Hospital Management of Gallbladder Disease

Gallbladder disease, including acute cholangitis, cholecystitis, and choledocholithiasis, is a common cause of hospitalization, often requiring prompt diagnosis and management to prevent complications like sepsis or perforation. This pamphlet provides students with a guide to diagnose, evaluate, and manage these conditions in the hospital setting, including when to consult surgery or interventional radiology (IR), with clinical scenarios to apply the knowledge.

Clinical Presentation

• Acute Cholecystitis:

- Symptoms:
  - Right upper quadrant (RUQ) pain (constant, postprandial), nausea, vomiting, fever, anorexia.
- Exam:
  - RUQ tenderness, Murphy's sign (inspiratory arrest on RUQ palpation), guarding (if peritonitis), fever (Temp >38°C).
- Risk Factors:
  - Gallstones (90% of cases), female, obesity, age >40, rapid weight loss, pregnancy.

• Acute Cholangitis:

- Symptoms:
  - Charcot's triad (RUQ pain, fever, jaundice), Reynolds' pentad (Charcot's triad + hypotension, altered mental status) in severe cases.
- Exam:
  - RUQ tenderness, jaundice (icteric sclerae, yellow skin), fever (Temp >39°C), hypotension (SBP <90 mmHg, septic shock), confusion (encephalopathy).
- Risk Factors: Choledocholithiasis, biliary obstruction (strictures, tumors), prior ERCP, stents.

• Choledocholithiasis:

- Symptoms: RUQ pain (colicky, postprandial), jaundice, nausea, vomiting, dark urine, pale stools.

- Exam: RUQ tenderness, jaundice, no fever (unless cholangitis develops), normal vitals (if uncomplicated).
- Risk Factors: Gallstones, history of cholecystitis, female, obesity, hypertriglyceridemia.

• Associated Conditions:

Gallstone disease (90% of cases), biliary sludge, pancreatic disease (pancreatitis), liver disease (e.g., cirrhosis), malignancy (cholangiocarcinoma).

Causes and Differential Diagnosis

• Causes:

- Gallstones (Cholelithiasis):
  - **Acute Cholecystitis**: Obstruction of cystic duct by gallstone (90% of cases), leading to inflammation.
  - **Choledocholithiasis**: Stone in common bile duct (CBD), often from gallbladder migration.
  - **Acute Cholangitis**: Secondary to CBD obstruction (choledocholithiasis, strictures), leading to infection.
  - **Acalculous Cholecystitis** (5-10% of cholecystitis):
- **Causes**:
  - Ischemia, stasis, critical illness (e.g., ICU, sepsis, trauma), prolonged fasting, TPN.
- **Risk Factors**:
  - Elderly, diabetes, burns, HIV, immunosuppression.
- **Mirizzi Syndrome**:
  - Definition: Rare complication of gallstone disease where a stone in the cystic duct or Hartmann's pouch compresses the CBD, causing obstruction and inflammation.
  - Types:
    - Type I: Extrinsic compression of CBD without fistula.
    - Type II-IV: Fistula formation between cystic duct and CBD (increasing severity).
  - Features:
    - RUQ pain, jaundice, elevated LFTs, imaging shows CBD compression, dilated intrahepatic ducts.
  - Complications: Cholangitis, biliary strictures, increased risk of gallbladder cancer.

- **Other Causes of Biliary Obstruction**:
  - **Malignancy**:
    - Pancreatic Cancer: Head of pancreas mass causing CBD obstruction (painless jaundice, Courvoisier's sign: palpable GB).
    - Cholangiocarcinoma: Intrahepatic or extrahepatic (Klatskin tumor at CBD bifurcation), presents with jaundice, pruritus, weight loss.
    - Gallbladder Cancer: Advanced cases invade CBD, often with history of chronic cholecystitis or gallstones.
  - **Benign Strictures**:
    - Post-ERCP, prior surgery (e.g., cholecystectomy), chronic pancreatitis, primary sclerosing cholangitis (PSC).
    - Parasites: Ascaris lumbricoides, Clonorchis sinensis (common in endemic areas, e.g., Southeast Asia).
  - **Sludge/Hemobilia**: Biliary sludge (microlithiasis), blood clots (hemobilia from trauma, liver biopsy).

• Differential Diagnosis:

- Acute Pancreatitis: Epigastric pain radiating to back, lipase >3x ULN, CT showing pancreatic edema.
- Perforated Peptic Ulcer: Sudden severe pain, free air on X-ray, peritonitis (rebound tenderness).
- Hepatitis: RUQ pain, jaundice, elevated LFTs, negative imaging for gallstones.
- Appendicitis: RLQ pain, Rovsing's sign, CT showing appendiceal inflammation.
- Mesenteric Ischemia: Severe pain out of proportion to exam, lactic acidosis, CT angiography (occlusion).

Clinical Features and Diagnosis Table

Condition	Clinical Features	Diagnostic Tools	Key Findings
Acute Cholecystitis	RUQ pain, Murphy's sign, fever	Ultrasound, HIDA scan	Gallstones, GB wall thickening, pericholecystic fluid.
Acute Cholangitis	Charcot's triad (pain, fever, jaundice)	Ultrasound, MRCP, blood cultures	Dilated CBD, stones, positive cultures.
Choledocholithiasis	RUQ pain, jaundice, dark urine	Ultrasound, MRCP, ERCP	CBD stones, dilated CBD (>6 mm).
Acalculous Cholecystitis	RUQ pain, fever, critical illness	Ultrasound, CT	GB distension, wall thickening, no stones.

Diagnosis and Labs

• Diagnostic Criteria:

- Tokyo Guidelines (TG18):
  - Overview: The Tokyo Guidelines (updated in 2018, TG18) provide standardized criteria for diagnosing and grading the severity of acute cholecystitis and cholangitis, aiding in clinical decision-making.
    - **Acute Cholecystitis:**
      - A: Local signs (Murphy's sign, RUQ tenderness/mass/pain).
      - B: Systemic signs (fever >38°C or <36°C, chills, HR >90 bpm).
      - C: Imaging (gallstones, GB wall thickening >4 mm, pericholecystic fluid, HIDA scan: non-visualized GB).
      - Diagnosis: 1 from A + 1 from B + 1 from C.
      - Severity Grading:
        - Grade I (Mild): Meets criteria, no organ dysfunction, responds to medical therapy.
        - Grade II (Moderate): **1 of:** palpable GB, duration >72h, marked inflammation (e.g., gangrene, abscess, peritonitis).
        - Grade III (Severe): **Organ dysfunction (e.g., respiratory:** PaO2/FiO2 <300; renal: Cr >2 mg/dL; cardiovascular: SBP <90 mmHg).
    - **Acute Cholangitis**:
      - A: Systemic inflammation (fever >38°C or <36°C, HR >90 bpm, WBC <4,000 or >10,000/µL).
      - B: **Cholestasis (jaundice, bilirubin >2 mg/dL, elevated LFTs:** ALT, AST, ALP, GGT).
      - C: Imaging (biliary dilatation, CBD stone, stricture).
      - Diagnosis: 1 from A + 1 from B + 1 from C.
        - Severity Grading:
          - Grade I (Mild): Meets criteria, responds to antibiotics.
          - Grade II (Moderate): No response to antibiotics within 24h, or 2 of: age >75, WBC >15,000 or <5,000/µL, albumin <2.5 g/dL, bilirubin >5 mg/dL.
          - Grade III (Severe): Organ dysfunction (e.g., hypotension, altered mental status, respiratory failure).
    - **Choledocholithiasis;** Clinical suspicion (jaundice, RUQ pain) + imaging (CBD stone on US/MRCP/ERCP).

Labs:

- CBC:
  - Leukocytosis (WBC >10,000/μL, inflammation/infection), leukopenia (WBC <4,000/μL, severe sepsis).
  - Anemia (if GI bleed from stone erosion, Mirizzi syndrome).
  - CMP:
    - **LFTs:** Elevated bilirubin, ALT/AST (cholestasis), ALP, GGT (biliary obstruction)..
    - **Creatinine:** Elevated Cr (AKI, hypovolemia, sepsis in cholangitis).
  - **Amylase/Lipase:** Elevated (concurrent pancreatitis, 15-20% of gallstone cases)
- Inflammatory Markers:
  - **CRP/ESR:** Elevated in cholecystitis, cholangitis (CRP >3 mg/dL predicts severity).
- **Procalcitonin:** Elevated in cholangitis (bacterial infection, sepsis).
- **Blood Cultures:** Positive in cholangitis (E. coli, Klebsiella, Enterococcus), guide antibiotic choice.
- Coagulation: PT/INR elevated in liver dysfunction (cholestasis), anticoagulation (e.g., warfarin use).

Imaging:

- Abdominal Ultrasound:
  - **First-line:** Gallstones, GB wall thickening (>4 mm), pericholecystic fluid, dilated CBD (>6 mm), sonographic Murphy's sign.
  - **Sensitivity:** 85-95% for cholecystitis, 50-75% for CBD stones.
- HIDA Scan:
  - **Cholecystitis:** Non-visualized GB (cystic duct obstruction), sensitivity >95%.
  - Use if US inconclusive; not for cholangitis/choledocholithiasis.
- MRCP:
  - **Choledocholithiasis:** Gold standard non-invasive (sensitivity 90-95% for CBD stones), shows dilated CBD, strictures.
  - Use if US negative but high suspicion (e.g., jaundice, elevated LFTs).
- CT Abdomen:
  - **Cholecystitis:** GB wall thickening, pericholecystic fluid, less sensitive for stones (70%).
  - **Cholangitis:** Biliary dilatation, CBD stones, complications (e.g., abscess).

- ERCP: (GI consult to perform)
  - **Diagnostic and therapeutic:** Visualizes CBD stones, strictures; allows stone removal, sphincterotomy.
  - Use in cholangitis (urgent) or choledocholithiasis (if MRCP confirms stones).

Treatment and Overall Management

• General Principles:

- Stabilize: ABCs (airway, breathing, circulation), IV access, telemetry, oxygen if SpO2 <90%.
- Supportive care: Fluids, pain control, NPO initially, treat underlying cause (e.g., stones, infection).
- Prevent complications: Monitor for sepsis, perforation, cholangitis in cholecystitis.

• Initial Management:

- Fluid Resuscitation:
  - LR 1-2 L IV bolus (20-30 mL/kg), then 100-200 mL/h (target urine output >0.5 mL/kg/h). (cautious in CHF)
- Monitor**:** Lactate, Cr (AKI risk), fluid overload (crackles, JVD).
- Pain Control: Morphine 2-5 mg IV q4-6h PRN (preferred over meperidine, less seizure risk).
  - Avoid NSAIDs (risk of GI bleeding, renal injury).
- NPO: Bowel rest until pain resolves, nausea subsides (typically 24-48h); early oral feeding (low-fat diet) if tolerated.

• Specific Treatments:

- **Acute Cholecystitis:**
  - Antibiotics (if infection suspected, e.g., fever, leukocytosis): vCeftriaxone (CTX) 1 g IV daily + metronidazole (Flagyl) 500 mg IV q8h (covers Gram-negatives, anaerobes).
  - Alternative: Piperacillin-tazobactam 4.5 g IV q6h.
  - Cholecystectomy:
    - Timing: Early (within 24-72h) for mild/moderate cases (TG18 grade I/II); delayed (4-6 weeks) for severe cases (TG18 grade III, organ failure).
    - Laparoscopic preferred; open if perforation or extensive inflammation.

- Percutaneous Cholecystostomy (Drain):
  - Preferred: High surgical risk (e.g., elderly, comorbidities, TG18 grade III), acalculous cholecystitis, or critically ill (e.g., ICU, sepsis).
  - Procedure: IR-guided drain placement, decompress GB, antibiotics, plan delayed cholecystectomy if candidate.

- **Acute Cholangitis**:
  - Antibiotics: Piperacillin-tazobactam 4.5 g IV q6h (broad-spectrum, covers Gram-negatives, anaerobes).
  - Alternative: Meropenem 1 g IV q8h (if severe, MDR organisms).
    - Duration: 7-14 days (culture-guided); 4-7 days if source controlled.
  - BiliaryDrainage: Timing: Urgent (<24h) for moderate/severe cases (TG18 grade II/III), or if no response to antibiotics in 12-24h.
    - ERCP: Preferred; sphincterotomy, stone removal, stent placement.
    - Percutaneous Transhepatic Cholangiography (PTC): If ERCP fails or not feasible (e.g., altered anatomy, prior surgery).
  - Supportive Care: IV fluids (NS 2 L bolus if hypotensive), pressors (norepinephrine 0.01-0.5 mcg/kg/min if shock).
- **Choledocholithiasis**:
  - ERCP: Timing: Within 24-48h if cholangitis or persistent obstruction (jaundice, dilated CBD); elective if asymptomatic.
    - Procedure: Stone extraction, sphincterotomy, stent if incomplete clearance.
  - Cholecystectomy: Timing: Same admission (if gallstones present) to prevent recurrence; delay if severe comorbidities.
  - Antibiotics: Only if cholangitis develops (as above); not routine for uncomplicated cases.

• When to Consult Surgery:

- Indications:
  - **Acute Cholecystitis:** For cholecystectomy (early: 24-72h for mild/moderate; delayed: >4 weeks for severe).
  - **Gallbladder Perforation:** Emergent surgery (e.g., peritonitis, free air on X-ray).
  - **Failed Medical Management:** Persistent symptoms after 48-72h of antibiotics/fluids (e.g., worsening fever, pain).
  - **Recurrent Episodes:** Elective cholecystectomy to prevent future attacks.
  - **Mirizzi Syndrome:** Cholecystectomy (often open, due to fistula risk), may require CBD repair (Type II-IV).

- Timing:
  - **Emergent:** Perforation, peritonitis, or TG18 grade III with organ failure (within 6h).
  - **Urgent:** Mild/moderate cholecystitis (within 24-72h).
  - **Elective:** Post-ERCP (choledocholithiasis), recurrent symptoms.

• When to Consult Interventional Radiology (IR):

- Indications:
  - **Percutaneous Cholecystostomy:** High surgical risk (e.g., elderly, TG18 grade III, acalculous cholecystitis, ICU).
  - **Percutaneous Transhepatic Cholangiography (PTC):** Failed ERCP (cholangitis, choledocholithiasis), altered anatomy, or CBD stricture.
  - **Emphysematous Cholecystitis:** Gas in GB wall (high perforation risk), urgent drainage.
  - **Malignancy:** Stenting for palliation (e.g., pancreatic cancer, cholangiocarcinoma causing obstruction).
- Timing:
  - **Emergent:** Severe cholangitis with failed ERCP (<24h), emphysematous cholecystitis.
  - **Urgent:** High-risk patients with cholecystitis not responding to antibiotics (24-48h).

• Monitoring:

- **Labs**: Q12-24h (LFTs, bilirubin, WBC, Cr) until improving.
- **Vital Signs:** Q4h (fever, tachycardia, hypotension indicate SIRS/sepsis).
- **Imaging**: Repeat US/CT if worsening (e.g., suspected perforation, abscess).
- **Pain/Nutrition:** Daily assessment (restart oral intake when pain-free, no nausea).

Key Pearls

• **Diagnosis:** Cholecystitis (TG18: RUQ pain, fever, imaging); Cholangitis (Charcot's triad); Choledocholithiasis (jaundice, CBD stone on MRCP).

• **Fluids:** NS/LR 20-30 mL/kg bolus, then 100-200 mL/h; target urine output >0.5 mL/kg/h.

• **Antibiotics:** Cholecystitis (if infection: CTX + Flagyl or pip-tazo); Cholangitis (urgent: pip-tazo or meropenem).

• **Surgery Consult:** Cholecystectomy (early for mild/moderate cholecystitis, delayed for severe); emergent for perforation.

• **IR Consult:** Percutaneous drain for high-risk cholecystitis (TG18 grade III, acalculous); PTC if ERCP fails in cholangitis; stenting for malignancy.

• **ERCP:** Urgent for cholangitis (<24h), within 24-48h for choledocholithiasis with obstruction.

• **Mirizzi Syndrome:** Rare, CBD compression by cystic duct stone; requires cholecystectomy, possible CBD repair.

• **Monitor:** Labs q12-24h, vital signs q4h, imaging if worsening (perforation, abscess risk).

References

• **UpToDate:** "Acute Cholecystitis: Diagnosis and Management" (2025).

• **NEJM:** "Acute Cholangitis: A Review" (2024).

• **Am J Gastroenterol:** "Choledocholithiasis: Diagnosis and Treatment" (2023).

• **J Hepatobiliary Pancreat Sci:** "Tokyo Guidelines 2018: Management of Gallbladder Disease" (2018).

Clinical Scenarios

Case 1: A 40-Year-Old Female with RUQ Pain

- Presentation: A 40-year-old female with obesity presents with RUQ pain, nausea, and fever for 24 hours after a fatty meal. Exam: BP 130/80 mmHg, HR 95 bpm, Temp 38.5°C, RUQ tenderness, positive Murphy's sign.
- Labs: WBC 12,000/μL, bilirubin 1.5 mg/dL, ALT 80 U/L, Cr 0.9 mg/dL.
- Imaging: Ultrasound shows gallstones, GB wall thickening (5 mm), pericholecystic fluid.
- Diagnosis: Acute Cholecystitis (Gallstone-Induced, TG18 Grade I) → RUQ pain, Murphy's sign, fever, US findings.
- Management: NPO, NS 200 mL/h IV (target urine output >0.5 mL/kg/h). Ceftriaxone 1 g IV daily + metronidazole 500 mg IV q8h. Morphine 2 mg IV q4h PRN (pain). Surgery consult for early cholecystectomy (within 48h, laparoscopic). Monitor labs q12h (WBC, LFTs), vital signs q4h. Start low-fat diet when pain-free (day 2). Discharge post-cholecystectomy if uncomplicated.

Case 2: A 65-Year-Old Male with Jaundice and Fever

- Presentation: A 65-year-old male with a history of gallstones presents with RUQ pain, fever, and jaundice for 12 hours, now with hypotension and confusion. Exam: BP 85/55 mmHg, HR 110 bpm, Temp 39.5°C, jaundice, RUQ tenderness, disoriented.
- Labs: WBC 18,000/µL, bilirubin 4 mg/dL, ALT 200 U/L, Cr 1.5 mg/dL, lactate 3.5 mmol/L, blood cultures: E. coli.
- Imaging: Ultrasound shows dilated CBD (8 mm); MRCP confirms CBD stone.
- Diagnosis: Acute Cholangitis (Choledocholithiasis-Induced, TG18 Grade III) → Reynolds' pentad (pain, fever, jaundice, hypotension, confusion), CBD stone.
- Management: ICU admission (hypotension, lactate 3.5). NS 2 L IV bolus, norepinephrine 0.01 mcg/kg/min (MAP <65 mmHg). Meropenem 1 g IV q8h (sepsis). Urgent GI consult for ERCP (<24h, stone removal, sphincterotomy). IR consult for PTC if ERCP fails. Monitor labs q6h (LFTs, lactate, Cr), blood cultures. Plan cholecystectomy post-resolution (4-6 weeks). Social work for follow-up care.

Case 3: A 75-Year-Old Male with Critical Illness

- Presentation: A 75-year-old male in the ICU post-MI on TPN presents with RUQ pain and fever for 48 hours. Exam: BP 100/60 mmHg, HR 105 bpm, Temp 39°C, RUQ tenderness, no Murphy's sign, sedated on ventilator.
- Labs: WBC 16,000/µL, bilirubin 2 mg/dL, Cr 1.8 mg/dL, procalcitonin 2 ng/mL.
- Imaging: CT shows GB distension, wall thickening (6 mm), pericholecystic fluid, no stones.
- Diagnosis: Acalculous Cholecystitis (Critical Illness) → RUQ pain, fever, CT findings, ICU patient on TPN.
- Management: NPO, NS 150 mL/h IV. Ceftriaxone 1 g IV daily + metronidazole 500 mg IV q8h. Morphine 2 mg IV q4h PRN. IR consult for percutaneous cholecystostomy (high surgical risk, TG18 grade III). Surgery consult for delayed cholecystectomy (post-ICU, if candidate). Monitor labs q12h (WBC, LFTs), vital signs q4h. Continue TPN, monitor for sepsis.

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