline complete blood count is standard before an operation with a small but real bleeding risk.

Educational objective. Order pre-operative tests that change management; functional capacity above four metabolic equivalents in a low-risk patient having a low-risk operation needs minimal testing.

Question 3

A 45-year-old man is post-operative day 5 after a laparoscopic sigmoid colectomy for diverticular disease. He had been passing flatus and eating on day 3. This morning he reports nausea and vomited twice. His heart rate is 116, temperature 38.4 C, and his abdomen is distended with generalized tenderness and guarding. White cell count is 17 and C-reactive protein has risen from 60 to 240.

Which of the following is the most likely diagnosis?

- A. Post-operative ileus
- B. Adhesive small bowel obstruction
- C. Anastomotic leak
- D. Clostridioides difficile colitis
- E. Urinary tract infection

Answer: C

Explanation. The return of vomiting after bowel function had resumed, on post-operative day 5, with tachycardia, fever, a distended tender abdomen with guarding, and a sharply rising C-reactive protein is the classic presentation of an anastomotic leak. Ileus does not produce fever, guarding, and a rising inflammatory marker after function had returned. Adhesive obstruction is unusual this early and does not explain the fever and peritonism. Clostridioides difficile causes diarrhea rather than vomiting and distension with guarding, although fulminant colitis can mimic this; it would be considered if diarrhea were present. A urinary infection does not cause peritonitis. The next step is resuscitation, antibiotics, and a CT with contrast, followed by drainage or reoperation.

Educational objective. Vomiting that returns after bowel function had resumed, with fever and peritonism around post-operative day 3 to 7, is an anastomotic leak until proven otherwise.

Question 4

A 66-year-old woman is post-operative day 2 after an open abdominal aortic aneurysm repair. She has a temperature of 38.1 C, mild dyspnea, and reduced breath sounds at both lung bases with dullness to percussion. Oxygen saturation is 93 percent on room air. Her wound is clean and her abdomen is soft.

Which of the following is the most appropriate management?

- A. Broad-spectrum intravenous antibiotics for pneumonia
- B. CT pulmonary angiography

- **C.** Analgesia, incentive spirometry, mobilization, and chest physiotherapy
- **D.** Blood cultures and removal of all intravenous lines
- **E.** Furosemide for pulmonary edema

Answer: C

Explanation. Low-grade fever with bibasal reduced breath sounds on the first two days after a major upper abdominal operation is most consistent with atelectasis, driven by splinting from pain and shallow breathing. Treatment is adequate analgesia so the patient can breathe deeply, incentive spirometry, chest physiotherapy, and mobilization. Antibiotics are reserved for pneumonia, which typically appears later with productive cough, a higher fever, and an infiltrate. Pulmonary embolism produces sudden dyspnea and tachycardia rather than bibasal findings, and typically later. Line sepsis is not suggested by the picture. Pulmonary edema is possible after large-volume resuscitation but would show crackles and a positive fluid balance rather than basal dullness alone; assessing the fluid balance is reasonable but the primary treatment here is pulmonary hygiene.

Educational objective. Early post-operative fever with basal findings after upper abdominal surgery is treated with analgesia, incentive spirometry, and mobilization before antibiotics.

Question 5

A 30-year-old man weighing 70 kg is admitted with a small bowel obstruction. A nasogastric tube is draining 1.2 litres of bilious fluid a day. He is NPO. His electrolytes show sodium 136, potassium 3.1, chloride 92, and bicarbonate 34 mmol per litre.

Which of the following intravenous fluid regimens is most appropriate?

- **A.** Five percent dextrose at maintenance rate
- **B.** Normal saline with potassium supplementation at maintenance rate plus replacement of the nasogastric losses
- **C.** Balanced crystalloid at maintenance rate without replacement of losses
- **D.** Three percent hypertonic saline
- **E.** Albumin 5 percent

Answer: B

Explanation. Nasogastric losses are rich in hydrogen, chloride, sodium, and potassium, producing a hypokalemic, hypochloremic metabolic alkalosis, as seen here. The losses must be replaced in addition to maintenance, and the replacement fluid should contain chloride and potassium, which makes normal saline with added potassium the appropriate choice; the chloride corrects the alkalosis. Dextrose alone provides free water and no electrolytes and would worsen the hyponatremia and hypokalemia. Maintenance fluid without replacing 1.2 litres of daily losses leaves the patient in deficit. Hypertonic saline

is for symptomatic severe hyponatremia, which is not present. Albumin has no role in routine replacement of gastrointestinal losses.

Educational objective. Replace nasogastric losses volume for volume with a chloride-containing fluid plus potassium, in addition to maintenance, to correct the hypochloremic hypokalemic alkalosis they cause.

Question 6

A 52-year-old woman underwent a total thyroidectomy for papillary carcinoma six hours ago. The nurse reports that she is anxious, her voice is muffled, and she has difficulty swallowing. On examination the anterior neck is tense and swollen and the dressing is dry. Oxygen saturation is 95 percent and falling.

Which of the following is the most appropriate immediate action?

- **A.** Order a CT of the neck
- **B.** Check serum calcium and give intravenous calcium gluconate
- **C.** Open the wound at the bedside to evacuate the hematoma and call the surgeon
- **D.** Administer nebulized epinephrine and observe
- **E.** Perform a cricothyroidotomy

Answer: C

Explanation. A tense, swollen neck with dysphagia, voice change, and falling saturation within hours of thyroidectomy is a compressive neck hematoma, which obstructs the airway by venous and lymphatic congestion of the larynx. The immediate life-saving step is to open the skin and strap muscle closure at the bedside to release the hematoma, then return to the operating room for definitive control. Imaging wastes the minutes that matter. Hypocalcemia causes tingling and spasm, not a tense neck. Nebulized epinephrine does not address the compression. Cricothyroidotomy is a rescue for a failed airway; decompressing the hematoma comes first and usually relieves the obstruction, and anesthesia should be called to secure the airway in parallel.

Educational objective. Post-thyroidectomy neck hematoma with airway compromise is treated by opening the wound at the bedside immediately, before imaging.

Question 7

A 68-year-old man is post-operative day 3 after an open inguinal hernia repair under spinal anesthesia. He has not passed urine for ten hours, has suprapubic discomfort, and a bladder scan shows 750 mL. He takes tamsulosin for benign prostatic hyperplasia.

Which of the following is the most appropriate next step?

- **A.** Furosemide 20 mg intravenously

- **B.** Insert a urethral catheter and plan a trial of void after 24 to 72 hours
- **C.** Insert a suprapubic catheter
- **D.** Start empiric antibiotics for a urinary tract infection
- **E.** Renal ultrasound and nephrology consultation

Answer: B

Explanation. Post-operative urinary retention is common after spinal anesthesia, groin surgery, and in older men with prostatic enlargement; a bladder volume of 750 mL with discomfort confirms it. The treatment is to drain the bladder with a urethral catheter and then attempt a trial of void once the anesthetic effect has resolved and pain is controlled, with the alpha-blocker continued. Furosemide increases urine production into a bladder that cannot empty and worsens retention. A suprapubic catheter is reserved for failed urethral catheterization or urethral injury. Antibiotics are not indicated without evidence of infection. Renal imaging is not required for an obvious post-operative retention.

Educational objective. Post-operative urinary retention is diagnosed by bladder scan and treated by catheterization followed by a trial of void, not by diuretics.

Question 8

A 40-year-old woman is post-operative day 7 after a laparotomy for perforated appendicitis. Over the last 24 hours the wound has leaked a moderate volume of pink, serosanguineous fluid. On removing the dressing the skin edges are intact but the wound feels soft in the middle. She is afebrile.

Which of the following is the most likely diagnosis?

- **A.** Superficial wound infection
- **B.** Seroma
- **C.** Fascial dehiscence
- **D.** Enterocutaneous fistula
- **E.** Normal wound healing

Answer: C

Explanation. A sudden discharge of serosanguineous, pink fluid from a laparotomy wound around post-operative day 5 to 10 is the classic herald of fascial dehiscence, especially in a contaminated case; the fluid is peritoneal fluid tracking through the separated fascia, and the wound feels soft because the fascial support is gone. Infection produces purulent discharge with erythema and warmth. A seroma is a localized fluctuant collection with straw-coloured fluid, not the volume and character described. An enterocutaneous fistula drains enteric content, which is bilious or feculent, and typically later. Normal wounds do not discharge on day 7. The wound needs examination by the surgeon; if the fascia is open the patient returns to the operating room before evisceration occurs.

Educational objective. Serosanguineous drainage from a laparotomy wound around post-operative day 5 to 10 signals fascial dehiscence and needs urgent surgical assessment.

The Acute Abdomen and Appendicitis

Question 9

A 23-year-old man presents with 18 hours of abdominal pain that began around the umbilicus and has moved to the right lower quadrant. He has anorexia and vomited once after the pain began. Temperature is 37.9 C, heart rate 96. He is tender at McBurney's point with localized guarding. White cell count is 13.5. Urinalysis is normal.

Which of the following is the most appropriate next step in management?

- **A.** Discharge with analgesia and review in 24 hours
- **B.** Intravenous antibiotics alone and reassessment in 48 hours
- **C.** NPO, intravenous fluids, analgesia, and surgical consultation for appendectomy
- **D.** Colonoscopy
- **E.** Barium enema

Answer: C

Explanation. Migratory pain, anorexia, vomiting after the onset of pain, low-grade fever, localized right lower quadrant tenderness with guarding, and leukocytosis in a young man is appendicitis with a high pre-test probability; the management is resuscitation, analgesia, and surgical assessment for appendectomy, with imaging at the surgeon's discretion. Discharge risks perforation. Antibiotics alone are an option in selected adults with imaging-confirmed uncomplicated disease and no appendicolith after a shared decision, but they are not the default and require confirmation first. Colonoscopy is contraindicated in acute appendicitis because of perforation risk, and barium enema has no role.

Educational objective. A classic history of migratory pain with localized right lower quadrant peritonism and leukocytosis is managed with resuscitation and surgical assessment for appendectomy.

Question 10

A 78-year-old woman with atrial fibrillation who stopped her anticoagulant two weeks ago presents with four hours of severe, constant central abdominal pain. She has vomited once and had one loose stool. On examination she is in obvious distress, but her abdomen is soft with only mild diffuse tenderness and no guarding. Heart rate is 118 and irregular. Lactate is 4.8 mmol per litre.

Which of the following is the most likely diagnosis?

- A. Acute pancreatitis
- B. Acute mesenteric ischemia
- C. Sigmoid volvulus
- D. Gastroenteritis
- E. Diverticulitis

Answer: B

Explanation. Severe pain out of proportion to a soft abdomen, in a patient with atrial fibrillation who is not anticoagulated, with a raised lactate and early gut emptying (vomiting and a loose stool), is the textbook presentation of acute mesenteric ischemia from an embolus to the superior mesenteric artery. Peritoneal signs appear only once the bowel infarcts, by which time mortality is high. Pancreatitis causes epigastric pain radiating to the back with a raised lipase. Sigmoid volvulus produces distension and constipation. Gastroenteritis does not produce a lactate of 4.8 and pain of this severity. Diverticulitis is localized and inflammatory. The next step is CT angiography, heparin, resuscitation, and urgent revascularization or laparotomy.

Educational objective. Pain out of proportion to examination in a patient with atrial fibrillation and a raised lactate is mesenteric ischemia until proven otherwise; get CT angiography and a surgeon immediately.

Question 11

A 19-year-old woman presents with 12 hours of right lower quadrant pain and nausea. Her last menstrual period was six weeks ago and her periods are usually regular. Temperature is 37.4 C, heart rate 104, blood pressure 108/70. She has right lower quadrant tenderness with mild rebound.

Which of the following is the most important next investigation?

- A. CT of the abdomen and pelvis with contrast
- B. Urine or serum beta-human chorionic gonadotropin
- C. Plain abdominal radiograph
- D. Diagnostic laparoscopy
- E. Serum lipase

Answer: B

Explanation. Any woman of reproductive age with abdominal pain needs a pregnancy test before anything else, and a six-week history of amenorrhea with right lower quadrant pain and tachycardia raises ectopic pregnancy as an immediate life threat. A positive test leads to a transvaginal ultrasound; a negative test allows the workup for appendicitis and ovarian pathology to proceed with ultrasound and, if needed, CT. Ordering a CT first exposes a possibly pregnant patient to radiation and may miss the diagnosis. Plain

radiographs contribute nothing here. Diagnostic laparoscopy may be the eventual treatment but not before the pregnancy test and ultrasound. Lipase is not the priority with this presentation.

Educational objective. Every woman of reproductive age with abdominal pain gets a pregnancy test first; amenorrhea with lower abdominal pain is ectopic pregnancy until excluded.

Question 12

A 35-year-old man presents with 3 days of right lower quadrant pain, fever to 38.8 C, and a palpable tender mass. CT shows a 5 cm rim-enhancing fluid collection adjacent to a thickened appendix with an appendicolith, without free air or generalized fluid. He is hemodynamically stable with a soft abdomen away from the mass.

Which of the following is the most appropriate management?

- **A.** Immediate open appendectomy
- **B.** Intravenous antibiotics, percutaneous drainage of the abscess, and consideration of interval appendectomy
- **C.** Oral antibiotics and discharge
- **D.** Right hemicolectomy
- **E.** Colonoscopy within 24 hours

Answer: B

Explanation. Perforated appendicitis with a contained abscess in a stable patient is treated non-operatively in the first instance: intravenous antibiotics and image-guided percutaneous drainage of a drainable collection, because operating through an inflammatory phlegmon carries a high risk of bowel injury and conversion to a larger resection. Interval appendectomy weeks later is considered, particularly with an appendicolith, which raises the recurrence risk; in older patients colonoscopy is done to exclude a cecal neoplasm. Immediate appendectomy is for generalized peritonitis or failure of non-operative management. Oral antibiotics alone are inadequate for a 5 cm abscess. Hemicolectomy is not indicated. Colonoscopy in the acute phase risks perforation.

Educational objective. A contained appendiceal abscess in a stable patient is managed with antibiotics and percutaneous drainage, with interval appendectomy considered afterwards.

Question 13

A 55-year-old man presents with sudden, severe epigastric pain that began an hour ago while he was walking. He takes daily naproxen for osteoarthritis. He is lying still, sweating, with a heart rate of 110 and blood pressure 118/76. His abdomen is rigid with generalized rebound tenderness and absent bowel sounds.

Which of the following is the most appropriate next investigation?

- **A.** Serum lipase
- **B.** Upright chest radiograph
- **C.** Abdominal ultrasound
- **D.** Upper endoscopy
- **E.** MRI of the abdomen

Answer: B

Explanation. Sudden severe epigastric pain with a rigid abdomen in a man taking a non-steroidal anti-inflammatory drug is a perforated peptic ulcer until proven otherwise, and an upright chest radiograph is the fastest test to demonstrate free air under the diaphragm, present in about three quarters of cases; a CT follows if the radiograph is negative and the diagnosis remains likely. Lipase should be sent as part of the bloods but pancreatitis does not produce board-like rigidity within an hour. Ultrasound is poor at detecting free air. Endoscopy is contraindicated in suspected perforation because insufflation worsens it. MRI is slow and unnecessary. Management is resuscitation, antibiotics, a proton pump inhibitor, and an operation.

Educational objective. Sudden epigastric pain with a rigid abdomen suggests perforated ulcer; an upright chest radiograph for free air is the first investigation.

Question 14

A 62-year-old woman presents with two days of worsening generalized abdominal pain, distension, and vomiting. She has a history of a hysterectomy 15 years ago. Her heart rate is 124, temperature 38.6 C, and blood pressure 96/58. Her abdomen is distended and diffusely tender with involuntary guarding. Lactate is 5.2 mmol per litre. CT shows dilated small bowel loops with a transition point, free fluid, and a segment of bowel wall that does not enhance.

Which of the following is the most appropriate management?

- **A.** Nasogastric decompression and observation for 48 hours
- **B.** Water-soluble contrast challenge
- **C.** Resuscitation, broad-spectrum antibiotics, and urgent laparotomy
- **D.** Colonoscopic decompression
- **E.** Percutaneous drainage of the free fluid

Answer: C

Explanation. This patient has a small bowel obstruction with all four signs of strangulation (fever, tachycardia, peritonitis, raised lactate) and CT evidence of non-enhancing bowel, which means ischemic or dead bowel. She needs resuscitation with fluids, broad-spectrum antibiotics, and an urgent operation to resect the compromised segment. Non-operative management and a contrast challenge are appropriate

only for uncomplicated adhesive obstruction without signs of strangulation. Colonoscopic decompression is for sigmoid volvulus and pseudo-obstruction. Percutaneous drainage of reactive free fluid does not address the dying bowel.

Educational objective. Any sign of strangulation (fever, tachycardia, peritonitis, rising lactate, or non-enhancing bowel on CT) in a bowel obstruction mandates urgent operation.

Question 15

A 48-year-old woman presents with 24 hours of epigastric pain radiating to the back, with nausea and vomiting. She drinks no alcohol. Her lipase is 2,400 units per litre (normal under 60). Ultrasound shows gallstones in the gallbladder and a common bile duct of 5 mm. Liver enzymes are mildly raised. She is hemodynamically stable with no fever and no jaundice.

Which of the following is the most appropriate management plan?

- **A.** Urgent ERCP within 24 hours
- **B.** Supportive care with fluids and analgesia, then cholecystectomy during the same admission once the pancreatitis settles
- **C.** Immediate laparoscopic cholecystectomy
- **D.** Antibiotics and discharge with outpatient follow-up in six weeks
- **E.** Total parenteral nutrition for one week

Answer: B

Explanation. This is mild gallstone pancreatitis: the stone has passed, the duct is not dilated, and there is no cholangitis or persistent obstruction. Management is supportive (fluids, analgesia, early oral feeding as tolerated), followed by cholecystectomy during the same admission once the pancreatitis has settled, because delaying discharge without cholecystectomy carries a substantial risk of recurrent pancreatitis. Urgent ERCP is reserved for cholangitis or persistent biliary obstruction with a dilated duct and rising bilirubin. Operating during the acute inflammation is not standard for the mild case; the operation waits until the pain and enzymes settle. Antibiotics are not indicated in mild pancreatitis, and discharge without a plan for cholecystectomy invites recurrence. Parenteral nutrition is reserved for severe disease when enteral feeding fails.

Educational objective. Mild gallstone pancreatitis is treated supportively with cholecystectomy on the same admission; ERCP is reserved for cholangitis or persistent duct obstruction.

Question 16

A 28-year-old man presents with two days of generalized abdominal pain, nausea, and profuse watery diarrhea. He has a fever of 38.2 C. His abdomen is soft, mildly and diffusely tender, with active bowel

sounds and no guarding or rebound. White cell count is 12. He returned from travel abroad a week ago.

Which of the following is the most appropriate next step?

- **A.** Emergency laparotomy
- **B.** CT of the abdomen with contrast
- **C.** Supportive care with oral rehydration and stool studies, with clinical reassessment
- **D.** Diagnostic laparoscopy
- **E.** Upper endoscopy

Answer: C

Explanation. Diffuse mild tenderness with active bowel sounds, profuse diarrhea, and recent travel points to infectious gastroenteritis, a non-surgical cause of abdominal pain. There are no peritoneal signs. Management is rehydration, stool studies, and reassessment; the key safety step is serial examination, because early appendicitis and colitis can also begin this way, and any localization of tenderness or development of guarding changes the plan. CT is reserved for localizing signs, systemic toxicity, or failure to improve. Laparotomy and laparoscopy are not indicated in the absence of peritonism. Endoscopy has no role in acute gastroenteritis.

Educational objective. Diffuse mild tenderness with diarrhea and active bowel sounds and no peritonism is medical until serial examination says otherwise.

Biliary Disease and the Pancreas

Question 17

A 44-year-old woman presents with 30 hours of constant right upper quadrant pain, fever of 38.5 C, and vomiting. She has had similar shorter episodes after fatty meals in the past. On examination she has inspiratory arrest on palpation of the right upper quadrant. White cell count is 15. Bilirubin and liver enzymes are normal. Ultrasound shows gallstones, a gallbladder wall of 6 mm, and pericholecystic fluid.

Which of the following is the most appropriate management?

- **A.** Analgesia and elective cholecystectomy in six weeks
- **B.** NPO, intravenous fluids, antibiotics, and laparoscopic cholecystectomy during this admission
- **C.** ERCP with sphincterotomy
- **D.** Percutaneous cholecystostomy
- **E.** Oral ursodeoxycholic acid

Answer: B

Explanation. Persistent pain over six hours, fever, leukocytosis, a positive Murphy's sign, and ultrasound showing a thickened wall with pericholecystic fluid make the diagnosis of acute calculous

cholecystitis. In a fit patient the standard of care is early laparoscopic cholecystectomy during the same admission, ideally within 72 hours of onset, after resuscitation and antibiotics; delayed surgery carries more complications and readmissions. ERCP is for common duct stones or cholangitis, which the normal bilirubin and duct argue against. Percutaneous cholecystostomy is reserved for patients too sick to tolerate an operation. Ursodeoxycholic acid dissolves selected small cholesterol stones over months and has no role in acute cholecystitis.

Educational objective. Acute cholecystitis in a fit patient is treated by early laparoscopic cholecystectomy during the index admission, not by delayed surgery.

Question 18

A 70-year-old man presents with two days of fever, rigors, jaundice, and right upper quadrant pain. Temperature is 39.4 C, heart rate 122, blood pressure 88/50, and he is confused. Bilirubin is 110 micromoles per litre, alkaline phosphatase is 480 units per litre, and white cell count is 21. Ultrasound shows a common bile duct of 12 mm with a stone.

After initial resuscitation and intravenous antibiotics, which of the following is the most appropriate definitive step?

- **A.** Elective cholecystectomy in six weeks
- **B.** Urgent biliary decompression by ERCP
- **C.** MRCP to further define the anatomy
- **D.** Oral antibiotics and discharge
- **E.** Liver biopsy

Answer: B

Explanation. Fever, jaundice, and right upper quadrant pain (Charcot's triad) plus hypotension and confusion (Reynolds' pentad) is severe acute cholangitis from an obstructing common bile duct stone. Antibiotics alone do not treat an obstructed infected biliary system; the infected bile must be drained, and ERCP with sphincterotomy and stone extraction is the first-line method, urgently in a patient in septic shock. Cholecystectomy follows once the patient recovers. MRCP would only delay treatment when the ultrasound has already shown the stone and the dilated duct. Discharge is dangerous. Liver biopsy has no role.

Educational objective. Cholangitis is treated with antibiotics and urgent biliary decompression, usually by ERCP; antibiotics alone are insufficient when the duct is obstructed.

Question 19

A 38-year-old man is admitted with severe acute pancreatitis from alcohol. On day 4 he has a persistent fever, a heart rate of 110, and worsening abdominal pain. CT shows an area of non-enhancing pancreatic parenchyma with surrounding fluid but no gas.

Which of the following is the most appropriate management at this point?

- **A.** Immediate surgical necrosectomy
- **B.** Continued supportive care with enteral nutrition, and intervention only if infected necrosis is confirmed or strongly suspected, preferably delayed and by minimally invasive means
- **C.** Broad-spectrum antibiotics as prophylaxis against infection of the necrosis for four weeks
- **D.** Immediate ERCP
- **E.** Discharge with oral analgesia

Answer: B

Explanation. Non-enhancing pancreas on CT is necrotizing pancreatitis. Sterile necrosis is managed supportively, with enteral nutrition preferred over parenteral. Infection of the necrosis is suspected with clinical deterioration and confirmed by gas on CT or a positive aspirate; when it occurs, the modern approach is antibiotics and a step-up strategy of delayed (ideally after about four weeks, when the necrosis has walled off) percutaneous or endoscopic drainage, escalating to minimally invasive necrosectomy if needed. Early open necrosectomy carries high mortality and is avoided. Prophylactic antibiotics for sterile necrosis are not recommended. ERCP is for biliary obstruction or cholangitis, not present here. Discharge is inappropriate in a patient with severe pancreatitis and systemic signs.

Educational objective. Necrotizing pancreatitis is managed supportively; intervention is reserved for infected necrosis and is delayed and minimally invasive whenever possible.

Question 20

A 61-year-old woman presents with two weeks of progressive painless jaundice, pale stools, dark urine, and a 6 kg weight loss. On examination she is jaundiced with a smooth, non-tender, palpable mass below the right costal margin. Bilirubin is 180 micromoles per litre with a predominantly obstructive enzyme pattern.

Which of the following is the most likely diagnosis?

- **A.** Choledocholithiasis
- **B.** Acute hepatitis
- **C.** Carcinoma of the head of the pancreas
- **D.** Acute cholecystitis
- **E.** Primary biliary cholangitis

Answer: C

Explanation. Painless progressive obstructive jaundice with weight loss and a palpable, non-tender gallbladder (Courvoisier's sign) is the classic presentation of a malignant obstruction of the distal common bile duct, most often carcinoma of the head of the pancreas; a gallbladder distended by a stone is usually fibrotic and does not become palpable, and stones cause colicky pain. Acute hepatitis produces a hepatocellular enzyme pattern without a distended gallbladder. Acute cholecystitis is painful and febrile without deep jaundice. Primary biliary cholangitis is a chronic cholestatic disease of middle-aged women without a palpable gallbladder or rapid weight loss. The next step is a pancreatic-protocol CT to stage the tumour and assess resectability.

Educational objective. Painless obstructive jaundice with a palpable non-tender gallbladder suggests a malignant distal biliary obstruction, most often pancreatic head cancer.

Question 21

A 50-year-old man is two days post laparoscopic cholecystectomy. He reports increasing abdominal pain, nausea, and feels unwell. Temperature is 38.0 C. His abdomen is distended and tender in the right upper quadrant and flank. Bilirubin is 45 micromoles per litre and rising. Ultrasound shows a large fluid collection in the gallbladder fossa and free fluid in the pelvis.

Which of the following is the most likely diagnosis?

- **A.** Retained common bile duct stone
- **B.** Bile leak or bile duct injury
- **C.** Post-operative ileus
- **D.** Port-site hernia
- **E.** Pancreatitis

Answer: B

Explanation. Pain, fever, rising bilirubin, and a fluid collection with free fluid within days of cholecystectomy is a bile leak, from the cystic duct stump, a duct of Luschka, or a bile duct injury. Bile in the peritoneum causes biliary peritonitis and ileus, and the absorbed bile raises the bilirubin. A retained duct stone causes colicky pain and cholestasis without a large collection. Ileus alone does not produce fever, a collection, and rising bilirubin. A port-site hernia presents with a localized bulge and obstruction. Pancreatitis would show a raised lipase. Management is drainage of the collection, an ERCP to define and stent the leak, and hepatobiliary surgical involvement if a major duct injury is found.

Educational objective. Post-cholecystectomy pain with fever, rising bilirubin, and a fluid collection is a bile leak or duct injury until proven otherwise.

Question 22

A 33-year-old woman with a body mass index of 34 is found to have asymptomatic gallstones on an ultrasound performed for another reason. She has never had biliary pain. She is otherwise well.

Which of the following is the most appropriate management?

- **A.** Elective laparoscopic cholecystectomy
- **B.** Reassurance and observation, with cholecystectomy only if symptoms develop
- **C.** Ursodeoxycholic acid for two years
- **D.** ERCP with sphincterotomy
- **E.** Extracorporeal shock wave lithotripsy

Answer: B

Explanation. Most gallstones never cause symptoms, and the annual risk of developing biliary pain in an asymptomatic patient is low, so prophylactic cholecystectomy is not recommended for the general population; exceptions include a porcelain gallbladder, large polyps, certain hemolytic conditions, and some patients awaiting transplantation or bariatric surgery. Observation with clear advice to return if pain develops is the standard. Ursodeoxycholic acid dissolves only small cholesterol stones slowly and recurrence is common; it is not indicated. ERCP addresses duct stones, not gallbladder stones, and carries risk. Lithotripsy for gallstones has been largely abandoned.

Educational objective. Asymptomatic gallstones are observed; cholecystectomy is for symptomatic stones or specific high-risk situations.

Question 23

A 58-year-old man with a history of alcohol use presents with recurrent epigastric pain, steatorrhea, and a 10 kg weight loss over a year. His fasting glucose is 9.2 mmol per litre. CT shows a small, atrophic pancreas with parenchymal calcifications and a dilated pancreatic duct.

Which of the following is the most likely diagnosis?

- **A.** Acute pancreatitis
- **B.** Chronic pancreatitis
- **C.** Pancreatic adenocarcinoma
- **D.** Peptic ulcer disease
- **E.** Celiac disease

Answer: B

Explanation. Recurrent pain, exocrine insufficiency (steatorrhea and weight loss), endocrine insufficiency (new diabetes), and pancreatic calcifications with an atrophic gland and a dilated duct in a patient with alcohol use is chronic pancreatitis. Acute pancreatitis is an acute illness with a raised lipase, not a year of steatorrhea and calcification. Pancreatic cancer causes weight loss and can cause diabetes but

presents with a mass and often jaundice, not diffuse calcification; it must be considered in any chronic pancreatitis patient with a change in symptoms. Peptic ulcer disease does not cause steatorrhea. Celiac disease causes malabsorption without pancreatic calcification. Management is alcohol cessation, pancreatic enzyme replacement, diabetes management, analgesia, and endoscopic or surgical drainage for a dilated duct with pain.

Educational objective. Chronic pancreatitis presents with pain, steatorrhea, diabetes, and pancreatic calcifications; management addresses the cause, the enzymes, and the pain.

Question 24

A 66-year-old woman is admitted with acute cholecystitis. She has severe chronic obstructive pulmonary disease, heart failure with an ejection fraction of 25 percent, and is on home oxygen. Despite 48 hours of antibiotics she remains febrile with a heart rate of 110 and worsening right upper quadrant pain. Ultrasound shows a distended gallbladder with a thick wall and no duct dilatation.

Which of the following is the most appropriate next step?

- **A.** Open cholecystectomy
- **B.** Laparoscopic cholecystectomy
- **C.** Percutaneous cholecystostomy
- **D.** ERCP
- **E.** Continued antibiotics for another week

Answer: C

Explanation. This patient is failing antibiotic therapy for acute cholecystitis and is a prohibitive operative risk because of severe cardiopulmonary disease. Percutaneous cholecystostomy drains the infected gallbladder under image guidance with local anesthesia, controls the sepsis, and allows recovery; cholecystectomy can be reconsidered later if her condition permits. Both open and laparoscopic cholecystectomy carry an unacceptable anesthetic risk in this patient at this moment. ERCP treats duct obstruction, not an obstructed gallbladder without duct dilatation. Continuing antibiotics that have already failed for 48 hours risks gangrene and perforation.

Educational objective. In acute cholecystitis that fails antibiotics in a patient too sick for surgery, percutaneous cholecystostomy is the appropriate source control.

Bowel Obstruction and Hernias

Question 25

A 74-year-old woman presents with 24 hours of colicky abdominal pain, vomiting, and distension. She has never had abdominal surgery. On examination there is a small, tender, irreducible lump below and lateral to the pubic tubercle in the right groin. Abdominal radiograph shows dilated small bowel loops.

Which of the following is the most likely diagnosis?

- **A.** Adhesive small bowel obstruction
- **B.** Obstructed femoral hernia
- **C.** Direct inguinal hernia
- **D.** Saphena varix
- **E.** Inguinal lymphadenopathy

Answer: B

Explanation. Small bowel obstruction in a patient with no previous surgery should prompt a careful search of the hernial orifices, and a tender irreducible lump below and lateral to the pubic tubercle in an older woman is a femoral hernia, the hernia most likely to obstruct and strangulate because of its narrow neck. Adhesions cannot be the cause without prior surgery. An inguinal hernia lies above and medial to the pubic tubercle. A saphena varix is a soft compressible swelling at the saphenofemoral junction that disappears on lying down and does not cause obstruction. Lymphadenopathy is not associated with obstruction. She needs resuscitation, nasogastric decompression, and an urgent operation to reduce the hernia, assess the bowel, and repair the defect; a tender obstructed hernia is never forced back.

Educational objective. Bowel obstruction with no previous surgery demands a groin examination; a femoral hernia in an older woman is the diagnosis that is missed.

Question 26

A 45-year-old man presents with 36 hours of colicky abdominal pain, bilious vomiting, and no flatus for 24 hours. He had an open appendectomy 20 years ago. He is afebrile, heart rate 92, with a mildly distended, soft abdomen and no peritonism. Lactate is normal. CT shows dilated small bowel loops with a transition point in the right lower quadrant, no closed loop, and normal bowel wall enhancement.

Which of the following is the most appropriate initial management?

- **A.** Immediate laparotomy
- **B.** Nasogastric decompression, intravenous fluids, analgesia, and a period of non-operative management with serial examination, often with a water-soluble contrast study
- **C.** Colonoscopic decompression
- **D.** Oral laxatives and discharge
- **E.** Neostigmine

Answer: B

Explanation. Uncomplicated adhesive small bowel obstruction, with no fever, tachycardia, peritonism, raised lactate, or CT signs of ischemia or closed loop, resolves without an operation in the majority of patients. The initial management is nasogastric decompression, fluid resuscitation with potassium replacement, analgesia, and close serial examination for signs of strangulation, commonly with a water-soluble contrast challenge: contrast reaching the colon within about 8 to 24 hours predicts resolution, and failure to do so is an indication for surgery. Immediate laparotomy is for strangulation or closed loop. Colonoscopic decompression and neostigmine are for large bowel volvulus and pseudo-obstruction. Laxatives are contraindicated and discharge is unsafe.

Educational objective. Uncomplicated adhesive small bowel obstruction is managed non-operatively with decompression, fluids, and serial examination; strangulation signs or a failed contrast challenge lead to surgery.

Question 27

An 82-year-old man from a care home presents with three days of abdominal distension, absolute constipation, and mild pain. His abdomen is massively distended and tympanitic but soft and non-tender. Abdominal radiograph shows a hugely dilated loop of colon arising from the pelvis and extending toward the right upper quadrant, resembling a coffee bean.

Which of the following is the most appropriate initial management?

- **A.** Emergency Hartmann procedure
- **B.** Endoscopic decompression with a flexible sigmoidoscope and placement of a rectal tube
- **C.** Water-soluble contrast enema
- **D.** Intravenous neostigmine
- **E.** Discharge with laxatives

Answer: B

Explanation. A coffee-bean-shaped dilated loop arising from the pelvis in an elderly institutionalized patient is a sigmoid volvulus. In the absence of peritonitis or ischemia the first step is endoscopic detorsion with a flexible sigmoidoscope and a rectal tube left in place, which succeeds in most cases; because recurrence is common, elective sigmoid resection is planned during the same admission in patients fit enough. Emergency resection is reserved for failed decompression, peritonitis, or ischemic mucosa at endoscopy. A contrast enema is a diagnostic test that is unnecessary with a classic radiograph. Neostigmine is for pseudo-obstruction, not mechanical volvulus. Discharge with laxatives risks perforation.

Educational objective. Sigmoid volvulus without peritonitis is decompressed endoscopically first, followed by elective resection during the same admission because of the high recurrence rate.

Question 28

A 68-year-old man presents with a two-month history of altered bowel habit and one week of increasing distension, crampy pain, and constipation. He has had no vomiting. His abdomen is distended and tympanitic with mild tenderness in the right lower quadrant. CT shows an obstructing mass in the sigmoid colon with a cecum measuring 11 cm and a competent ileocecal valve.

Which of the following is the greatest immediate concern?

- **A.** Cecal perforation from closed-loop distension
- **B.** Aspiration pneumonia
- **C.** Deep venous thrombosis
- **D.** Hypokalemia from vomiting
- **E.** Liver metastases

Answer: A

Explanation. A left-sided obstructing colon cancer with a competent ileocecal valve creates a closed loop between the valve and the tumour, and the cecum, the widest and thinnest part of the colon, bears the wall tension. A cecal diameter over about 10 to 12 cm, with right lower quadrant tenderness, signals impending ischemia and perforation, which converts a curable obstruction into feculent peritonitis. The absence of vomiting reflects the competent valve. Aspiration, thrombosis, and electrolyte disturbance are real but secondary. Liver metastases affect long-term prognosis, not the next few hours. Management is resuscitation and urgent decompression, by resection with or without a stoma, or a stent as a bridge to surgery where appropriate.

Educational objective. Large bowel obstruction with a competent ileocecal valve is a closed loop; a cecum over about 10 to 12 cm is at imminent risk of perforation.

Question 29

A 3-week-old boy is brought in by his parents because of a swelling in the right groin that appears when he cries and disappears when he is calm. He is feeding well and the swelling is soft and reducible.

Which of the following is the most appropriate management?

- **A.** Observation until age 5 to allow spontaneous closure
- **B.** Elective herniotomy in the near future
- **C.** Emergency herniorrhaphy with mesh
- **D.** Truss
- **E.** Ultrasound-guided aspiration

Answer: B

Explanation. An intermittent reducible groin swelling in an infant is an indirect inguinal hernia from a patent processus vaginalis. Unlike umbilical hernias, inguinal hernias in infants do not close spontaneously and carry a significant risk of incarceration in the first year, so elective herniotomy (ligation of the sac without mesh) is arranged promptly. Emergency surgery is for an irreducible hernia. Mesh is not used in infants. Trusses have no place in children. Aspiration is dangerous and could injure bowel.

Educational objective. Infant inguinal hernias do not close spontaneously and are repaired electively soon after diagnosis because of the risk of incarceration.

Question 30

A 55-year-old man presents with a painful lump in the left groin that appeared suddenly while lifting furniture six hours ago. The lump is tender, tense, and cannot be reduced. He has vomited once. Heart rate is 104 and temperature 37.8 C. The overlying skin is slightly red.

Which of the following is the most appropriate management?

- **A.** Firm manual reduction under sedation and discharge
- **B.** Analgesia, resuscitation, and urgent surgical exploration and repair
- **C.** Ultrasound and outpatient referral
- **D.** Oral antibiotics for cellulitis
- **E.** Application of ice and elevation for 24 hours

Answer: B

Explanation. A tense, tender, irreducible hernia with systemic signs and skin changes is strangulated: the bowel or omentum within it has compromised blood supply. The treatment is urgent operation to release the constriction, assess the viability of the contents, resect dead bowel if present, and repair the defect. Forceful reduction of a strangulated hernia can push ischemic bowel back into the abdomen, where it perforates unobserved, and is never attempted when the hernia is tender and the patient is unwell. Outpatient referral, antibiotics alone, and conservative measures allow the bowel to die.

Educational objective. A tense, tender, irreducible hernia with systemic signs is strangulated and is treated by urgent operation, never by forceful reduction.

Question 31

A 60-year-old man is seen in clinic with a bulge in the lower midline abdomen that has enlarged over a year through a previous laparotomy scar. It is soft, reducible, and causes mild discomfort on standing. His body mass index is 38 and he smokes 20 cigarettes a day.

Which of the following is the most appropriate management plan?

- **A.** Immediate open repair without mesh
- **B.** Optimization with weight loss and smoking cessation, then elective mesh repair
- **C.** Lifelong abdominal binder with no surgical plan
- **D.** Emergency laparoscopic repair
- **E.** Injection of sclerosant into the sac

Answer: B

Explanation. This is an incisional hernia. Elective repair is indicated for symptoms and progressive enlargement, and it is done with mesh because suture repair alone has a high recurrence rate. Because recurrence and wound complications are driven by obesity and smoking, the patient is optimized first: weight reduction and at least four weeks of smoking cessation before an elective operation. A binder is a temporizing measure, not a plan. There is no emergency here, and sclerosant has no role.

Educational objective. Incisional hernias are repaired electively with mesh after optimizing the modifiable risks of recurrence, especially obesity and smoking.

Question 32

A 34-year-old woman is post-operative day 3 after a laparoscopic Roux-en-Y gastric bypass. She reports left upper quadrant pain and feels unwell. Her heart rate has been 125 to 130 for six hours. Temperature is 37.6 C and her abdomen is soft with mild port-site tenderness. Oxygen saturation is 96 percent on room air.

Which of the following is the most appropriate next step?

- **A.** Reassurance and discharge because the abdomen is soft
- **B.** Urgent assessment for an anastomotic leak with CT with oral contrast or return to the operating room for diagnostic laparoscopy
- **C.** Oral analgesia and review tomorrow
- **D.** Empiric treatment for a urinary tract infection
- **E.** Beta-blocker for sinus tachycardia

Answer: B

Explanation. In a post-bariatric patient, persistent tachycardia over 120 is the earliest and often the only sign of a staple line or anastomotic leak; the abdomen is frequently soft and the temperature normal because obesity masks the signs, and waiting for peritonitis costs lives. The correct response is urgent evaluation for a leak with a contrast study or CT, or diagnostic laparoscopy if the suspicion is high or imaging is unavailable, along with resuscitation and antibiotics. Reassurance, delay, empiric treatment of an unproven infection, and suppressing the heart rate with a beta-blocker all miss the diagnosis.

Educational objective. Tachycardia over 120 after bariatric surgery is a leak until proven otherwise, even with a soft abdomen and normal temperature.

Gastrointestinal Bleeding

Question 33

A 60-year-old man presents with two episodes of hematemesis and melena. He takes daily aspirin and ibuprofen for back pain. Heart rate is 112, blood pressure 96/60. Hemoglobin is 84 g/L. He has no history of liver disease.

After resuscitation with intravenous fluids and blood, which of the following is the most appropriate next step?

- **A.** Urgent colonoscopy
- **B.** Intravenous proton pump inhibitor and upper endoscopy within 24 hours
- **C.** Intravenous octreotide and endoscopic variceal banding
- **D.** CT angiography of the abdomen
- **E.** Immediate laparotomy

Answer: B

Explanation. Hematemesis and melena in a man taking non-steroidal anti-inflammatory drugs and aspirin is an upper gastrointestinal bleed, most likely from a peptic ulcer. After resuscitation, an intravenous proton pump inhibitor is started and upper endoscopy is performed within 24 hours, sooner if unstable, to diagnose and treat the source with clips, injection, or thermal therapy. Colonoscopy is for lower bleeding. Octreotide and banding are for variceal bleeding in a patient with liver disease, which this patient does not have. CT angiography is used for brisk bleeding when endoscopy fails or for lower sources. Surgery is reserved for bleeding that cannot be controlled endoscopically or radiologically.

Educational objective. Non-variceal upper gastrointestinal bleeding is treated with resuscitation, an intravenous proton pump inhibitor, and endoscopy within 24 hours.

Question 34

A 75-year-old woman presents with the sudden painless passage of a large volume of bright red blood per rectum. She has no abdominal pain. Heart rate is 100, blood pressure 118/74, and she is not orthostatic. Hemoglobin is 105 g/L. A nasogastric aspirate is clear and bilious. Rectal examination shows fresh blood without a palpable mass.

Which of the following is the most likely source of bleeding?

- **A.** Duodenal ulcer

- **B.** Diverticular bleeding
- **C.** Anal fissure
- **D.** Esophageal varices
- **E.** Ischemic colitis

Answer: B

Explanation. Sudden, painless, large-volume hematochezia in an older patient with a bilious (non-bloody) nasogastric aspirate points to a colonic source, and diverticular bleeding is the most common cause of major lower gastrointestinal hemorrhage; it arises from a vessel at the neck of a diverticulum, is painless, and stops spontaneously in most patients. A duodenal ulcer would usually produce melena or a bloody aspirate, though a bilious aspirate does not completely exclude it. A fissure produces small amounts of blood with severe pain on defecation. Varices produce hematemesis in a patient with liver disease. Ischemic colitis produces crampy pain followed by bloody diarrhea, not painless bleeding. Management is resuscitation, exclusion of an upper source if unstable, and colonoscopy after preparation, or CT angiography if bleeding is brisk.

Educational objective. Painless large-volume hematochezia in an older patient is most often diverticular, and most episodes stop on their own.

Question 35

A 52-year-old man with known alcoholic cirrhosis presents with massive hematemesis. He is confused, with a heart rate of 130 and blood pressure 82/48. He has spider nevi and ascites.

In addition to resuscitation with blood products, which of the following should be started immediately?

- **A.** Intravenous octreotide and prophylactic antibiotics, with urgent endoscopy
- **B.** Oral proton pump inhibitor only
- **C.** Immediate transjugular intrahepatic portosystemic shunt without endoscopy
- **D.** High-dose intravenous furosemide
- **E.** Oral lactulose alone

Answer: A

Explanation. Hematemesis with shock in a cirrhotic patient is variceal bleeding until proven otherwise. Vasoactive therapy (octreotide or terlipressin) reduces portal pressure and bleeding, prophylactic antibiotics reduce infection and mortality, and urgent endoscopy with band ligation is the definitive treatment; a proton pump inhibitor is often given but is not the priority. A balloon tamponade tube or a transjugular shunt is rescue therapy for bleeding that endoscopy cannot control. Diuretics would worsen the hypovolemia. Lactulose is given for encephalopathy but does not treat the bleeding. The airway should be protected in a confused patient with massive hematemesis.

Educational objective. Variceal bleeding is treated with vasoactive drugs, antibiotics, and urgent endoscopic banding alongside resuscitation.

Question 36

A 45-year-old man is admitted with melena and a duodenal ulcer with a visible non-bleeding vessel is found at endoscopy and treated with clips and injection. He is started on an intravenous proton pump inhibitor. *Helicobacter pylori* testing is positive.

Which of the following is the most appropriate long-term plan?

- **A.** Lifelong intravenous proton pump inhibitor
- **B.** *Helicobacter pylori* eradication therapy, avoidance of non-steroidal anti-inflammatory drugs, and confirmation of eradication
- **C.** Elective vagotomy and antrectomy
- **D.** No further treatment because the ulcer has been clipped
- **E.** Repeat endoscopy every month for a year

Answer: B

Explanation. Endoscopic hemostasis treats the bleeding but not the cause. *Helicobacter pylori* is the underlying driver and eradication therapy dramatically reduces recurrence; eradication should be confirmed with a urea breath test or stool antigen after treatment, off proton pump inhibitors. Non-steroidal anti-inflammatory drugs are stopped or replaced. Oral proton pump inhibitor therapy continues for a defined course. Surgery for peptic ulcer disease is now reserved for complications that cannot be controlled endoscopically. Ceasing all treatment invites recurrent bleeding. Monthly endoscopy is unnecessary; gastric ulcers are re-scoped to confirm healing and exclude malignancy, duodenal ulcers generally are not.

Educational objective. After a bleeding peptic ulcer, treat the cause: eradicate *Helicobacter pylori*, stop the offending drug, and confirm eradication.

Question 37

A 70-year-old woman presents with persistent bright red rectal bleeding. Colonoscopy after preparation shows active bleeding from the right colon that cannot be localized to a specific lesion because of the volume of blood. Her heart rate is 118 and she has required four units of red cells.

Which of the following is the most appropriate next step?

- **A.** Blind subtotal colectomy
- **B.** CT angiography followed by angiographic embolization if the bleeding site is identified
- **C.** Tagged red cell scan in 24 hours

- **D.** Observation on the ward
- **E.** Upper endoscopy

Answer: B

Explanation. Brisk ongoing lower gastrointestinal bleeding with hemodynamic instability that colonoscopy cannot localize is an indication for CT angiography, which detects bleeding at rates of about 0.3 to 0.5 mL per minute and directs selective angiographic embolization, controlling the bleeding in most cases without an operation. Blind subtotal colectomy is a last resort for the exsanguinating patient in whom localization has failed. A tagged red cell scan is slow and better suited to intermittent slower bleeding. Observation in an unstable patient is unsafe. An upper source should have been excluded early, but with colonoscopic visualization of right colonic bleeding the priority is localization and embolization.

Educational objective. Brisk lower gastrointestinal bleeding that colonoscopy cannot localize is managed with CT angiography and embolization before surgery.

Question 38

A 28-year-old man presents with several months of intermittent bright red blood on the toilet paper and streaking the stool, with severe pain during defecation that lasts for an hour afterwards. He is constipated. Examination of the anus shows a small skin tag at the posterior midline; internal examination is too painful to complete.

Which of the following is the most likely diagnosis?

- **A.** Internal hemorrhoids
- **B.** Chronic anal fissure
- **C.** Perianal abscess
- **D.** Rectal cancer
- **E.** Fistula-in-ano

Answer: B

Explanation. Severe pain with defecation that persists afterwards, small amounts of bright red blood, constipation, and a posterior midline sentinel skin tag is a chronic anal fissure. Hemorrhoids bleed painlessly unless thrombosed. An abscess causes a throbbing constant pain with a tender swelling and fever. Rectal cancer in a 28-year-old is unlikely and does not cause this pain pattern, though any persistent bleeding needs eventual examination once the fissure is treated. A fistula drains persistently and is usually painless between abscesses. Treatment is fibre, fluids, sitz baths, and a topical smooth-muscle relaxant, with lateral internal sphincterotomy for chronic fissures that fail medical treatment.

Educational objective. Painful defecation with minor bleeding and a posterior sentinel tag is a chronic anal fissure; treatment starts with stool softening and topical sphincter relaxants.

Colorectal Disease and Diverticulitis

Question 39

A 58-year-old man presents with three days of left lower quadrant pain, low-grade fever, and mild nausea. He is tolerating fluids. Heart rate is 88, temperature 37.9 C. He has localized left lower quadrant tenderness without guarding. White cell count is 12. CT shows sigmoid wall thickening with pericolic fat stranding and no abscess, free air, or fistula.

Which of the following is the most appropriate management?

- **A.** Emergency Hartmann procedure
- **B.** Outpatient management with a liquid diet, analgesia, and close follow-up, with antibiotics for those with comorbidity or systemic features
- **C.** Percutaneous drainage
- **D.** Immediate colonoscopy
- **E.** Elective sigmoid colectomy next week

Answer: B

Explanation. This is uncomplicated acute diverticulitis (Hinchey 0) in a well patient tolerating fluids. Current practice is outpatient management with diet modification and analgesia, with antibiotics reserved for patients with systemic signs, immunosuppression, or comorbidity; trials show that omitting antibiotics in selected patients does not increase complications. Emergency resection is for feculent or purulent peritonitis. Drainage requires an abscess. Colonoscopy during the acute episode risks perforation; it is done six to eight weeks later to exclude cancer. Elective resection is considered after complicated or recurrent disease, not after a first uncomplicated episode.

Educational objective. Uncomplicated diverticulitis in a well patient is managed as an outpatient, with antibiotics selectively, and colonoscopy after recovery.

Question 40

A 66-year-old woman presents with sudden severe generalized abdominal pain, fever, and rigidity. She has a history of diverticular disease. Heart rate is 128, blood pressure 90/54. CT shows free intraperitoneal air and free fluid with sigmoid wall thickening.

Which of the following is the most appropriate management?

- **A.** Intravenous antibiotics and observation
- **B.** Percutaneous drainage of the free fluid
- **C.** Resuscitation, intravenous antibiotics, and emergency laparotomy with sigmoid resection
- **D.** Colonoscopy to assess the sigmoid
- **E.** Endoscopic stenting

Answer: C

Explanation. Generalized peritonitis with free air and hemodynamic instability in a patient with diverticular disease is perforated diverticulitis with purulent or feculent peritonitis (Hinchey III or IV). This requires resuscitation, broad-spectrum antibiotics, and an emergency operation, typically a sigmoid resection with an end colostomy (Hartmann procedure) or, in selected patients, resection with primary anastomosis and a diverting ileostomy. Antibiotics alone and percutaneous drainage cannot control feculent contamination of the whole peritoneum. Colonoscopy and stenting are contraindicated in perforation.

Educational objective. Perforated diverticulitis with generalized peritonitis is treated by resuscitation and emergency resection, most often a Hartmann procedure.

Question 41

A 72-year-old man presents with fatigue and shortness of breath on exertion. He has no gastrointestinal symptoms. Hemoglobin is 88 g/L with a mean corpuscular volume of 70 fL and a low ferritin. He takes no non-steroidal anti-inflammatory drugs.

Which of the following is the most appropriate next step?

- **A.** Oral iron supplementation and review in three months
- **B.** Colonoscopy and upper endoscopy to identify a source of gastrointestinal blood loss
- **C.** Bone marrow biopsy
- **D.** Serum vitamin B12 and folate only
- **E.** Reassurance because he has no gastrointestinal symptoms

Answer: B

Explanation. Iron deficiency anemia in a man, or in a post-menopausal woman, indicates chronic gastrointestinal blood loss until proven otherwise, and right-sided colon cancer is the diagnosis that must be excluded; these tumours bleed slowly and occultly without changing bowel habit. Bidirectional endoscopy is the standard investigation. Treating with iron alone delays the diagnosis of a curable cancer. Bone marrow biopsy is not indicated for a straightforward iron deficiency picture. Vitamin B12 and folate deficiency cause macrocytic, not microcytic, anemia. The absence of symptoms is exactly why the cancer has not been found.

Educational objective. Iron deficiency anemia in a man or post-menopausal woman is colorectal cancer until the colon has been examined.

Question 42

A 62-year-old woman is found on screening colonoscopy to have a 3 cm ulcerated mass in the sigmoid colon; biopsy confirms adenocarcinoma. She is otherwise well.

Which of the following is the most appropriate next step before treatment?

- **A.** Immediate sigmoid colectomy without further investigation
- **B.** Staging with CT of the chest, abdomen and pelvis and a baseline carcinoembryonic antigen
- **C.** PET scan alone
- **D.** Neoadjuvant chemoradiation
- **E.** Barium enema

Answer: B

Explanation. Colorectal cancer is staged before it is treated. For colon cancer the staging is CT of the chest, abdomen and pelvis to look for liver and lung metastases and local extent, a baseline carcinoembryonic antigen for surveillance, and a complete colonoscopy to exclude synchronous lesions (already done here). The case is then discussed at a multidisciplinary tumour board, and for non-metastatic colon cancer the treatment is a segmental resection with lymphadenectomy, followed by adjuvant chemotherapy if nodes are positive. PET is used selectively, not as primary staging. Neoadjuvant chemoradiation is for rectal cancer, not sigmoid colon cancer. Barium enema adds nothing after colonoscopy.

Educational objective. Colon cancer is staged with CT of chest, abdomen and pelvis and a baseline carcinoembryonic antigen before resection.

Question 43

A 58-year-old man presents with pneumaturia and recurrent urinary tract infections over three months. He had an episode of diverticulitis one year ago. CT shows air in the bladder and a thickened sigmoid colon adherent to the bladder dome.

Which of the following is the most likely diagnosis?

- **A.** Emphysematous cystitis
- **B.** Colovesical fistula from diverticular disease
- **C.** Bladder cancer
- **D.** Urethral stricture
- **E.** Prostatitis

Answer: B

Explanation. Pneumaturia (air in the urine) with recurrent urinary infections, air in the bladder on CT, and a thickened sigmoid adherent to the bladder in a patient with previous diverticulitis is a colovesical fistula, the most common fistula complicating diverticular disease. Emphysematous cystitis occurs in

diabetics with gas-forming organisms but does not show a sigmoid mass adherent to the bladder. Bladder cancer does not cause pneumaturia unless it fistulates. Stricture and prostatitis do not produce air in the bladder. Management is colonoscopy to exclude a colonic cancer as the cause, then elective sigmoid resection with closure of the bladder defect.

Educational objective. Pneumaturia with recurrent urinary infections after diverticulitis indicates a colovesical fistula, treated by resection after excluding malignancy.

Question 44

A 40-year-old man presents with three days of throbbing perianal pain that has become constant, with a fever of 38.5 C. Examination shows a tender, fluctuant, erythematous swelling lateral to the anus.

Which of the following is the most appropriate management?

- **A.** Oral antibiotics alone and review in one week
- **B.** Incision and drainage
- **C.** Sitz baths and topical nitroglycerin
- **D.** Rubber band ligation
- **E.** Lateral internal sphincterotomy

Answer: B

Explanation. A fluctuant, tender, erythematous perianal swelling with fever is a perianal abscess, and abscesses are treated by incision and drainage; antibiotics alone do not penetrate a pus collection and delay definitive treatment, though they are added for surrounding cellulitis, immunosuppression, or systemic illness. Sitz baths and topical nitroglycerin are fissure treatments. Band ligation is for internal hemorrhoids. Sphincterotomy is for chronic fissure. The patient is warned that about a third to a half of perianal abscesses lead to a fistula.

Educational objective. A perianal abscess is drained surgically; antibiotics alone are not a substitute for drainage.

Question 45

A 30-year-old woman presents with a 6-month history of intermittent bloody diarrhea, abdominal cramping, and weight loss. Colonoscopy shows continuous inflammation from the rectum to the splenic flexure with superficial ulceration. She now presents acutely with ten bloody stools a day, fever, tachycardia, and abdominal distension. Radiograph shows a transverse colon diameter of 7 cm.

Which of the following is the most appropriate management?

- **A.** Immediate colonoscopy to assess the extent of disease

- **B.** Intravenous steroids, fluid and electrolyte correction, close surgical review, and colectomy if there is no improvement or deterioration occurs
- **C.** Oral mesalamine and discharge
- **D.** Loperamide to reduce stool frequency
- **E.** Barium enema

Answer: B

Explanation. Continuous inflammation from the rectum with superficial ulceration is ulcerative colitis, and the current presentation with systemic toxicity and a colon over 6 cm is toxic megacolon, a surgical emergency. Management is intravenous steroids, aggressive fluid and electrolyte correction, thromboprophylaxis, exclusion of *Clostridioides difficile*, and joint medical and surgical care with a low threshold for subtotal colectomy if the patient does not improve within 48 to 72 hours or deteriorates or perforates. Colonoscopy and barium enema risk perforation in a dilated colon. Oral mesalamine is for mild disease. Antimotility agents such as loperamide precipitate megacolon and are contraindicated.

Educational objective. Toxic megacolon in colitis is treated with steroids, resuscitation, and early surgical involvement; antimotility agents and endoscopy are contraindicated.

Breast Disease

Question 46

A 24-year-old woman presents with a 2 cm smooth, firm, mobile, painless lump in the upper outer quadrant of the left breast that she noticed two months ago. There is no nipple discharge or skin change, and no family history of breast cancer.

Which of the following is the most appropriate next step?

- **A.** Reassurance and discharge, because the lump is almost certainly benign
- **B.** Ultrasound of the breast, with core biopsy if the imaging is not clearly benign
- **C.** Mammography alone
- **D.** Excisional biopsy
- **E.** MRI of the breast

Answer: B

Explanation. Every breast lump is evaluated by triple assessment (clinical examination, imaging, and tissue sampling where indicated) regardless of how benign it feels. In a woman under about 30 with dense breasts, ultrasound is the imaging of choice; a lesion with classic fibroadenoma features that is concordant with the clinical picture can be observed or sampled by core biopsy depending on size and preference, but a lump is never dismissed on examination alone. Mammography is less sensitive in dense young breasts.

Excisional biopsy is not the first step; core biopsy gives the diagnosis with less morbidity. MRI is not a first-line tool for a palpable lump.

Educational objective. Every palpable breast lump gets a triple assessment; in young women ultrasound is the first imaging test.

Question 47

A 56-year-old woman presents with a hard, irregular, fixed 3 cm mass in the right breast with dimpling of the overlying skin and a palpable hard axillary node. Core biopsy shows invasive ductal carcinoma, estrogen receptor positive, HER2 negative.

Which of the following best describes the next step in management?

- **A.** Immediate mastectomy and axillary dissection without further investigation
- **B.** Staging investigations and multidisciplinary discussion to plan systemic and surgical treatment
- **C.** Tamoxifen alone
- **D.** Radiation therapy alone
- **E.** Observation with repeat imaging in six months

Answer: B

Explanation. Breast cancer with a clinically involved axilla is at least stage II to III disease, and treatment is planned after staging and multidisciplinary review. Staging includes axillary ultrasound with node biopsy and, for locally advanced disease, imaging for distant metastases. Treatment sequencing (neoadjuvant systemic therapy to downstage, then surgery and radiation, then endocrine therapy for this receptor-positive tumour) is decided by the tumour board. Proceeding straight to mastectomy forgoes the chance of downstaging and complete staging. Endocrine therapy alone or radiation alone are not curative approaches for a resectable locally advanced cancer in a fit patient. Observation is inappropriate.

Educational objective. Breast cancer is staged and discussed at a multidisciplinary tumour board before treatment; a clinically involved axilla often prompts neoadjuvant therapy.

Question 48

A 32-year-old woman who is breastfeeding presents with a painful, red, swollen area in the left breast, fever of 38.6 C, and a fluctuant mass beneath the redness. She has been treated with oral antibiotics for four days without improvement.

Which of the following is the most appropriate management?

- **A.** Change to a different oral antibiotic and continue breastfeeding

- **B.** Aspiration or drainage of the abscess under ultrasound guidance, antibiotics, and continued breastfeeding or expression from the affected breast
- **C.** Cessation of breastfeeding and bromocriptine
- **D.** Mastectomy
- **E.** Core biopsy of the mass before any treatment

Answer: B

Explanation. A fluctuant mass in a lactating woman with mastitis that has failed antibiotics is a lactational breast abscess, usually from *Staphylococcus aureus*. Treatment is drainage, preferably by needle aspiration under ultrasound guidance (repeated as needed) or incision and drainage for large or superficial abscesses, together with antibiotics; breastfeeding or expression is continued because emptying the breast helps resolution and is safe for the infant. Changing antibiotics without draining the pus fails. Stopping lactation is unnecessary. Mastectomy is never the treatment for an abscess. Biopsy is reserved for non-lactational abscesses that fail to resolve, where inflammatory carcinoma must be excluded.

Educational objective. A lactational breast abscess is drained, usually by ultrasound-guided aspiration, with antibiotics and continued breast emptying.

Question 49

A 47-year-old woman presents with spontaneous bloody discharge from a single duct of the right nipple over six weeks. No lump is palpable. Mammography and ultrasound are normal.

Which of the following is the most appropriate next step?

- **A.** Reassurance because the imaging is normal
- **B.** Excision of the involved duct (microdochectomy) for diagnosis
- **C.** Bilateral mastectomy
- **D.** Antibiotics for duct ectasia
- **E.** Cabergoline

Answer: B

Explanation. Unilateral, spontaneous, single-duct, bloody nipple discharge is pathological and needs a tissue diagnosis even with normal imaging. The most common cause is an intraductal papilloma, but ductal carcinoma in situ and invasive carcinoma account for a minority, and imaging is often normal because the lesion is small and within the duct. Excision of the duct system (microdochectomy or a major duct excision) is both diagnostic and therapeutic. Reassurance risks missing a cancer. Mastectomy is not indicated. Duct ectasia produces multi-duct green or cheesy discharge, not single-duct blood. Cabergoline treats galactorrhea from hyperprolactinemia, which presents as bilateral milky discharge.

Educational objective. Unilateral spontaneous single-duct bloody nipple discharge requires duct excision for diagnosis, even when imaging is normal.

Question 50

A 61-year-old woman has a 1.5 cm invasive ductal carcinoma in the upper outer quadrant of a moderately sized breast, with no clinically or sonographically involved axillary nodes. She prefers to keep her breast.

Which of the following is the most appropriate surgical management?

- **A.** Lumpectomy with sentinel lymph node biopsy, followed by radiation to the breast
- **B.** Total mastectomy with axillary dissection
- **C.** Lumpectomy alone without radiation or axillary staging
- **D.** Axillary dissection without breast surgery
- **E.** Radiation alone

Answer: A

Explanation. For a small unifocal invasive cancer in a breast of adequate size, breast-conserving surgery with clear margins followed by whole-breast radiation gives survival equivalent to mastectomy, with the patient's preference deciding between them. A clinically and sonographically negative axilla is staged with sentinel lymph node biopsy, which avoids the lymphedema and morbidity of a full dissection in most patients. Lumpectomy without radiation carries a high local recurrence rate. Mastectomy with axillary dissection is more surgery than the disease requires. Radiation alone is not a curative strategy for an invasive cancer that can be resected.

Educational objective. Small invasive breast cancers are treated with breast-conserving surgery plus radiation, with sentinel node biopsy for a clinically negative axilla.

Question 51

A 68-year-old woman presents with a three-month history of an eczema-like, crusting, itchy lesion of the left nipple and areola that has not responded to topical steroids. There is no palpable lump.

Which of the following is the most appropriate next step?

- **A.** A stronger topical steroid for another month
- **B.** Punch biopsy of the nipple lesion and mammography to look for an underlying carcinoma
- **C.** Antifungal cream
- **D.** Reassurance
- **E.** Nipple excision without further investigation

Answer: B

Explanation. A persistent, unilateral, eczematous lesion of the nipple that fails to respond to topical treatment is Paget disease of the nipple until proven otherwise, which is almost always associated with an underlying ductal carcinoma in situ or invasive carcinoma, often without a palpable mass. A punch biopsy of the skin confirms Paget cells, and mammography and ultrasound (with MRI in some cases) look for the underlying tumour. Continued topical treatment delays the diagnosis. Fungal infection and benign eczema are bilateral or respond to treatment. Excising the nipple without staging the underlying breast is inadequate.

Educational objective. A unilateral eczematous nipple lesion unresponsive to topical treatment is Paget disease until biopsy proves otherwise, and it signals an underlying carcinoma.

Thyroid and Neck

Question 52

A 42-year-old woman presents with a painless 2 cm nodule in the right lobe of the thyroid found incidentally. She is clinically euthyroid. Her thyroid-stimulating hormone is normal. Ultrasound shows a solid, hypoechoic nodule with microcalcifications and irregular margins.

Which of the following is the most appropriate next step?

- **A.** Radionuclide thyroid scan
- **B.** Ultrasound-guided fine needle aspiration
- **C.** Total thyroidectomy without further investigation
- **D.** Levothyroxine suppression therapy
- **E.** Repeat ultrasound in one year

Answer: B

Explanation. With a normal thyroid-stimulating hormone, the evaluation of a thyroid nodule proceeds from ultrasound to fine needle aspiration when the sonographic features and size warrant it; a solid hypoechoic nodule with microcalcifications and irregular margins is high-suspicion on ultrasound risk stratification and should be sampled at 1 cm or larger. A radionuclide scan is used when the thyroid-stimulating hormone is suppressed, to identify an autonomous nodule. Proceeding to surgery without cytology risks unnecessary thyroidectomy. Suppression therapy is not recommended. Waiting a year on a high-suspicion nodule delays the diagnosis of a probable papillary carcinoma.

Educational objective. A thyroid nodule with a normal thyroid-stimulating hormone and suspicious ultrasound features is evaluated by ultrasound-guided fine needle aspiration.

Question 53

A 35-year-old woman is 18 hours post total thyroidectomy. She reports tingling around her mouth and in her fingertips. Tapping over the facial nerve in front of the ear produces twitching of the upper lip.

Which of the following is the most appropriate management?

- **A.** Reassurance because these symptoms are due to anxiety
- **B.** Check serum calcium and give calcium, with calcitriol if hypocalcemia is confirmed
- **C.** Open the wound to evacuate a hematoma
- **D.** Urgent laryngoscopy
- **E.** Intravenous magnesium only

Answer: B

Explanation. Perioral and fingertip paresthesia with a positive Chvostek sign after total thyroidectomy is hypocalcemia from parathyroid injury or devascularization, which occurs in a substantial minority of patients transiently. The serum calcium (corrected for albumin, or ionized) is checked and oral or intravenous calcium is given according to severity, with calcitriol to enhance absorption; magnesium is checked and replaced if low because hypomagnesemia impairs parathyroid hormone release. Attributing the symptoms to anxiety misses a treatable and potentially dangerous problem (tetany, laryngospasm, arrhythmia). A hematoma presents with neck swelling and airway symptoms, not tingling. Laryngoscopy assesses vocal cord function after nerve injury, which presents with hoarseness or stridor.

Educational objective. Perioral tingling and a positive Chvostek sign after thyroidectomy indicate hypocalcemia; check calcium and treat.

Question 54

A 58-year-old man who smokes presents with a painless, firm, 3 cm mass in the left anterior neck below the angle of the jaw that has been present for two months. He has no thyroid symptoms. Examination of his oral cavity is normal to inspection.

Which of the following is the most appropriate next step?

- **A.** Open excisional biopsy of the mass
- **B.** Fine needle aspiration of the mass and examination of the upper aerodigestive tract, including laryngoscopy
- **C.** Empiric antibiotics for two weeks and review
- **D.** Reassurance because the mass is painless
- **E.** Radioactive iodine scan

Answer: B

Explanation. A persistent, firm neck mass in a smoker over 40 is a metastatic lymph node from a squamous cell carcinoma of the upper aerodigestive tract until proven otherwise. The evaluation is fine

needle aspiration of the node (safe and accurate) and a thorough search for the primary with examination of the mouth, pharynx, and larynx, including fiberoptic laryngoscopy, plus imaging. Open biopsy of the node is avoided until the primary is sought because it can seed tumour and complicate later neck dissection. Antibiotics are for a tender reactive node with a source. Painlessness is a feature of malignancy, not reassurance. A radioactive iodine scan is for thyroid nodules with a suppressed thyroid-stimulating hormone.

Educational objective. A persistent neck mass in an adult smoker is investigated with fine needle aspiration and a search for an aerodigestive primary; open biopsy of the node comes last.

Question 55

A 22-year-old woman presents with a soft, painless 3 cm midline neck swelling just below the hyoid bone that moves upward when she protrudes her tongue.

Which of the following is the most likely diagnosis?

- **A.** Branchial cleft cyst
- **B.** Thyroglossal duct cyst
- **C.** Cystic hygroma
- **D.** Dermoid cyst
- **E.** Thyroid nodule

Answer: B

Explanation. A midline neck cyst that elevates with tongue protrusion is a thyroglossal duct cyst, a remnant of the thyroid's descent from the foramen cecum that is tethered to the tongue base through the hyoid. A branchial cleft cyst lies along the anterior border of the sternocleidomastoid laterally. A cystic hygroma is a soft transilluminating lymphatic malformation in the posterior triangle, usually in children. A dermoid cyst can be midline but does not move with tongue protrusion. A thyroid nodule moves with swallowing but not with tongue protrusion. Treatment is the Sistrunk procedure, excising the cyst with the central hyoid and the tract to the tongue base, after confirming normal thyroid tissue in the neck.

Educational objective. A midline neck cyst that rises with tongue protrusion is a thyroglossal duct cyst, treated by the Sistrunk procedure.

Question 56

A 50-year-old man is found to have a thyroid nodule with fine needle aspiration reported as medullary carcinoma. His serum calcitonin is markedly raised.

Which of the following must be done before thyroidectomy?

- **A.** Radioactive iodine ablation

- **B.** Measurement of plasma metanephrines to exclude pheochromocytoma, and RET mutation testing
- **C.** Levothyroxine suppression
- **D.** Neck irradiation
- **E.** Nothing; proceed directly to surgery

Answer: B

Explanation. Medullary thyroid carcinoma arises from parafollicular C cells and may be part of multiple endocrine neoplasia type 2, in which pheochromocytoma coexists in a substantial proportion; operating on an undiagnosed pheochromocytoma can precipitate a fatal hypertensive crisis, so plasma or urinary metanephrines are checked before any surgery and the pheochromocytoma is removed first if present. RET mutation testing identifies hereditary disease and guides family screening. Radioactive iodine is ineffective because C cells do not concentrate iodine. Thyroid-stimulating hormone suppression does not affect medullary carcinoma. Radiation is not first-line. Proceeding without excluding pheochromocytoma is dangerous.

Educational objective. Before surgery for medullary thyroid carcinoma, exclude pheochromocytoma with metanephrines and test for RET mutation.

Trauma and Burns

Question 57

A 30-year-old man is brought in after a motor vehicle collision. He is agitated, with a respiratory rate of 36, heart rate 130, and blood pressure 78/40. The trachea is deviated to the left, the right chest is hyperresonant with absent breath sounds, and the neck veins are distended.

Which of the following is the most appropriate immediate action?

- **A.** Portable chest radiograph
- **B.** Immediate needle or finger decompression of the right chest followed by a chest tube
- **C.** CT of the chest
- **D.** Pericardiocentesis
- **E.** Intubation and positive pressure ventilation before any other intervention

Answer: B

Explanation. Respiratory distress with hypotension, tracheal deviation away from a hyperresonant silent hemithorax, and distended neck veins is a tension pneumothorax, a clinical diagnosis that is treated before any imaging. Immediate decompression of the pleural space (needle in the second intercostal space at the midclavicular line or the fifth space at the anterior axillary line, or finger thoracostomy) converts it to a simple pneumothorax, and a chest tube follows. A radiograph or CT delays a treatment that takes seconds. Pericardiocentesis is for tamponade, which produces distended neck veins and hypotension but

not tracheal deviation or a silent hyperresonant chest. Positive pressure ventilation before decompression worsens the tension.

Educational objective. Tension pneumothorax is a clinical diagnosis treated by immediate decompression before imaging.

Question 58

A 25-year-old woman is brought in after a fall from a height. Her airway is patent and breathing is adequate. Heart rate is 128, blood pressure 88/50, skin cool and clammy. The pelvis is unstable on gentle examination and there is bruising over the left flank. A FAST examination is negative.

Which of the following is the most appropriate next step?

- **A.** CT of the abdomen and pelvis before any further intervention
- **B.** Application of a pelvic binder, activation of the massive transfusion protocol, and tranexamic acid, with angioembolization or preperitoneal packing if she remains unstable
- **C.** Emergency laparotomy
- **D.** Two litres of normal saline and observation
- **E.** Diagnostic peritoneal lavage

Answer: B

Explanation. Hemorrhagic shock with an unstable pelvis and a negative FAST points to pelvic and retroperitoneal bleeding from the fracture. The immediate steps are to close the pelvic ring with a binder to reduce the volume into which she can bleed, resuscitate with blood products in balanced ratios rather than large volumes of crystalloid, give tranexamic acid within three hours of injury, and proceed to angioembolization or preperitoneal packing if she does not stabilize. CT is for the stable patient. Laparotomy without a positive FAST or peritonitis is unlikely to find the bleeding and can worsen pelvic hemorrhage by releasing the tamponade. Large-volume saline worsens coagulopathy and acidosis. Peritoneal lavage has been replaced by FAST and CT.

Educational objective. An unstable pelvic fracture with shock is treated with a binder, blood products, tranexamic acid, and angioembolization or packing, not crystalloid and CT.

Question 59

A 40-year-old man is stabbed in the left upper abdomen. On arrival he is alert with a heart rate of 96 and blood pressure 124/80. There is a 2 cm wound below the left costal margin with omentum protruding through it.

Which of the following is the most appropriate management?

- **A.** Reduce the omentum, close the wound, and observe

- **B.** Local wound exploration under local anesthesia
- **C.** Exploratory laparotomy
- **D.** CT of the abdomen with contrast and admission for serial examination
- **E.** Discharge with wound care instructions

Answer: C

Explanation. Evisceration through a stab wound is an absolute indication for laparotomy, along with hemodynamic instability, peritonitis, and gross blood from the stomach or rectum, because the wound has clearly breached the peritoneum and the probability of a hollow viscus or solid organ injury is high. Reducing the omentum and observing risks a missed bowel injury. Local wound exploration and CT with serial examination are appropriate selective strategies for stable patients with anterior abdominal stab wounds without these hard signs. Discharge is unsafe.

Educational objective. Evisceration, peritonitis, instability, or gross gastrointestinal bleeding after a stab wound mandate laparotomy; other stable stab wounds may be managed selectively.

Question 60

A 19-year-old man is brought in after a motorcycle crash. He was briefly unconscious, then awake and talking, but over the last 30 minutes has become drowsy. His right pupil is now dilated and sluggish, and he has weakness of the left arm and leg. Glasgow Coma Scale has fallen from 14 to 9.

Which of the following is the most likely diagnosis?

- **A.** Diffuse axonal injury
- **B.** Epidural hematoma
- **C.** Concussion
- **D.** Subarachnoid hemorrhage from a ruptured aneurysm
- **E.** Cervical spinal cord injury

Answer: B

Explanation. A lucid interval followed by deterioration, an ipsilateral dilated pupil (uncal herniation compressing the third nerve), and contralateral weakness is the classic course of an epidural hematoma, usually from a temporal bone fracture lacerating the middle meningeal artery; CT shows a lens-shaped collection. It is a neurosurgical emergency because evacuation before irreversible brainstem compression restores a good outcome. Diffuse axonal injury causes coma from the moment of impact with a relatively normal CT. Concussion does not produce a dilated pupil and focal weakness. Aneurysmal subarachnoid hemorrhage is not a traumatic pattern. Spinal cord injury does not cause a unilateral dilated pupil or a falling level of consciousness.

Educational objective. A lucid interval then deterioration with an ipsilateral dilated pupil after head trauma is an epidural hematoma needing emergency neurosurgical evacuation.

Question 61

A 70 kg man sustains partial- and full-thickness burns to the whole of both arms, the anterior trunk, and the anterior surface of one leg in a house fire. He has singed nasal hairs and carbonaceous sputum but is speaking in full sentences.

Which of the following is the most appropriate initial management priority?

- **A.** Immediate escharotomy of the arms
- **B.** Early airway assessment with a low threshold for intubation because of inhalational injury, together with fluid resuscitation calculated from the burn area
- **C.** Topical silver sulfadiazine and discharge
- **D.** Prophylactic intravenous antibiotics
- **E.** Cooling the burns with ice for one hour

Answer: B

Explanation. Singed nasal hairs and carbonaceous sputum indicate inhalational injury, and airway edema can progress over hours to obstruction even in a patient who is currently speaking; early intubation is often the safest course. The burn area is roughly 9 plus 9 (both arms) plus 18 (anterior trunk) plus 9 (anterior leg), about 45 percent, which requires formula-based resuscitation (about 2 to 4 mL per kilogram per percent burned over 24 hours, half in the first eight hours, titrated to urine output). Escharotomy is for circumferential full-thickness burns compromising perfusion or ventilation and is not the first priority. Discharge is inappropriate for a major burn. Prophylactic antibiotics are not recommended. Ice causes further tissue injury and hypothermia; burns are cooled with cool running water for a limited time only.

Educational objective. In a major burn, secure the airway early if inhalational injury is suspected and resuscitate by formula titrated to urine output.

Question 62

A 28-year-old man presents 12 hours after a closed tibial fracture that was splinted in the emergency department. He now has severe, escalating pain in the leg that is not relieved by opioids, pain on passive extension of the toes, and the anterior compartment feels tense. Pedal pulses are present.

Which of the following is the most appropriate management?

- **A.** Increase the opioid dose and elevate the leg above the heart

- **B.** Remove the splint and all circumferential dressings, keep the limb at heart level, and arrange urgent fasciotomy
- **C.** Doppler ultrasound of the leg arteries
- **D.** Reassurance because pulses are present
- **E.** Observation for another 12 hours

Answer: B

Explanation. Pain out of proportion, pain on passive stretch of the muscles in the compartment, and a tense compartment after a tibial fracture is compartment syndrome; pulses are lost late and their presence does not exclude it. Treatment is immediate removal of anything constricting, keeping the limb at heart level (elevation above the heart reduces arterial inflow and worsens ischemia), and urgent fasciotomy; compartment pressure measurement can support the diagnosis when the examination is equivocal but must not delay treatment. Increasing analgesia masks progression. Doppler assesses arterial injury, which is a different problem. Observation allows muscle necrosis, which becomes irreversible within hours.

Educational objective. Compartment syndrome is a clinical diagnosis with pain out of proportion and pain on passive stretch; pulses are preserved until late, and the treatment is urgent fasciotomy.

Question 63

A 45-year-old man is brought in after a motor vehicle collision with abdominal bruising. He is hemodynamically stable. CT shows a grade III splenic laceration with a small amount of free fluid and no active contrast extravasation. He has no other injuries.

Which of the following is the most appropriate management?

- **A.** Immediate splenectomy
- **B.** Non-operative management with admission, serial examinations, serial hemoglobin, and bed rest, with angioembolization if there is evidence of ongoing bleeding
- **C.** Discharge home with instructions
- **D.** Diagnostic peritoneal lavage
- **E.** Exploratory laparotomy with splenorrhaphy

Answer: B

Explanation. Blunt splenic injury in a hemodynamically stable patient is managed non-operatively in the majority of cases regardless of grade, with monitoring in hospital, serial examination and hemoglobin, and angioembolization for contrast extravasation or a falling hemoglobin. This preserves splenic immune function and avoids laparotomy. Splenectomy is reserved for instability, failure of non-operative management, or other injuries requiring laparotomy. Discharge is unsafe with a fresh solid organ injury. Peritoneal lavage has no role after a CT diagnosis. Splenorrhaphy is an option at laparotomy but there is no indication for laparotomy here.

Educational objective. Blunt splenic injury in a stable patient is managed non-operatively with monitoring and angioembolization as needed.

Question 64

A 60-year-old woman is brought in after a high-speed frontal collision. She is stable. Chest radiograph shows a widened mediastinum, loss of the aortic knob contour, and deviation of the nasogastric tube to the right.

Which of the following is the most appropriate next investigation?

- **A.** Transthoracic echocardiogram
- **B.** CT angiography of the chest
- **C.** Bronchoscopy
- **D.** Repeat chest radiograph in six hours
- **E.** Ventilation-perfusion scan

Answer: B

Explanation. A widened mediastinum with loss of the aortic contour and deviation of the esophagus after a deceleration injury raises the diagnosis of blunt thoracic aortic injury, most often at the isthmus just distal to the left subclavian artery. CT angiography of the chest is the definitive test in a stable patient and determines the grade of injury and the need for endovascular repair. Transthoracic echocardiography does not visualize the descending aorta adequately. Bronchoscopy is for suspected airway injury. Waiting six hours risks rupture. Ventilation-perfusion scanning is for pulmonary embolism. Management includes strict blood pressure and heart rate control while planning repair.

Educational objective. A widened mediastinum after deceleration injury is investigated with CT angiography for blunt aortic injury.

Vascular Surgery

Question 65

A 66-year-old man who smokes presents with pain in both calves that comes on reliably after walking 200 metres and is relieved by standing still for a few minutes. His feet are warm with intact skin. Ankle-brachial index is 0.7 bilaterally.

Which of the following is the most appropriate initial management?

- **A.** Bilateral femoropopliteal bypass
- **B.** Smoking cessation, a supervised exercise program, antiplatelet therapy, and a statin
- **C.** Angioplasty of both superficial femoral arteries

- **D.** Anticoagulation with warfarin
- **E.** Amputation

Answer: B

Explanation. This is intermittent claudication from peripheral arterial disease without limb-threatening features. First-line treatment is medical and behavioural: stopping smoking, a structured exercise programme that improves walking distance substantially, an antiplatelet agent, a statin, and control of blood pressure and diabetes, which together reduce cardiovascular events (the main cause of death in these patients) and improve symptoms. Revascularization, by angioplasty or bypass, is reserved for lifestyle-limiting claudication that fails medical therapy or for limb-threatening ischemia. Anticoagulation is not indicated for stable claudication. Amputation is for non-salvageable limbs.

Educational objective. Claudication is treated first with smoking cessation, supervised exercise, antiplatelet therapy, and a statin; revascularization is for failure of medical treatment or limb threat.

Question 66

A 78-year-old man with atrial fibrillation presents with a sudden onset of severe pain in the right leg two hours ago. The leg is pale and cold below the knee, pedal pulses are absent, and he has reduced sensation in the foot but can still move his toes.

Which of the following is the most appropriate immediate management?

- **A.** Elevate the leg and apply warm compresses
- **B.** Immediate systemic heparin, analgesia, and urgent vascular surgical assessment for embolectomy
- **C.** Compression stockings and outpatient Doppler in one week
- **D.** Oral aspirin and observation overnight
- **E.** Below-knee amputation

Answer: B

Explanation. Sudden pain, pallor, pulselessness, and paresthesia in a patient with atrial fibrillation is acute limb ischemia from an embolus lodging at the popliteal or femoral bifurcation. Immediate anticoagulation with heparin prevents propagation of thrombus, and urgent revascularization (balloon catheter embolectomy for an embolus) within about six hours gives the best chance of limb salvage; sensory loss indicates a threatened limb. Elevation reduces perfusion and warmth increases metabolic demand of ischemic tissue. Compression, outpatient review, and observation allow the limb to die. Amputation is for a non-viable limb with fixed mottling and rigid muscles, which is not the case here.

Educational objective. Acute limb ischemia is treated with immediate heparin and urgent revascularization; a threatened limb has hours, not days.

Question 67

A 74-year-old man presents with sudden severe back and abdominal pain, and collapse. Heart rate is 124, blood pressure 82/50. He is a smoker with hypertension. A pulsatile mass is felt in the epigastrium. Bedside ultrasound shows an 8 cm abdominal aorta.

Which of the following is the most appropriate management?

- **A.** CT angiography of the abdomen before any intervention
- **B.** Aggressive crystalloid resuscitation to a systolic pressure of 140 mmHg
- **C.** Immediate transfer to the operating room for open or endovascular repair, with permissive hypotension and blood products en route
- **D.** Admission to the ward for observation
- **E.** Intravenous antihypertensives to reduce aortic wall stress

Answer: C

Explanation. Pain, collapse, hypotension, and a pulsatile mass with an aorta of 8 cm on bedside ultrasound is a ruptured abdominal aortic aneurysm. An unstable patient goes directly to the operating room for repair (endovascular if the anatomy is suitable and the team is ready, otherwise open), with resuscitation using blood products and a target of permissive hypotension (systolic roughly 80 to 100 mmHg) until the aorta is controlled, because raising the pressure dislodges the clot and increases bleeding. CT is for stable patients to plan endovascular repair. Aggressive crystalloid to a normal pressure worsens bleeding and coagulopathy. Observation is fatal. Antihypertensives in a hypotensive patient are dangerous.

Educational objective. A ruptured aortic aneurysm in an unstable patient goes to the operating room with permissive hypotension; CT is for the stable patient.

Question 68

A 68-year-old woman presents with a 4-week history of a painful ulcer over the tip of her right great toe. The ulcer is 1 cm, punched out, with a pale base and no granulation tissue. She has rest pain in the foot at night that improves when she hangs the foot over the side of the bed. The foot is cool with absent pedal pulses. Ankle-brachial index is 0.35.

Which of the following is the most appropriate management?

- **A.** Compression bandaging and leg elevation
- **B.** Urgent vascular imaging and revascularization
- **C.** Oral antibiotics and topical dressings only
- **D.** Supervised exercise program
- **E.** Amputation of the toe without vascular assessment

Answer: B

Explanation. Rest pain relieved by dependency, a non-healing punched-out toe ulcer, absent pulses, and an ankle-brachial index of 0.35 define chronic limb-threatening ischemia. Without restoration of blood flow the ulcer will not heal and the limb is at risk, so the management is urgent imaging of the arterial tree (duplex, CT angiography, or catheter angiography) and revascularization by endovascular or open means, together with wound care, antibiotics if infected, and cardiovascular risk reduction. Compression and elevation reduce arterial perfusion and are contraindicated in an ischemic limb. Dressings alone cannot heal an ulcer without blood supply. Exercise therapy is for claudication, not limb-threatening ischemia. Amputating the toe without revascularization fails to heal.

Educational objective. Rest pain, a non-healing arterial ulcer, and a very low ankle-brachial index mean limb-threatening ischemia; revascularize urgently and never compress an ischemic leg.

Question 69

A 55-year-old woman presents with a swollen, painful left calf three days after a long-haul flight. The calf is 4 cm larger in circumference than the right, warm, and tender along the deep veins. She has no chest symptoms.

Which of the following is the most appropriate next step?

- **A.** D-dimer alone; if positive, start warfarin
- **B.** Compression ultrasound of the leg, and anticoagulation if a deep venous thrombosis is confirmed
- **C.** CT pulmonary angiography
- **D.** Inferior vena cava filter placement
- **E.** Reassurance and analgesia

Answer: B

Explanation. Unilateral calf swelling with tenderness after a long flight gives a high pre-test probability of deep venous thrombosis, at which point compression ultrasound is the diagnostic test; a D-dimer is used to exclude the diagnosis only in low-probability patients and adds nothing in a high-probability one. Confirmed thrombosis is treated with anticoagulation (a direct oral anticoagulant or low-molecular-weight heparin), not started blindly on a D-dimer alone. CT pulmonary angiography is for suspected pulmonary embolism, and she has no chest symptoms. A filter is reserved for patients who cannot be anticoagulated. Reassurance risks a fatal embolus.

Educational objective. A high-probability deep venous thrombosis is confirmed by compression ultrasound and treated with anticoagulation; D-dimer is a rule-out test for low-probability patients.

Question 70

A 62-year-old man presents with a 6-month history of a shallow, irregular, weeping ulcer above the right medial malleolus, surrounded by brown pigmentation and firm, woody skin. Pedal pulses are present and the ankle-brachial index is 1.0. He has long-standing varicose veins.

Which of the following is the most appropriate management?

- **A.** Graduated compression therapy with leg elevation and treatment of the underlying venous reflux
- **B.** Urgent revascularization
- **C.** Systemic antibiotics for six weeks
- **D.** Below-knee amputation
- **E.** Skin biopsy as the first step in every case

Answer: A

Explanation. A shallow irregular ulcer above the medial malleolus with hemosiderin staining and lipodermatosclerosis in a patient with varicose veins is a venous ulcer, and with a normal ankle-brachial index confirming adequate arterial supply, the treatment is graduated compression (the mainstay), elevation, and correction of the superficial venous reflux by endovenous ablation, which reduces recurrence. Revascularization is for arterial disease, which the normal index excludes. Antibiotics are for clinical infection only. Amputation is not indicated. Biopsy is reserved for ulcers that fail to heal after adequate treatment or look atypical, to exclude a malignancy.

Educational objective. A venous ulcer with a normal ankle-brachial index is treated with compression, elevation, and treatment of the venous reflux; always check the index before compressing.

Skin, Soft Tissue, and Wounds

Question 71

A 52-year-old man with diabetes presents with 12 hours of severe pain in the left thigh after a minor scratch. The skin shows a modest area of erythema that has spread 5 cm beyond the marked margin in two hours. He is confused, with a heart rate of 130, blood pressure 90/56, and there is crepitus on palpation. The pain seems far greater than the skin changes suggest.

Which of the following is the most appropriate management?

- **A.** Oral cephalexin and review in 24 hours
- **B.** Intravenous antibiotics and an MRI to define the extent before any surgery
- **C.** Broad-spectrum intravenous antibiotics including clindamycin, resuscitation, and immediate surgical exploration and debridement
- **D.** Elevation and warm compresses

- **E.** Incision and drainage of the erythematous area under local anesthesia in the emergency department

Answer: C

Explanation. Pain out of proportion to the skin findings, rapid spread, crepitus, and systemic toxicity in a diabetic patient is necrotizing soft tissue infection. Survival depends on immediate, aggressive surgical debridement of all necrotic tissue, repeated as needed, combined with broad-spectrum antibiotics (including clindamycin for toxin suppression) and resuscitation. Oral antibiotics and review are fatal delays. Imaging may show gas but must never delay the operation when the clinical picture is clear. Elevation and compresses do nothing. Local incision in the emergency department is inadequate; the infection tracks along fascial planes far beyond the visible erythema and needs formal exploration in the operating room.

Educational objective. Necrotizing soft tissue infection is diagnosed clinically by pain out of proportion, rapid spread, and toxicity, and is treated by immediate surgical debridement.

Question 72

A 35-year-old woman presents with a 3 cm tender, fluctuant, red swelling in the axilla that has developed over four days. She has had two similar episodes in the other axilla and one in the groin over the past two years. She is afebrile.

Which of the following is the most likely diagnosis?

- **A.** Lymphadenitis
- **B.** Hidradenitis suppurativa
- **C.** Sebaceous cyst
- **D.** Lymphoma
- **E.** Cat scratch disease

Answer: B

Explanation. Recurrent abscesses in the axillae and groin over years is the pattern of hidradenitis suppurativa, a chronic inflammatory disease of apocrine gland-bearing skin that causes recurrent abscesses, sinus tracts, and scarring. The acute abscess is drained, but long-term management addresses the disease with weight management, smoking cessation, antibiotics such as tetracyclines or clindamycin with rifampicin, biologic therapy in severe cases, and wide excision for refractory areas. Lymphadenitis is a tender node with a source and does not recur in multiple sites over years. A sebaceous cyst can become infected but the multisite recurrence is characteristic of hidradenitis. Lymphoma presents with non-tender rubbery nodes and systemic symptoms. Cat scratch disease follows a scratch with regional lymphadenopathy.

Educational objective. Recurrent abscesses of the axilla and groin are hidradenitis suppurativa, a chronic disease requiring long-term management, not just drainage.

Question 73

A 48-year-old man presents with a changing pigmented lesion on his back. It is 9 mm across, asymmetric, with an irregular border and variegated colour, and has grown over three months.

Which of the following is the most appropriate next step?

- **A.** Shave biopsy of the raised portion
- **B.** Full-thickness excisional biopsy of the entire lesion with a narrow margin
- **C.** Wide local excision with a 2 cm margin immediately
- **D.** Cryotherapy
- **E.** Observation with photographs in three months

Answer: B

Explanation. A lesion meeting the ABCDE criteria (asymmetry, border irregularity, colour variation, diameter over 6 mm, evolution) is suspicious for melanoma. The correct biopsy is full-thickness excision of the whole lesion with a narrow (1 to 3 mm) margin, which allows the pathologist to measure Breslow thickness, the key determinant of prognosis and of the margins for the subsequent wide excision and the need for sentinel node biopsy. A shave biopsy transects the lesion and destroys the thickness measurement. Wide excision before histology commits to margins without knowing the thickness. Cryotherapy is contraindicated for a suspicious pigmented lesion. Observation of an evolving lesion delays diagnosis.

Educational objective. A suspicious pigmented lesion is biopsied by narrow-margin full-thickness excision so that Breslow thickness can be measured; never shave it.

Question 74

A 60-year-old man is post-operative day 6 after an open right hemicolectomy. The wound is red, warm, and tender along its lower half, and there is a purulent discharge from between two staples. He is afebrile with a soft abdomen. White cell count is 13.

Which of the following is the most appropriate management?

- **A.** Intravenous vancomycin and leave the wound closed
- **B.** Open the affected part of the wound, culture the pus, irrigate, and pack; antibiotics only if there is surrounding cellulitis or systemic illness
- **C.** Return to the operating room for wound debridement under general anesthesia
- **D.** Remove all staples and leave the entire wound open

- E. Apply a topical antibiotic ointment over the staples

Answer: B

Explanation. Purulent discharge with local erythema around post-operative day 3 to 7 is a superficial surgical site infection. The treatment is to open the involved part of the wound at the bedside (removing the staples over that segment), culture and drain the pus, irrigate, and pack for healing by secondary intention; antibiotics are added for surrounding cellulitis, systemic signs, or immunosuppression, not routinely. Leaving an abscess closed under antibiotics fails. Formal debridement in the operating room is for deep or necrotizing infection. Opening the entire wound is unnecessary when the infection is confined to one segment. Topical ointment over a closed collection does nothing.

Educational objective. A superficial wound infection is treated by opening and draining the involved segment; antibiotics are reserved for cellulitis or systemic illness.

Question 75

A 30-year-old man presents with a 4 cm tender, fluctuant, erythematous swelling in the right groin at the site where he injects drugs. He is febrile.

Which of the following is the most important step before incision and drainage?

- A. Blood cultures
- B. Ultrasound to exclude a mycotic pseudoaneurysm of the femoral artery
- C. HIV testing
- D. Tetanus booster
- E. Plain radiograph of the hip

Answer: B

Explanation. A swelling at an injection site in the groin may be a simple abscess or an infected (mycotic) pseudoaneurysm of the femoral artery from repeated arterial puncture; incising a pseudoaneurysm produces catastrophic hemorrhage. Any pulsatile groin swelling, or any groin swelling in a person who injects drugs, should be imaged with ultrasound (or CT angiography) before any incision, and a pseudoaneurysm is managed by vascular surgery. Blood cultures, HIV and hepatitis testing, and tetanus prophylaxis are all appropriate parts of care but are not the step that prevents disaster. A hip radiograph does not address the question.

Educational objective. Image a groin swelling in a person who injects drugs before incising it, to exclude a femoral pseudoaneurysm.

Upper Gastrointestinal, Bariatric, and Post-operative Complications

Question 76

A 45-year-old woman with a body mass index of 44 and type 2 diabetes is being considered for bariatric surgery. She has severe gastroesophageal reflux with esophagitis on endoscopy.

Which of the following operations is most appropriate?

- **A.** Sleeve gastrectomy
- **B.** Roux-en-Y gastric bypass
- **C.** Adjustable gastric band
- **D.** Nissen fundoplication alone
- **E.** Vertical banded gastroplasty

Answer: B

Explanation. Roux-en-Y gastric bypass is preferred over sleeve gastrectomy in patients with significant reflux, because the sleeve raises intragastric pressure and commonly worsens reflux, whereas the bypass diverts acid away from the esophagus and improves it; the bypass also produces strong remission of type 2 diabetes. The adjustable band has been largely abandoned for poor durability and complications. Fundoplication alone addresses reflux but not obesity or diabetes and is technically compromised in severe obesity. Vertical banded gastroplasty is a historical operation no longer performed.

Educational objective. In a bariatric candidate with significant reflux, Roux-en-Y gastric bypass is preferred over sleeve gastrectomy.

Question 77

A 50-year-old man who had a Roux-en-Y gastric bypass three years ago presents with recurrent episodes of severe crampy abdominal pain and vomiting, each lasting a few hours and resolving. He has lost 60 kg since surgery. Between episodes he is well. A CT during an episode shows a swirl of mesenteric vessels and mildly dilated small bowel.

Which of the following is the most likely diagnosis?

- **A.** Marginal ulcer
- **B.** Internal hernia
- **C.** Dumping syndrome
- **D.** Gallstones
- **E.** Adhesive obstruction

Answer: B

Explanation. Intermittent obstructive symptoms years after a gastric bypass with substantial weight loss, and a mesenteric swirl sign on CT, is an internal hernia through one of the mesenteric defects created

by the operation, which open up as the mesenteric fat disappears. It is dangerous because the bowel can strangulate, and the CT can be normal between episodes; diagnostic laparoscopy is indicated when the suspicion is high. A marginal ulcer causes epigastric pain and bleeding rather than intermittent obstruction. Dumping syndrome causes postprandial vasomotor symptoms and diarrhea, not obstruction. Gallstones cause right upper quadrant pain. Adhesive obstruction is possible but the swirl sign specifically points to an internal hernia.

Educational objective. Intermittent obstructive pain after gastric bypass with a mesenteric swirl on CT is an internal hernia and warrants laparoscopy because of the risk of strangulation.

Question 78

A 42-year-old woman presents with two years of progressive difficulty swallowing both solids and liquids, regurgitation of undigested food, and a 5 kg weight loss. Barium swallow shows a dilated esophagus tapering to a smooth narrowing at the lower end. Endoscopy shows no mass, and the scope passes the narrowing with gentle pressure.

Which of the following is the most likely diagnosis?

- **A.** Esophageal carcinoma
- **B.** Achalasia
- **C.** Peptic stricture
- **D.** Schatzki ring
- **E.** Diffuse esophageal spasm

Answer: B

Explanation. Dysphagia for both solids and liquids from the outset, regurgitation of undigested food, a dilated esophagus with a smooth tapered narrowing (the bird's beak), and a narrowing that the endoscope passes with gentle pressure describes achalasia, a failure of lower esophageal sphincter relaxation with absent peristalsis, confirmed by manometry. Carcinoma causes progressive dysphagia to solids first, with an irregular narrowing and a mass. A peptic stricture follows long-standing reflux and affects solids before liquids. A Schatzki ring causes intermittent solid food impaction. Diffuse spasm causes chest pain with a corkscrew esophagus. Treatment options are pneumatic dilatation, Heller myotomy with partial fundoplication, or peroral endoscopic myotomy.

Educational objective. Dysphagia to solids and liquids with a bird's beak esophagus is achalasia; confirm with manometry and treat by dilatation or myotomy.

Question 79

A 58-year-old man is post-operative day 4 after an Ivor Lewis esophagectomy. He develops a fever of 38.9 C, a heart rate of 124, and new atrial fibrillation. His chest drain output has become cloudy and he is increasingly short of breath.

Which of the following is the most likely diagnosis?

- **A.** Atelectasis
- **B.** Anastomotic leak
- **C.** Pulmonary embolism
- **D.** Urinary tract infection
- **E.** Drug fever

Answer: B

Explanation. Fever, tachycardia, new atrial fibrillation, and a cloudy or turbid chest drain output on post-operative day 4 after an esophagectomy with an intrathoracic anastomosis is an anastomotic leak until proven otherwise; new atrial fibrillation after esophagectomy is a recognized early marker of a leak or sepsis. Atelectasis does not produce turbid drain fluid and this degree of systemic upset. Pulmonary embolism causes dyspnea and tachycardia but not fever with turbid pleural fluid. Urinary infection and drug fever do not explain the drain. Management is antibiotics, drain fluid analysis, a contrast study or CT, and drainage or endoscopic or surgical management of the leak.

Educational objective. New atrial fibrillation, fever, and turbid drain fluid after esophagectomy signal an anastomotic leak.

Question 80

A 66-year-old man is post-operative day 2 after a laparoscopic colectomy. He has become agitated overnight, is disoriented to time and place, and is pulling at his lines. He was calm and oriented on the morning of surgery. He drinks half a bottle of wine most evenings. His vitals are normal apart from a heart rate of 104, and his glucose and oxygen saturation are normal.

Which of the following is the most appropriate initial management?

- **A.** Physical restraints and a haloperidol infusion
- **B.** Assessment for reversible causes, including alcohol withdrawal with a symptom-triggered benzodiazepine protocol and thiamine, review of opioids and anticholinergics, and reorientation
- **C.** CT of the head immediately
- **D.** Discharge home to a familiar environment
- **E.** Increase the opioid dose to settle him

Answer: B

Explanation. Acute post-operative confusion in an older patient is delirium until proven otherwise, and the management is to find and treat the cause: here, regular alcohol use makes withdrawal (peaking at 48 to 72 hours) the leading candidate, treated with a symptom-triggered benzodiazepine protocol and thiamine, alongside a review of deliriogenic drugs (opioids, anticholinergics, benzodiazepines other than for withdrawal), a search for infection, hypoxia, electrolyte disturbance, retention, constipation, and pain, and non-pharmacological measures (reorientation, sleep, glasses and hearing aids, family presence). Restraints and antipsychotic infusions worsen delirium and are reserved for dangerous agitation after causes are addressed. Head CT is indicated for focal signs, head trauma, or anticoagulation, not routinely. Discharge is unsafe. Increasing opioids deepens the delirium.

Educational objective. Post-operative delirium is managed by finding the cause; in a regular drinker, alcohol withdrawal at 48 to 72 hours is high on the list.