COMPLICATIONS OF GENERAL SURGICAL PROCEDURES

COMMON COMPLICATIONS OF ALL PROCEDURES

Table 90-1 Complications of General Surgical Procedures

Complication	Important Points
Fever	"Five Ws" (wind, water, wound, walking, wonder drugs) are common causes.
Pulmonary complications	
Atelectasis	<24 h, treat with pulmonary toilet, discharge unless ill or hypoxemic.
Pneumonia	2–7 d, polymicrobial, most require admission.
Pneumothorax	Multiple causes, consider expiratory views, consider needle aspiration.
Pulmonary embolism	Dyspnea is main symptom, high index of suspicion.
GI complications	
Intestinal obstruction	Obtain radiographs, search for causes.
Intra-abdominal abscess	CT diagnosis, early administration of broad-spectrum antibiotics.
Pancreatitis	Always consider in postoperative patients with abdominal pain.
Cholecystitis	Usually in older patients, can be acalculous.
Fistulas	Can be high output, admit if concerns over output.
GU complications	
Urinary tract infection	2–5 d, oral antibiotics, most discharged.
Urinary retention	Rapid catheter drainage, most discharged.
Acute renal failure	Prerenal, renal, and postrenal causes, most admitted.
Wound complications	
Hematoma	Caused by poor hemostasis, can drain most, but be careful with neck hematomas and hematomas after vascular surgery.
Seroma	Painless swelling, clear fluid, drain and discharge.
Infection	Open, drain, and culture specimens; be careful with wounds associated with respiratory tract, GI tract, or GU tract, or secondary to trauma.
Necrotizing fasciitis	Pain out of proportion to physical findings.
Dehiscence	Be careful with abdominal incisions (potential for evisceration).
Vascular complications	
Superficial thrombophlebitis	Usually aseptic, provide local therapy and discharge.
Deep venous thrombosis	Upper and lower extremity, perform Doppler studies.
Complications of drug therapy	
Diarrhea	Consider pseudomembranous colitis.
Drug fever	Many drugs implicated, requires admission.
Tetanus	Can occur after GI surgery.
Procedure-specific complications	See text.

FEVER:

- A common presenting complaint
- THINK FIVE 'W's → WIND (atelectasisi/pneumonia), WATER (UTI), WOUND, WALKING (deep venous thrombosis), WONDER DRUGS (drug fever, pseudomembranous colitis)
- Fever in the first 24 hours → usually atelectasis
- DVT can result in fever at any time but usually not until the fift post-operative day
- Pseudomembranous colitis due to antibiotics occurs up to 6 weeks postoperatively
- Common causes are outlined below and there evaluation below that

Table 90-2 Common Causes of Postoperative Fevers in General Surgical Patients

Cause of Fever	Presentation	Signs and Symptoms	Diagnostic Test	Treatment
Atelectasis	First 24 h	Isolated fever; may have tachypnea, dyspnea, and/or tachycardia	Chest radiography	Pulmonary toilet; admission if unsure or patient is ill appearing
Pneumonia	3–7 d	Dyspnea, chest pain, productive cough, fever, and/or tachypnea	Chest radiography	Admission and coverage with broad-spectrum antibiotics
Urinary tract infections	2–5 d	Often none; possibly dysuria	Urinalysis	Admission if patient is elderly or toxic
Skin and soft tissue infection	5–10 d	Increasing pain, erythema, swelling, drainage, and tenderness at incision site	Examination, aspiration and/or opening of wound	Drainage, packing, and outpatient antibiotic therapy
Thrombophlebitis (septic and sterile)	<3 d	Warm, tender and swollen vein	None	If not septic, warm soaks
				If septic, surgical removal
Deep vein thrombosis	4–6 d	Extremity swelling and pain	US	Admission and anticoagulation
Intra-abdominal abscesses	4–21 d	Fever and elevated white blood cell count without specific focal abdominal findings	CT	Admission and antibiotic administration
Pseudomembranous colitis	Anytime	Diarrhea	Stool testing using immunoassay	Vancomycin administration
Peritonitis	4–21 d	Tachycardia and abdominal pain, peritoneal irritation	CT	Admission and antibiotic administration
Pulmonary embolism	Anytime	Shortness of breath, tachypnea, and/or hemodynamic instability	CT or ventilation–perfusion scanning	Admission and anticoagulation
Transfusion reaction	First 24 h	Fever, chills	Transfusion check for incompatibility	Admission depending on condition of patient

Table 90-3 Evaluation and Management of Postoperative Fever
History
Presenting signs and symptoms
Onset of symptoms, time since procedure
Procedures performed and complications
Medications
History of blood transfusion
Physical examination
Particular attention to
Operative sites and contiguous areas
Sites of catheters and invasive monitors
Signs of deep venous thrombosis and pulmonary embolism
Decubitus ulcers
Lungs
Ancillary studies
Complete blood count with differential
Chest radiograph
Gram stain and culture of wound exudate
Urinalysis (urine culture if infected)
Sputum Gram stain and culture
Blood cultures
CT to exclude intra-abdominal pathology
If diarrhea present, consider immunoassay of specimen for *Clostridium difficile* toxin
Further tests as indicated (e.g., CT, radionuclide studies, venography, arteriography)
Treatment
If source identified, start antibiotics; admission based on condition of patient
If no source identified, consider admission, change all catheters and culture catheter specimens, stop all medication that might cause fever

RESPIRATORY COMPLICATIONS:

- **ATELECTASIS:**
  - **Collapse of pulmonary alveoli → very common**
  - If it is mild and there is no evidence of hypoxia, it may be managed as an outpatient with analgesia and deep breathing exercises
  - Admission is indidcated for aggressive chest physio/oxygen for those who are debilitated, underlying lung disease or those with hypoxia
- **PNEUMONIA:**
  - Usually becomes evident 24-96 hours post-operatively
  - Predisposing factors → prolonged ventilatory support/atelectasis
  - Post-op pneumonia is POLYMICROBIAL
  - Broad spectrum IV antibiotics
- **PNEUMOTHORAX:**
  - Occurs as complication of thoracic wall surgery, breast biopsy, laparoscopic abdominal surgery, abdominal paracentesis, NG insertion, CVC insertion etc
- **PULMONARY EMBOLUS:**
  - PE may present any time during the postoperative period

GENITOURINARY COMPLICATIONS:

- **UTI:**
  - Can occur after any surgical procedure but it is more likely after instrumentation of the GU tract or bladder catheterization
  - Only those with sepsis require admission and IV antibiotics
- **URINARY RETENTION:**
  - Common problem → occurs as the result of catecholamine stimulation of α-receptors in the bladder neck and urethral smooth muscle
  - More likely in elderly men, those receiving excessive fluid administration, anorectal surgery, spinal/epidural anaesthetic
  - Present with lower abdominal discomfort, urinary urgency and inability to void → diagnosis confirmed with bladder scan
  - If in retention after urological/GU procedure → consult urologist
  - Antibiotics given if GU tract instrumented or if retention is prolonged
- **ACUTE RENAL FAILURE:**
  - Classified according to the primary cause → prerenal, intrinsic or postrenal
  - Volume depletion is the most common cause → fluid bolus
  - Intrinsic causes → ATN/drug nephrotoxicity

WOUND COMPLICATIONS:

- The operative surgeon should be informed about all postoperative wound complications
- **HAEMATOMAS:**
  - Result from unrecognized inadequate haemostasis
  - Patients have pain, pressure and swelling within the wound
  - Differentiating between haematoma and infection can be difficult → remove a few sutures to allow haematoma to drain
  - If no infection and adequate haemostasis → discharge possible
  - In those with haematoma of the neck, or those post vascular surgery → extreme caution advised
- **SEROMA:**
  - Collection of serous fluid, usually the result of inadequate control of lymphatics during dissection, but can occur under split-skin grafts and in areas of large dead spaces
  - Painless swelling below the wound → needle aspiration reveals serous fluid
- **INFECTION:**
  - Systemic factors contribute → extremes of age, poor nutrition, DM, but LOCAL FACTORS ARE OF GREATEST SIGNIFICANCE
  - LOCAL FACTORS → necrotic tissue, poor perfusion, foreign bodies and haematomas
  - In nontraumatic, uninfected operative wounds in which the respiratory, alimentary and GU tracts are not entered, INFECTION RATES ARE LOW → those associated with trauma or entry of above areas have higher risk of infection

    - Present with pain, erythema, swelling, drainage and tenderness at the incision site
- **NECROTISING FASCIITIS:**
    - FEARED COMPLICATION
    - Usuall cause is contamination of the wound with Group A step or Staph aureus
    - RF include → DM, alcoholism, immunosuppression and peripheral vascular disease
    - Early clinical differentiation from cellulitis can be difficult → presence of marked systemic toxicity and pain out of proportion to local findings are characteristic
    - CT can show asymmetric fascial thickening, gas tracking along fascial planes or focal fluid collections
    - In more advanced cases → surface hyperesthesia, crepitation or bullae
    - Treatment should include antibiotics and IMMEDIATE SURGICAL CONSULTATION FOR DEBRIDEMENT
- **WOUND DEHISCENCE:**
    - Can be superficial or can extend into the deeper fascial planes
    - Caused by inadequate closure or intrinsice host factors → malnutrition, steroid use or DM
    - In abdominal wounds, dehiscence has the potential for evisceration → if evisceration not present, then conservative management is possible using abdominal binders

VASCULAR COMPLICATIONS:

- **SUPERFICIAL THROMBOPHLEBITIS:**
    - Most frequently due to stasis in varicose veins, which is usually aseptic
    - If there is no evidence of surrounding cellulitis or lymphangitis, and no DVT → local heat, elevation and NSAIDs
- **DEEP VENOUS THROMBOSIS:**
    - Coexists with superficial thrombophlebitis
    - DVT typically characterised by leg pain or swelling (or both)

<u>COMPLICATIONS OF DRUG THERAPY:</u>

- DRUG FEVER → MANY DRUGS ASSOCIATED AND THOUGHT TO BE A HYPERSENSITIVITY REACTION OR DISTURBED THERMOREGULATION
- Many antibiotics can cause diarrhoea, but the greatest concern in post-operative patients is PSEUDOMEMBRANOUS COLITIS → related to antibiotic use which destroys enteric bacterial flora and allows overgrowth of Clostridium difficile → watery and sometimes bloody diarrhoea with fever and crampy abdominal pain. Confirmed by tissue culture or detection of C difficile cytotoxin

Table 90-4 Some Medications Associated with Drug Fever	
Allopurinol	Lysergic acid
Aminoglycosides	Mebendazole
Amphetamine	Methyldopa
Amphotericin B	Metoclopramide
Antihistamines	Nifedipine
Asparaginase	Nitrofurantoin sodium
Azathioprine	Nomifensine
Barbiturates	Oxprenolol
Benztropine	Para-aminosalicylic acid
Bleomycin sulfate	Penicillins
Carbamazepine	Phenytoin sodium
Cephalosporins	Procainamide
Chlorpromazine	Propafenone
Cimetidine	Propylthiouracil
Clofibrate	Prostaglandin E_2
Cocaine derivatives	Quinidine sulfate
Dobutamine	Rifampin
Folate	Ritodrine
Haloperidol	Salicylates
Heparin	Streptokinase
Hydralazine	Streptomycin sulfate
Hydroxyurea	Sulfonamides
Ibuprofen	Tetracycline
Interferon	Thioridazine
Iodides	Tolmetin
Isoniazid	Triamterene
Levamisole	Trifluoperazine
Lincomycin	Vancomycin

COMPLICATIONS OF BREAST SURGERY:

- Infrequent → can develop minor wound infections and haematomas
- Rarely → pneumothorax has been reported
- Early complications seen with mastectomies → wound infection, necrosis of skin flaps, accumulation of seromas
    - Incidence of lymphoedema ranges from 5% to 80%

COMPLICATIONS OF GIT SURGERY:

GENERAL CONSIDERATIONS:

- **INTESTINAL OBSTRUCTION:**
    - Ileus, is thought to be due to stimulation of the splanchnic nerves which leads to neuronal inhibition of coordinated intrinsice bowel wall motor activity and is expected after any operation in which the peritoneal cavity

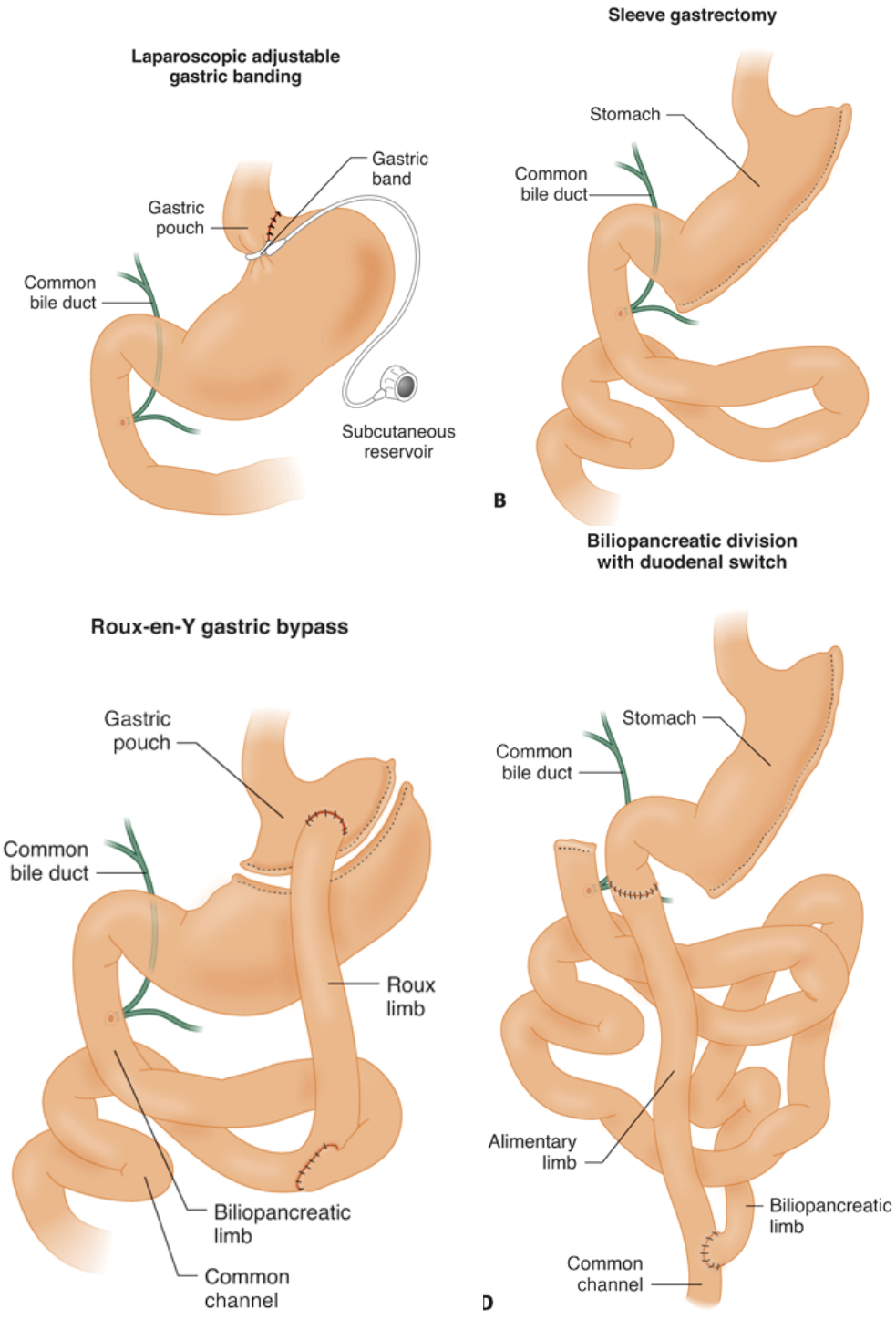
is violated → small bowel tone usually normalizes within 24 hours, colonic tone within 3-5 days. Prolonged ileus can be caused by peritonitis, intra-abdominal abscess, haemoperitoneum, pneumonia, electrolyte imbalance, sepsis, medications.
        - Presents with N+V, constipation, abdominal distention and pain
        - Responds to bowel rest, NG suction, and IV hydration
    - MECHANICAL OBSTRUCTION → most often secondary to ADHESIONS. Present with N+V, pain and abdominal distention. AXR show multiple air-fluid levels and paucity of gas in the colon. CT scanning is helpful to exclude obstruction due to bowel strangulation
- **INTRA-ABDOMINAL ABSCESS:**
    - Caused most frequently by preoperative contamination, spillage of bowel contents during surgery, contamination of a haematoma or postoperative anatomotic leaks
    - Patients have pain, N+V, ilues, fever, anorexia and tenderness
    - CT or US studies are required
    - BROAD-SPECTRUM ANTIBIOTICS
    - Some are amenable to percutaneous drainage, while others require surgical exploration
- **PANCREATITIS:**
    - Most commonly occurs after gastric resection, biliary tract surgery and ERCP and is due to direct manipulation or retraction of the pancreatic duct
    - In general, the treatment is the same to nonoperative pancreatitis
- **CHOLECYSTITIS:**
    - Patients can present in the postoperative period with biliary colic, acute CALCULOUS and acute ACALCULOUS cholecystitis
    - Acalculous cholecystitis is of particular concern and is more common in elderly men. Early diagnosis is critical (US features of cholecystitis without gallstones), because early operative intervention can reduce morbidity and mortality
- **FISTULAS:**
    - Enterocutaneous fistulas can occur almost anywhere in the GIT and are usually the result of technical complications or direct bowel injury
    - High-output fistulas can result in electrolyte abnormalities and volume depletion → those involved in the proximal GIT are most often high output and are of greatest concern
    - Sepsis is the other major complication
    - Most patients require admission
    - Most close spontaneously
- **TETANUS:**
    - C tetani is found in the GIT of 1% of the population and spillage can occur during GIT surgery → the organism is facilitated by devitalized tissue, blood clots and surgical suture
    - Incubation takes 0-73 days, at which time the toxin leads to clinical TETANUS → trismus and opisthotonos may not manifest
    - Consider in the unimmunized population

SPECIFIC CONSIDERATIONS:

- **ANASTOMOSIS:**
  - Leaks occur most frequently after oesophageal and colonic surgeries and the cause is most often related to surgical technique
  - Intrathoracic oesophageal anastomotic leaks usually manifest within 10 days
    - Presentation of these cases is dramatic with fever, chest pain, tachypnoea, tachycardia and possibly shock
    - CXR may reveal pneumothorax with pleural effusion
    - Even with immediate re-oepration, morbidity and mortality remain high
  - Signs and symptoms of GASTRIC ANASTOMOTIC LEAKS → abdominal pain, fever, leukocytosis, gastric outlet obstruction, peritonitis and shock
    - Patient should have immediate volume resuscitation, broad spectrum antibiotics and NG insertion
    - Immediate surgery is required
  - SMALL INTESTINE ANASTOMOTIC LEAKS → infrequent due to excellent blood supply and rapid healing of the area
    - If a leak occurs, patient usually presents with local abscess or peritonitis
    - Immediate reoperation required
  - COLORECTAL ANASTOMOSES:
    - Prone to disruption because of large number of pathogenic bacteria found, propensity for colonic distention and presence of only a single layer of circular muscle to support sutures
    - Patients usually present 7-14 days postoperatively with fever and abdominal pain
    - CT confirms the diagnosis
    - Treatment → broad-spectrum IV antibiotics, NG insertion and adequate resuscitation in preparation for surgery

BARIATRIC SURGERY:

- **FOUR MAIN PROCEDURES** → lap-band, sleeve gastrectomy, Roux-en-Y gastric bypass, biliopancreatic diversion with duodenal switch (see diagrams below.



- **Overall operative mortality is 2%, but postoperative complications are common**
- Life threatening problems like anastomotic leak and intra-abdominal bleeding must be considered, especially in the first few weeks → consider in a patient with abdominal pain, tachycardia or abdominal tenderness → CT scan
- Multiple complications can occur and are outlined below

- A common complication of Roux-en-Y gastric bypass is DUMPING SYNDROME → occurs when the pylorus is bypassed or removed → hyperosmolar chyme is dumped from the stomach into the jejunum, which results in rapid influx of extracellular fluid and an autonomic response → nausea, epigastric discomfort, palpitations, colicky abdominal pain, diaphoresis and sometimes syncope. TREATMENT IS DIETARY MODIFICATION WITH SMALL, DRY MEALS THE KEY. Refractory cases require pyloroplasty.

Table 90-5 Complications of Bariatric Surgical Procedures

Complication	Presentation	Signs and Symptoms	Diagnostic Test	Treatment	Associated Procedures
Anastomotic leak	1 wk to 1 mo	Tachycardia, dyspnea, abdominal pain, unexplained sepsis	Abdominal CT or meglumine diatrizoate (Gastrografin) UGI study	Resuscitation, surgical exploration	Open RYGBP, lap RYGBP, BPD
Intra-abdominal bleeding	First few weeks	Tachycardia, abdominal pain, hypotension	Abdominal CT or meglumine diatrizoate UGI study	Resuscitation, surgical exploration	Open RYGBP, lap RYGBP, BPD
GI obstruction	1 wk to 1 mo	Hiccups, N/V, abdominal pain	Plain radiography or CT looking for air-fluid levels	Nasogastric decompression	Open RYGBP, lap RYGBP
Stomal stenosis	6 mo	Postprandial abdominal pain, N/V with solids and liquids	Endoscopy or UGI study	Endoscopy with dilatation	Open RYGBP, lap RYGBP, PG
Stomal ulcer	2–4 mo	Epigastric abdominal pain or retrosternal chest pain, dyspepsia, N/V, UGI bleed	Endoscopy	Resuscitation, PPI, sucralfate	Open RYGBP, lap RYGBP
UGI bleed	Early: weeks Late: months	Melena, hematemesis, hypotension, altered mental status	Emergent endoscopy	Resuscitation, endoscopy, transfusion, PPI	Open RYGBP, lap RYGBP, PG
Dumping syndrome	Anytime	Diarrhea, abdominal cramps, N/V, tachycardia, palpitations, flushing, dizziness, syncope	Clinical diagnosis or endoscopy	Consumption of small, frequent meals, increase in oral hydration	Open RYGBP, lap RYGBP
Stomal obstruction	Months to years	N/V with solids and liquids	Endoscopy	Endoscopy, surgical revision	Open RYGBP, lap RYGBP
Gastroesophageal reflux disease	Months to years	Postprandial reflux, epigastric abdominal pain, N/V	Clinical diagnosis	Acid suppression, consumption of small, frequent meals	Open RYGBP, PG
Cholelithiasis/cholecystitis	Months to years	Abdominal pain with fatty foods, fever, tachycardia	US	Cholecystectomy	Open RYGBP, lap RYGBP, BPD
Vitamin deficiencies	Months to years	Weakness, bone loss, anemia, fractures, neuropathy, hypercalcemia	CBC, iron studies, parathyroid hormone studies, vitamin levels	Supplemental vitamins	Open RYGBP, lap RYGBP, BPD
Wernickeencephalopathy	Weeks to months	Cerebellar signs, ophthalmoplegia, weakness, memory disturbances	Clinical diagnosis	IV thiamine	Open RYGBP, lap RYGBP, BPD
Gastric slippage	Days to years	Epigastric abdominal pain, dysphagia, food intolerance, reflux	Plain abdominal radiography (reveals large gastric bubble above band) or UGI contrast study	Surgery	LAGB
Esophageal, gastric pouch dilation	After band adjustment	Epigastric abdominal pain, dysphagia, reflux	UGI contrast study	Band deflation by surgeon, close follow-up	LAGB
Band erosion	Months to years	Infected port site or acute abdomen	Meglumine diatrizoate UGI study (shows contrast leak), endoscopy, or surgical exploration	Removal of band, surgical repair	LAGB
Gastric injury/necrosis	24–48 h	Acute abdomen	Meglumine diatrizoate UGI study	Surgery	LAGB

- Wernickes encephalopathy is a rare, but serious complication that must be considered in a patient with a history of bariatric surgery who presents with any cerebellar signs, ophthalmoplegia, weakness and or memory disturbances

NON-BARIATRIC GASTRIC SURGERY:

- In those who have undergone complete gastrectomy for nonbariatric reasons can present with a few distinct syndromes:
  - Dumping syndrome
  - Alkaline reflux gastritis
  - Afferent loop syndrome → severe epigastric pain 1-2 hours post food that is relieved by vomiting. Diagnosis made by contrast radiography

- Postvagotomy diarrhoea → can lead to unpredictable and explosive diarrhoea with weight loss, malnutrition and social phobia. Incidence decreases with time and treatment is symptomatic

BILIARY TRACT SURGERY:

- More than 90% of all cholecystectomies are now performed laparoscopically
- There are complications related to biliary surgery as well as those related more generally to laparoscopic surgery (see below)

Table 90-6 Complications of Cholecystectomy
Bile leak
Bile duct stricture
Bleeding
Bowel injury
Intra-abdominal abscess
Acute myocardial infarction
Pancreatitis
Peritonitis
Pulmonary complications
Retained common duct stones or stones spilled into peritoneum
Splenic injury
Umbilical hernia
Wound infection

Table 90-7 Complications of Laparoscopy
Related to pneumoperitoneum
Cardiac arrhythmias during the procedure
Subcutaneous emphysema
Pneumothorax
Pneumomediastinum
CO_2 embolization
Related to insertion of needle and trocar
Bleeding from trocar site
GI tract injuries
Laceration
Intestinal burns
GU tract injuries
Major vessel injuries
Hernia from trocar site
Wound infection
Miscellaneous
Retained intra-abdominal gallstones
Biliary cutaneous fistula
Chronic pain
Infertility
Cholelithiasis
Metastases to the trocar site

- If there are signs of peritoneal irritation or fever, then a biliary injury is likely → CT will identify a collection of bile, but ERCP is required to identify the specific site and reoperation may be necessary
- Patients presenting soon after cholecystectomy with pain, pancreatitis and/or jaundice may have retained CBD stones → sphincterotomy is usually an effective means of dealing with retained stones
- Patients presenting late after cholecystectomy with fever, pain and jaundice may have bile duct stricture → ERCP required for diagnosis and treatment
- Spillage of gallstones initially thought to be benign, but increasingly have been linked to chronic abdominal pain, pelvic pain, dysmenorrhoea, intra-abdominal abscesses, colocutaneous fistula and implantation into the ovary with subsequent infertility

STOMAS:

- The two most commonly placed stomas are ileostomy and colostomy → problems associated with these are quite debilitating
- ISCHAEMIA AND STOMAL NECROSIS → manifested very early in the postoperative ocurse → inadequate blood supply to the stoma. Any evidence of compromised blood flow requires surgical evaluation
- PERISTOMAL MACERATION AND SKIN DESTRUCTION → poor seal of the stomal appliance

- STOMAL PROLAPSE → usually caused by inadequate fixation of the intra-abdominal portion or too-large an abdominal wall opening. Reduction should be attempted if the tissue is viable followed by surgical exploration.
- PARASTOMAL HERNIAS → occur if opening is too large. Attempt reduction and consult a surgeon

COLONOSCOPY:

- Potential complications include haemorrhage, perforation, retroperitoneal abscess, pneumoscrotum, pneumothorax, volvulus, postcolonoscopy distention, splenic rupture, appendicitis, bacteraemia and infection
- Haemorrhage is the most common complications and can be secondary to polypectomy, biopsies, laceration of the mucosa or teraing of the mesentery or spleen
    - If bleeding intraluminal → patient will present with PR bleeding
    - Those with mesenteric or splenic injury will present with signs of intra-abdominal bleeding → requires emergency laparotomy
- Colonic perforation with pneumoperitoneum usually is evident immediately but can take several hours to manifest
    - Usually secondary to intrinsic disease of the bowel (diverticular disease) or to vigorous manipulation during the procedure → immediate laparotomy

RECTAL SURGERY:

- Frequently experience urinary retention, constipation, rectal haemorrhage and rectal prolapse