CURRICULUM FOR HEPATO-PANCREATO-BILIARY SURGERY FELLOWSHIPS

1. Introduction

- The purpose of Fellowship education in Hepato-Pancreato-Biliary (HPB) Surgery is to provide a structured educational and training experience necessary to achieve expertise in HBP surgery
- This curriculum provides:
    - HPB Surgery Program Directors with a basis for instruction and evaluation of Fellows
    - Fellows with a guide to the study of HBP Surgery and an outline of the essential areas of knowledge and technical skills that need to be mastered.

2. Curriculum Structure

This Curriculum for Hepato-Pancreato-Biliary Surgery Fellowships should be considered by national and regional accreditation bodies responsible for establishing and maintaining a curriculum that describes the specific goals, detailed objectives, and core competencies that are relevant to their subspecialty fellowships.

The present document will describe the distinct medical knowledge and technical skills required by a fellow to become an expert in HPB Surgery. This curriculum for a Hepato-Pancreato-Biliary Surgery Fellowship has been approved by the Council of The International Hepato-Pancreato-Biliary Association (IHPBA) on May 1, 2008.

3. Overview of the Curriculum for a Hepato-Pancreato-Biliary Surgery Fellowship

At the conclusion of the fellowship in HPB Surgery, the fellow will be able to provide comprehensive, state-of-the-art medical and surgical care to patients with surgical diseases/disorders of the liver, pancreas, biliary tract and duodenum. This expertise will include the ability to investigate, diagnose, recommend appropriate treatment options, perform operative procedures, and provide the pre- peri- and late postoperative care. To achieve this goal, this curriculum provides a guide to the topics for study and the knowledge and skills required to become an HBP Surgeon.

This Curriculum consists of seven Major Units, some with Subunits:

Unit 1 – The Liver
- Anatomy, Embryology, Physiology, Testing
- Congenital and Acquired Non-neoplastic Liver Disease
- Neoplastic Liver Disease
- Liver Surgery

Unit 2 – The Biliary Tract including Gallbladder Anatomy, Embryology, Physiology, Testing
- Congenital and Acquired Non-neoplastic Biliary Disease
- Neoplastic Biliary Disease

Unit 3 – The Pancreas and Duodenum
- Anatomy, Embryology, Physiology, Testing
- Congenital and Acquired Non-neoplastic Pancreatic Disease
- Neoplastic Pancreatic Disease
- Diseases of the Duodenum

Unit 4 – Imaging

Unit 5 – Oncology

Unit 6 – Trauma

Unit 7 – Transplantation

Each Unit or Subunit is organized into 3 Sections:

1. Objectives: description of the topics the Fellow must understand and the specific knowledge to be acquired
2. Content: description of the specific areas of study necessary to achieve the unit objectives
3. Clinical Skills: description of the clinical activities and technical skills that are to be mastered

Unit 1 – The Liver A. Anatomy, Embryology, Physiology, Testing

1. Objectives: Upon completion of this unit the fellow will understand:
   a. Intrahepatic and extrahepatic anatomy of the liver and the relationship with the adjacent and surrounding structures
   b. The embryology of the liver and biliary tract and the potential anomalies
   c. The physiology of the liver
   d. Clinical hematologic and biochemical tests relevant to the liver and their indications and interpretation:
      (1) Tests of hepatocellular injury
      (2) Tests of liver function
   e. Hepatic imaging techniques and their indications and interpretation
   f. Implications of investigations and surgical procedures on the liver

2. Content:
   a. Embryology of the liver
      (1) Relationship to other foregut structures
   b. Extrahepatic anatomy of the liver
      (1) Lobes, sectors, segments
      (2) Nomenclature systems
      (3) Ligaments, fissures and incisures
      (4) Anomalies
   c. Anatomy of the porta
      (1) Portal vein, hepatic artery
      (2) Bile duct, gall bladder
      (3) Variants of normal and anomalies
      (4) Lymphatic drainage and nodal anatomy
      (5) Nerves
   d. Anatomy of the retrohepatic space
      (1) IVC and its branches
      (2) Adrenal, kidney, diaphragm
   e. Intrahepatic anatomy:
      (1) Hepatic veins and variants of normal
      (2) Portal triad structures and segmental anatomy
      (3) Histology of the normal liver
   f. Physiology of the liver
      (1) Bilirubin metabolism
      (2) Coagulation
      (3) Other clinically relevant metabolic pathways

   g. Hematologic, biochemical, and histologic testing (assessment) of the liver
      (1) Transaminases and markers of cholestasis
      (2) Measures of liver function
         (a) Static – including INR (PT), Factors V and VII, bilirubin, albumin
         (b) Dynamic – including clearance tests, e.g. ICG, galactose, aminopyrine, lidocaine (MEGX)
      (3) Indicators of portal hypertension
      (4) Indications for liver biopsy

h. Imaging of the liver
   (1) Ultrasound (U/S) and Doppler, Computerized Tomography (CT) Scans, Magnetic Resonance Imaging (MRI) Scans
   (2) Nuclear tests: Proton Emission Tomographic (PET) Scans, Liver/Spleen scans, Biliary excretion (e.g. HIDA) Scans, RBC Scans
i. Application of investigations to hepatic surgery

3. Clinical Skills:
   a. Identify, recognize, and describe anatomic structures in and around the liver
      (1) By reading and interpreting images of the liver
      (2) Intraoperatively
   b. Perform and interpret intraoperative U/S of the liver and porta
   c. Perform liver biopsy – percutaneously, laparoscopic or open
   d. Identify anatomic anomalies and explain their embryologic origin
   e. Understand the indications for and be able to interpret the hematologic and biochemical tests and explain the underlying physiology
   f. Interpret the dynamic tests of liver function
   g. Apply the relative advantages and disadvantages to the application of the different modalities of hepatic imaging
   h. Determine the appropriate abdominal wall incisions for open procedures on the liver
   i. Determine the appropriate port site placements and patient positions for laparoscopic procedures on the liver, and the relative indications for each and the need for a hand-port
   j. Evaluate liver function and portal hypertension (including Child's score and its variations)
   k. Assess the overall risk and the hepatic risk of surgery by recognizing the implications of abnormalities of liver hematologic and biochemical testing on both hepatic and non-hepatic procedures.
   l. Develop a detailed operative strategy for liver resections based on preoperative assessment and imaging

<u>B. Congenital and Acquired Non-neoplastic Liver Disease</u>

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The pathophysiology, presentation and natural history of the congenital and acquired non-neoplastic diseases of the liver.
   b. The investigative procedures available to efficiently diagnose the disease/ disorder.
   c. The treatment options available for the condition and the results, including the risks and benefits of the operative and non-operative procedures.
   d. The pre, intra- and postoperative management, including the management of complications of therapy.

2. Content:
   a. Pediatric liver diseases
      (1) Biliary atresia and Allegille's syndrome
         (a) Presentation, evaluation and natural history (b) Treatment options and indications for intervention
   b. Liver cysts and abscesses
      (1) Solitary liver cysts
         (a) Presentation, evaluation and natural history

(b) Distinguish from cystic neoplasm
(c) Treatment options and indications for intervention

(2) Polycystic liver disease
(a) Associated abnormalities
(b) Presentation, evaluation and natural history
(c) Treatment options and indications for intervention

(3) Pyogenic and fungal liver abscess
(a) Potential bacterial and fungal pathogens and sources
(b) Presentation, evaluation
(c) Treatment and indications for surgical drainage

(4) Other liver abscess including amoebic abscess, TB
(a) Presentation, evaluation and natural history
(b) Treatment options and indications for intervention

(5) Echinococcal liver cyst
(a) Life cycle, epidemiology, target organs
(b) Presentation, evaluation and natural history
(c) Treatment options and indications for intervention

c. Liver failure

(1) Hepatitis and acute liver failure
(a) Causes of acute liver failure
(b) Investigation and prognosis
i. Classification systems including King's College criteria
(c) Treatment strategies
i. Role of liver support systems ii. Role of liver transplantation

(2) Cirrhosis and portal hypertension
(a) Causes of cirrhosis, diagnosis and natural history, staging and treatment options (including indications for liver transplantation) for each
i. Viral hepatitis B, C, D ii. Alcoholic liver disease
iii. Non-alcoholic fatty liver disease and steatohepatitis iv. Autoimmune liver disease
a. Autoimmune chronic active hepatitis
b. Primary biliary cirrhosis
c. Primary sclerosing cholangitis
v. Hemochromatosis, Wilson's disease, alpha-1 antitrypsin deficiency
vi. Budd Chiari syndrome
(b) Portal hypertension
i. Pathophysiology
ii. Interpretation of hematologic and biochemical tests and imaging
iii. Non-operative treatment options and strategies iv. Portosystemic decompression
a. Indications and sequellae
b. Risks and benefits of TIPS and surgical shunts
c. Types of surgical shunts
i) Relative indications
d. Sugiura procedure
iv. Indications for liver transplantation

3. Clinical Skills:
    a. Diagnose and treat patients with cystic diseases of the liver
    b. Diagnose and manage patients with liver abscess(es)
    c. Perform laparoscopic and open drainage of liver cyst or abscess (unroofing, resection)
    d. Diagnose and classify acute and chronic liver failure.
    e. Diagnose, investigate and manage patient with portal hypertension
    (1) Perform portosystemic shunt – portocaval, mesocaval, splenorenal and their variants.
    (2) Perform the Sugiura procedure

C. Neoplastic Liver Disease

1. Objectives: Upon completion of this unit the fellow will understand:
    a. The pathophysiology, presentation and natural history of benign, primary and secondary malignant neoplasms of the liver.
    b. The investigative procedures available to efficiently diagnose the disease/disorder.
    c. The staging of malignancies of the liver including histologic assessment
    d. The treatment options available for the neoplasm, and the results, including the risks and benefits of the operative and non-operative procedures.
    e. The pre, intra- and postoperative management, including the management of complications of therapy.
    f. The role of neoadjuvant and adjuvant therapy of malignant liver neoplasms.

2. Content:
    a. Benign neoplasms of the liver
        (1) Presentation, investigation, diagnosis, and natural history of hemangioma, hamartoma, adenoma, focal nodular hyperplasia
        (2) Histology and indications for biopsy
        (3) Treatment options and indication for ablation or resection
    b. Primary malignancies of the liver
        (1) Hepatocellular carcinoma (HCC)
            (a) Etiology, presentation, investigation, diagnosis, and natural history of HCC
            (b) Role of screening and staging systems for HCC Treatment options and the risk: benefit ratio for each: resection, transplantation, ablation, chemotherapy +/- embolization, radiation
        (2) Cholangiocarcinoma (intrahepatic or peripheral)
            (a) Diagnosis, investigation and staging
            (b) Treatment options including palliative procedures
        (3) Epithelioid hemangioendothelioma, lymphoma, sarcoma and other neoplasms
            (a) Diagnosis, investigation and staging
            (b) Treatment options
    c. Secondary malignancies of the liver
        (1) Colorectal primary
            (a) Pathogenesis, staging of colorectal cancer
            (b) Investigation and staging
            (c) Treatment options
                i. Indications, and risk: benefit ratio of ablation / resection
                ii. Neo-adjuvant, downstaging, and adjuvant chemotherapy

(2) Neuroendocrine and other primary
(a) Investigation and staging
(b) Treatment options
i. Indications, and risk: benefit ratio ablation / resection (c) Neoadjuvant and adjuvant therapy

3. Clinical Skills:
   a. Evaluate patients with benign neoplasms of the liver, including interpretation of imaging and indications for biopsy
   b. Manage patients with benign hepatic neoplasms
   c. Evaluate patients with HCC, including screening for potential HCC and staging
   d. Evaluate patients with primary and secondary adenocarcinoma and other metastatic lesions of the liver including staging
   e. Manage patents with primary and secondary hepatic malignancies
   f. Participate in multidisciplinary tumor review conferences
   g. Perform liver resections
   h. Provide pre- and postoperative therapy following liver resection including the diagnosis and management of complications
   i. Recommend appropriate therapy for unresectable hepatic malignancies
   j. Recommend appropriate adjuvant radiation and/or chemotherapy following resection for hepatic malignancies
   k. Interact with Medical and Radiation Oncologists

D. Liver Surgery

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The types of and techniques for liver resections
   b. Preoperative patient assessment and the cumulative risks of the proposed procedure
   c. Preoperative management
   d. Intraoperative management during a liver resection
   e. Postoperative management including complications.

2. Content:
   a. Types of liver resection
      (1) Nomenclature of liver resections (Brisbane system)
      (2) Laparoscopic, laparoscopic-assisted, open laparotomy
      (3) Nonanatomic, segmental, lobectomy, extended lobectomy
      (4) Vascular control: none, Pringle maneuver, total vascular isolation
      (5) Vascular resection and reconstruction
      (6) Staged resections
      (7) Combination with ablation
   b. Preoperative assessment and the cumulative risks to the proposed procedure
      (1) Patient comorbidities (cardiopulmonary and other)
      (2) Hepatic risk
         (a) Assessment of liver function, portal hypertension
         (b) Volumetric assessment of liver remnant
         (c) Portal vein embolization

c. Preoperative management
   (1) Prophylaxis against common complications
      (a) DVT, infection
   (2) Neuroendocrine hormonal blockade
   (3) Detailed operative plan based on preoperative imaging
d. Liver resection
   (1) Anesthetic considerations
      (a) Agents, coagulation, CVP
   (2) Blood loss conservation including cell saver and blood product administration
   (3) Laparoscopic techniques
      (a) Patient and port placement
      (b) Hand port
   (4) Parenchymal transection techniques
      (a) Relative advantages and disadvantages
      (b) Normal, fatty, fibrotic and cirrhotic parenchyma
      (c) Laparoscopic or open use
   (5) Concomitant resection and reconstruction of the
      (a) Diaphragm
      (b) IVC
      (c) Portal vein
      (d) Bile duct
e. Postoperative management
   (1) Complications and management, including liver failure

3. Clinical Skills:
   a. Evaluate patients for liver surgery including the comorbidities and any underlying liver disease to determine risk
   b. Determine the need for portal vein embolization, staged resection or concomitant ablation
   c. Perform intraoperative staging of tumors including intraoperative U/S
   d. Perform liver resections using a variety of approaches and transection techniques
   e. Perform complex liver resections including bile duct, portal vein, IVC, diaphragm
   f. Manage the liver resection patient during the immediate, early and late postoperative periods and diagnose and treat complications of the resection

Unit 2 – The Biliary Tract including Gallbladder A. Anatomy, Embryology, Physiology, Testing

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The anatomy of the biliary tract including the intra- and extrahepatic, hepatic duct, the gallbladder and cystic duct, the common bile duct, the ampulla of Vater, and their relationships with the adjacent and surrounding structures
   b. The embryology of the liver and biliary tract and the potential anomalies
   c. The physiology of bile metabolism and biliary tract epithelium
   d. Clinical biochemical tests relevant to the biliary tract and their interpretation
   e. Biliary imaging techniques and their indications and interpretation
   f. Implications of investigations on surgical procedures on the bile duct

2. Content:
   a. Embryology of the biliary tract
      (1) Relationship to liver, pancreas and other portal and foregut structures
   b. Anatomy of the hepatic duct and biliary plate
      (1) Segmental anatomy and variants of normal
      (2) Blood supply and lymphatic drainage
      (3) Relationship with other portal structures
   c. Anatomy of the gallbladder and cystic duct
      (1) Blood supply and lymphatic drainage
      (2) Variants of normal and anomalies
   d. Anatomy of the bile duct
      (1) Blood supply, lymphatic drainage and regional lymph nodes
      (2) Variants of normal and anomalies
      (3) Relationship with other portal structures and the pancreatic duct
      (4) Sphincter of Oddi and ampulla of Vater
   e. Bile metabolism and biliary physiology
      (1) Bile-salt dependent and independent bile production
      (2) Hormonal influences
      (3) Biliary epithelium and gallbladder function
      (4) Sphincter of Oddi motility
   f. Biochemical investigation
      (1) interpretation
   g. Imaging
      (1) Axial and body imaging techniques:
         (a) U/S, CT scan and MRI scan, including MRCP
      (2) Endoscopic U/S
      (3) Direct contrast imaging
         (a) Percutaneous transhepatic cholangiogram (PTC) and cholecystography and endoscopic retrograde cholangiopancreatography (ERCP)
      (4) Endoscopic assessment of Ampulla of Vater
      (5) Nuclear biliary excretion imaging (HIDA scan) – qualitative and quantitative (HIDA scan)

3. Clinical Skills:
   a. Identify and describe biliary tract structures (normal and abnormal)
      (1) By reading and interpreting images of the biliary tract
      (2) Intraoperatively
   b. Perform and interpret intraoperative U/S of the liver and biliary tract
   c. Identify anatomic anomalies and explain their embryologic origin
   d. Understand the indications for and be able to interpret the biochemical tests and explain the underlying physiology
   e. Apply understanding of the relative advantages and disadvantages of the different modalities of biliary tract imaging to determine optimal investigation
   f. Determine the abdominal wall incisions that are appropriate for open procedures on the biliary tract and the relative indications for each
   g. Determine the appropriate port site placements and patient positions that are useful for laparoscopic procedures on the biliary tract and the relative indications for each
   h. Develop a detailed operative strategy for biliary surgery based on preoperative assessment and imaging

B. Congenital and Non-neoplastic Biliary Disease

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The pathophysiology, presentation and natural history of the congenital and acquired non-neoplastic diseases of the biliary tract including the gallbladder
   b. The investigative procedures available to efficiently diagnose of the disease/disorder
   c. The treatment options available for the condition, and the outcomes, including the risks and benefits of the operative and non-operative treatments
   d. The pre-, intra- and postoperative management, including the management of complications of therapy

2. Content:
   a. Congenital and pediatric
      (1) Choledochal cyst, Caroli's disease, congenital hepatic fibrosis, biliary atresia and Allegille's syndrome
         (a) Presentation, classification, evaluation and natural history
         (b) Treatment options and indications for intervention
   b. Gallstones
      (1) Pathogenesis
      (2) Presentation and investigation of
         (a) Biliary colic, cholecystitis, cholangitis, Mirrizzi's syndrome, gallstone ileus
      (3) Treatment: Percutaneous, laparoscopic and open
      (4) Cholecystectomy-related biliary injuries
         (a) Mechanism of injury & classification
         (b) Associated injuries
         (c) Management
   c. Benign strictures
      (1) Primary sclerosing cholangitis (PSC)
         (a) Etiology, pathophysiology, natural history and non-operative management
         (b) Complications and management
            i. Screening for cholangiocarcinoma ii. PTC with biliary drainage (PTBD), ERCP with endobiliary stent

iii. Resection iv. Transplantation

(2) Posttraumatic and idiopathic

(a) Mechanism of injury and classification

(b) Management options

d. Intrahepatic stones

(1) Pathophysiology, presentation and investigation

(2) Common infectious bacteria

(3) Surgical options including liver resection and biliary access (Hutson) choledochojejunostomy, hepaticojejunostomy with transhepatic stents

3. Clinical Skills:
   a. Investigate the jaundiced patient by determining the most efficient modalities, and interpret the results of biochemical testing and imaging
   b. Apply understanding of the relative merits and disadvantages of nonoperative biliary manipulation (PTBD and endoscopic stenting) to treat biliary tract obstruction.
   c. Manage the patient with complex gallstone disease
   d. Manage biliary injuries resulting from cholecystectomy and other trauma
   e. Perform resection and reconstruction for choledochal cysts, intrahepatic stones, and benign strictures
   f. Evaluate and manage the patient with the complications of PSC

C. Neoplastic Biliary Disease

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The presentation and natural history of benign and malignant neoplasms of the bile duct and gallbladder
   b. The investigative procedures available to efficiently diagnosis the neoplasm.
   c. The staging of adenocarcinoma of the bile duct and gallbladder including histologic assessment
   d. The treatment options available for the neoplasm, and the indications and outcomes, including the risks and benefits of the operative and non-operative treatments
   e. The pre-, intra- and postoperative management, including the management of complications of surgery.
   f. The role of neoadjuvant and adjuvant chemo- and radiation therapy of malignant biliary neoplasms

2. Content:
   a. Gallbladder
      (1) Polyps
         (a) Presentation, natural history
         (b) Indications for resection
         (c) Principles of resection
      (2) Adenocarcinoma
         (a) Presentation, staging (including histology) and natural history
         (b) Investigation
         (c) Surgical options
            i. Extent and timing of resection
         (d) Chemo and radiotherapy ii. Neo- and/or adjuvant therapy iii. Definitive management
         (e) Palliative care options
   b. Bile duct
      (1) Adenoma of Ampulla of Vater

(a) Presentation, natural history, investigation
(b) Resection options
1. Endoscopic, transduodenal resection and reconstruction
(2) Adenocarcinoma
(a) Location: Hilar (Klatskin), intrapancreatic, ampulla
(b) Type – papillary, sclerosing
(c) Presentation, investigation and staging, including laparoscopic staging
(d) Resection and reconstruction – indications and contraindication
(e) Palliative options
1. PTBD or endoscopic stent
2. Surgical bypass

3. Clinical Skills:
a. Investigate and manage patients with gallbladder polyps and benign neoplasms of the ampulla of Vater
(1) Perform extended cholecystectomy for potential oncologic indication
(2) Perform transduodenal resection of the Ampulla of Vater with reconstruction of the bile and pancreatic ducts
b. Investigate and manage patients with hilar cholangiocarcinoma
(1) Perform extended resection of the biliary bifurcation with the caudate and ipsilateral lobes of the liver, portal lymphadenectomy, and biliary reconstruction
c. Investigate and manage patients with distal bile duct tumors
(1) Perform pancreatoduodenectomy
d. Participate in multidisciplinary tumor review conferences
e. Provide postoperative management including the diagnosis and treatment of complications of biliary resection and/or bypass
f. Recommend appropriate adjuvant radiation and/or chemotherapy following resection and interacts with Medical and Radiation Oncologists
g. Recommend appropriate therapy for unresectable carcinoma of the gall- bladder or bile duct

Unit 3 – The Pancreas & Duodenum

A. Anatomy, Embryology, Physiology, Testing

1. Objectives: Upon completion of this unit the fellow will understand:
   a. Anatomy of pancreas and its relationship with portal structures, retroperitoneal structures and the adjacent organs
   b. Anatomy of the pancreatic duct and its relationship with the bile duct, sphincter of Oddi and the ampulla of Vater
   c. Anatomy of duodenum and its relationship with portal structures, retroperitoneal structures and the adjacent organs
   d. The embryology of the pancreas, pancreatic duct and duodenum and potential anomalies
   e. The physiology of pancreatic exocrine and exocrine functions and duodenal physiology
   f. Clinical biochemical tests of pancreatic function and injury and their interpretation
   g. Pancreatic and duodenal imaging techniques and their indications and interpretation
   h. Implications of investigations on surgical procedures on the pancreas and duodenum

2. Content:
   a. Embryology of the pancreas and duodenum
      (1) Relationship to liver, bile duct and other foregut structures
      (2) Etiology of anomalies including pancreas divisum and annular pancreas
   b. Anatomy of the pancreas
      (1) Spectrum of normal anatomy and variants
      (2) Arterial supply and venous drainage
      (3) Lymphatic drainage and regional lymph nodes.
      (4) Relationship with:
         (a) Portal structures: duodenum, bile duct, hepatic artery, portal vein, splenic and superior mesenteric veins and their branches
         (b) Retroperitoneum: IVC and its branches, aorta and SMA and their branches, adrenal gland, kidneys
         (c) Adjacent organs: stomach, spleen, colon, small intestine
   c. Anatomy of the pancreatic duct
      (1) Variants of normal and anomalies
   d. Anatomy of the duodenum
      (1) Spectrum of normal anatomy and variants
      (2) Arterial supply and venous drainage
      (3) Lymphatic drainage and regional lymph nodes.
      (4) Relationship with:
         (a) Portal structures: bile duct, hepatic artery, portal vein, splenic and superior mesenteric veins and their branches
         (b) Retroperitoneum: IVC and its branches, aorta and SMA and their branches, adrenal gland, kidneys
         (c) Adjacent organs: pancreas, stomach, spleen, colon, small intestine
   e. Pancreatic metabolism and physiology

(1) Exocrine enzyme physiology
    (a) Synthesis, excretion and activation
    (b) Neural and hormonal influences
(2) Endocrine metabolism
    (a) Islet cell function, neuroendocrine hormones

f. Duodenal physiology
    (1) Motility
    (2) Neuroendocrine ("gut") hormone physiology
    (3) Biochemical investigation and interpretation
g. Biochemical Testing
    (1) Markers of pancreatic injury
    (2) Measures of pancreatic exocrine function
    (3) Urinary and serum neuroendocrine hormones
h. Imaging
    (1) Axial and body imaging techniques:
        (a) U/S, CT scan and MRI scan, including MRCP
    (2) Endoscopy and endoscopic U/S
    (3) Direct contrast imaging
        (a) Endoscopic retrograde cholangio-pancraetography (ERCP)
    (4) Nuclear studies:
        (a) PET scan
        (b) Neuroendocrine imaging (Octreotide scan)
i. Application of testing and imaging to pancreatic and duodenal surgery

3. Clinical Skills:
    a. Identify, recognize, and describe anatomic structures in and around the pancreas & duodenum
        (1) By reading and interpreting images of the duodenum, pancreas and its duct
        (2) Intraoperatively
    b. Perform and interpret intraoperative U/S of the pancreas and surrounding structures
    c. Identify anatomic anomalies and explains their embryologic origin
    d. Understand the indications for and interpret the biochemical tests and explain the underlying physiology including the tests of pancreatic function
    e. Apply the relative advantages and disadvantages of the different modalities of pancreatic imaging to efficiently investigate diseases and disorders of the pancreas and duodenum
    f. Determine the appropriate abdominal wall incision for open procedures on the pancreas and/or duodenum
    g. Determine the appropriate port site placements and patient positions for laparoscopic procedures on the pancreas and/or duodenum and the relative indications for each and the need for a hand-port
    h. Develop a detailed operative strategy for pancreatic and duodenal surgery based on preoperative assessment and imaging

<u>B. Congenital and Acquired Non-neoplastic Pancreatic Disease</u>

1. Objectives: Upon completion of this unit the fellow will understand:
    a. The pathophysiology, presentation and natural history of the congenital and acquired non-neoplastic diseases of the pancreas
    b. The investigative procedures available to efficiently diagnose the disease/disorder

c. The treatment options available for the condition, and results, including the risks and benefits of the operative and nonoperative procedures
d. The pre-, intra- and postoperative management, including the management of complications of therapy

2. Content:
   a. Pancreatitis
      (1) Acute
         (a) Pathogenesis, staging and prognosis
         (b) Management, including surgical options and complications
         (c) Indications for surgical intervention
      (2) Chronic
         (a) Pathogenesis, complications and nonoperative management
         (b) Pancreatic stents and endoscopic/percutaneous drainage procedures
         (c) Surgical options and indications
         (d) Pain control
   b. Pancreas Divisum
      (1) Pathogenesis, staging and prognosis
      (2) Management, including surgical options and complications
      (3) Indications for surgical intervention
   c. Annular pancreas
      (1) Pathogenesis, staging and prognosis
      (2) Management, including surgical options and complications
      (3) Indications for surgical intervention

3. Clinical Skills:
   a. Manage patients with acute pancreatitis, including complications
      (1) Determine the need for surgical intervention
      (2) Perform open and/or laparoscopic procedures for acute pancreatitis
   b. Investigate and manage the patient with chronic pancreatitis
      (1) Determine the need for operative intervention
      (2) Perform: pseudocyst-enterostomy, lateral pancreaticojejunosomy with/without limited resection of the head of the pancreas (Frey procedure), pancreatic resection

C. Neoplastic Diseases of the Pancreas

1. Objectives: Upon completion of this unit the fellow will understand:
   a. The Pathophysiology, presentation and natural history of benign, primary and secondary malignant neoplasms of the pancreas
   b. The investigative procedures available to efficiently diagnose the disease/disorder
   c. The staging of malignancies of the pancreas including histologic assessment
   d. The treatment options available for the neoplasm, and the outcomes, including the risks and benefits of the operative and nonoperative procedures
   e. The pre-, intra- and postoperative management, including the management of complications of therapy
   f. The role of neoadjuvant and adjuvant therapy of malignant pancreatic lesions

2. Content:
   a. Benign cysts and neoplasms of the pancreas
      (1) Microcystic serous cystadenoma
         (a) Presentation, investigation, diagnosis, and natural history
         (b) Histology and indications for biopsy
         (c) Treatment options and indication for resection
      (2) Mucinous cystic neoplasm
         (a) Presentation, investigation, diagnosis, and natural history
         (b) Histology and indications for aspiration/biopsy
         (c) Treatment options and indication for resection
      (3) Intraductal papillary mucinous neoplasm (IPMN)
         (a) Presentation, investigation, diagnosis, and natural history
         (b) Histology and indications for aspiration / biopsy
         (c) Treatment options and indication for resection
      (4) Solid Pseudopapillary Neoplasms
         (a) Presentation, investigation, diagnosis, and natural history
         (b) Histology and indications for aspiration / biopsy
         (c) Treatment options and indication for resection
      (5) Cystic Neuroendocrine Tumors
         (a) Presentation, investigation, diagnosis, and natural history
         (b) Histology and indications for aspiration / biopsy
         (c) Treatment options and indication for resection
      (6) Von Hippel Lindau syndrome
         (a) Pathology, associated lesions, investigation
         (b) Management

   b. Malignancies of the pancreas
      (1) Primary
         (a) Adenocarcinoma
            1. Presentation, investigation and staging
            2. Assessment of resectability
            3. Pre-, peri- and postoperative management
            4. Palliative procedures
         (b) Neuroendocrine tumors
            1. Presentation, investigation and staging
            2. Assessment of resectability
            3. Pre-, peri- and postoperative management
         (c) Lymphoma
            1. Presentation, staging
            2. Role of surgery (2)

      Secondary
         (a) Renal cell carcinoma
            1. Presentation and management
         (b) Melanoma
            1. Presentation and management

3. Clinical Skills:
    a. Investigate and manage patients with benign cysts and neoplasms of the pancreas
        (1) Determine need for biopsy/aspiration and resection
        (2) Perform resections including enucleation of NE tumors and spleen preserving distal pancreatectomy
    b. Investigate and manage patients with adenocarcinoma of the pancreas
        (1) Stage the tumor pre- and intraoperatively and determine resectability
        (2) Perform pancreatoduodenectomy +/- portal vein resection and reconstruction
        (3) Perform distal pancreatectomy and regional lymphadenectomy
        (4) Perform palliative procedures for unresectable tumors
    c. Participate in multidisciplinary tumor review conferences
    d. Provide postoperative management including the diagnosis and treatment of complications of pancreatic resection and/or bypass
    e. Recommend appropriate therapy for unresectable pancreatic carcinoma
    f. Recommend appropriate neo- and adjuvant radiation and/or chemotherapy and interact with Medical and Radiation Oncologists

D. Diseases of the Duodenum

1. Objectives: Upon completion of this unit the fellow will understand:
    a. The pathophysiology, presentation and natural history of the diseases of the pancreas
    b. The investigative procedures available to efficiently diagnose the disease/disorder
    c. The treatment options available for the condition, and the results, including the risks and benefits of the operative and non-operative procedures
    d. The pre-, intra- and postoperative management, including the management of complications of therapy

2. Content:
    a. Congenital disorders of the duodenum
        (1) Duodenal atresia and duplication
        (2) Duodenal diverticulae
    b. Duodenal ulcer disease
        (1) Pathogenesis, investigation and diagnosis
        (2) Nonoperative treatment
        (3) Operative management
    c. Crohn's disease
        (1) Presentation, investigation, diagnosis
        (2) Management
    d. Benign neoplasms (1) Adenoma
        (2) Hereditary Familial Polyposis
            (a) Genetics, presentation, investigation
            (b) Management
    e. Malignant neoplasms of the duodenum
        (1) Adenocarcinoma
            (a) Presentation, investigation, staging
            (b) Management
        (2) Gastrointestinal stromal tumor (GIST) and sarcomas
            (a) Presentation, investigation, staging

(b) Management options
1. Chemotherapy
2. Resection

(3) Neuroendocrine tumor
(a) Presentation (syndromes) investigation, staging
(b) Management

(4) "Secondary" to direct invasion of adjacent malignancy
(a) Carcinoma of the stomach or colon
(b) Renal cell carcinoma
(c) Investigation, staging
(d) Operative management

3. Clinical Skills:

a. Investigate and manage patients with benign lesions of the of the duodenum
(1) Determine need for operative intervention
(2) Perform acid-reduction procedures, limited resection and duodenal bypass procedures

f. Investigate and manage patients with malignant neoplasms of the duodenum
(1) Stage the tumor pre- and intraoperatively and determine resectability
(2) Perform appropriate resection (including pancreatoduodenectomy +/- portal vein resection and reconstruction when necessary) with regional lymphadenectomy
(3) Perform palliative procedures for unresectable tumors
(4) Participate in multidisciplinary tumor review conferences
(5) Recommend appropriate therapy for unresectable duodenal malignancies
(6) Recommend appropriate neo- and adjuvant radiation and/or chemotherapy and interact with Medical and Radiation Oncologists

g. Provide postoperative management including the diagnosis and treatment of complications of duodenal resection and/or bypass

<u>Unit 4 – Imaging</u>

1. Objectives: Upon completion of this unit the fellow will:
a. Understand the physics and technology of Ultrasound and Doppler, CT Scan, MRI Scan, PET Scan and the other nuclear medicine imaging procedures including biliary excretion scan (HIDA), RBC scan, Octreotide scan, and L/S scan
b. Understand the relative advantages, disadvantages and indications of each
c. Read and interpret the detailed information provided by the imaging of the liver biliary tract, pancreas and duodenum
d. Perform and interpret intraoperative ultrasound

2. Content:
a. The applied physics and technology of Ultrasound and Doppler, CT Scan, MRI Scan, PET Scan and the other nuclear medicine imaging procedures
b. The clinical protocols available for each technology
(1) The information provided by each protocol
(2) The interpretation of images
(3) The application to clinical investigation
c. Imaging algorithm for the investigation of hepatobiliary and pancreatic lesions including
(1) Liver cyst or tumor

(2) Jaundice
(3) Periampullary tumor
(4) Cyst or mass in the pancreas

3. Clinical Skills:
   a. Apply understanding of the relative merits of each imaging modality to efficiently investigate (including staging of) lesions of the liver, biliary tract, and pancreas
   b. Interpret images to correctly identify normal structures, anomalies and pathologic abnormalities
   c. Correlate and integrate the findings of the various imaging studies during the investigation of a patient
   d. Perform and interpret intraoperative ultrasound
   e. Interact with Diagnostic Radiologists with expertise in HPB diseases and body imaging

<u>Unit 5 – Oncology</u>

1. Objectives: Upon completion of this unit the fellow will:
   a. Understand the basic pathophysiology of neoplasia and the currently understood mechanisms of carcinogenesis
   b. Understand the mechanisms of action of the classes of chemotherapeutic agents currently available for HBP malignancies
   c. Understand the physics, mechanism of action and technology of radiation therapy
   d. Apply this understanding to the multidisciplinary management of HBP malignancies

2. Content:
   a. Basic pathophysiology of neoplasia
      (1) Mechanisms of carcinogenesis
      (2) Genetic alterations
      (3) Viral carcinogenesis
      (4) Chronic inflammation
      (5) Tumor biology including the potential for metastases
   b. Chemotherapy
      (1) Classes of drugs
      (2) Mechanisms of action
      (3) Toxicities
      (4) Combination therapy and available protocols
   c. Radiation therapy
      (1) Applied physics and technology
      (2) Mechanism of action
      (3) Toxicity
      (4) Combination protocols with chemotherapy
   d. Multidisciplinary management
      (1) Relative roles of surgery, ablation, chemotherapy and radiation therapy as:
         (a) Definitive management
         (b) Neo- and adjuvant therapy
         (c) Therapy for recurrent disease
         (d) Palliative therapy

3. Clinical Skills
    a. Apply knowledge of tumor biology, chemotherapy and radiation therapy to recommend an appropriate treatment strategy for the management of individual HBP malignancies
    b. Participate regularly in multidisciplinary tumor review conferences
    c. Interact with Interventional Radiologists, Medical Oncologists, Radiation Oncologists, Oncology Nurses and Allied Health Professionals, Palliative Care Physicians and Nurses

Unit 6 – Trauma

1. Objectives: Upon completion of this unit the fellow will understand:
    a. The pathophysiology of blunt and penetrating trauma to the liver, biliary tract and portal structures, pancreas, duodenum and adjacent structures
    b. The methods of assessment and diagnosis
    c. The principles and techniques available to manage traumatic injuries
    d. The management of complications of trauma to the liver, biliary tract, pancreas and duodenum

2. Content:
    a. Liver trauma
        (1) Mechanisms of injury and presentation
        (2) Diagnosis and classification of liver lacerations
        (3) Management
            (a) Angiography and embolization
            (b) Liver parenchyma hemostasis techniques
            (c) Total vascular exclusion +/- IVC shunt or veno-venous bypass for retrohepatic IVC and/or hepatic vein injuries
            (d) Resection
        (4) Complications: diagnosis and management
    b. Biliary tract and portal structures
        (1) Mechanisms of injury and presentation
            (a) “External” trauma
            (b) Operative injury during cholecystectomy
        (2) Investigation, diagnosis and classification of bile duct injuries
            (a) Identification of associated injuries
        (3) Management
            (a) Timing and role of ERCP + stent and PTBD
            (b) Principles and techniques of biliary reconstruction
        (4) Complications: diagnosis and management
    c. Pancreatic and duodenal trauma
        (1) Mechanisms of injury and presentation
        (2) Investigation, diagnosis
            (a) Identification of pancreatic duct disruption
            (b) Identification of duodenal injury
        (3) Management
            (a) Indications for pancreatic resection
            (b) Techniques for repair of duodenal injuries
        (4) Complications: diagnosis and management

3. Clinical Skills
   a. Consult and manage patients with blunt and penetrating trauma to the upper abdomen
   b. Evaluate injuries to the liver, biliary tract, porta, pancreas and duodenum
   c. Evaluate post-cholecystectomy injuries to the bile duct and determine a management strategy
   d. Perform emergency and elective operative procedures to resole and/or repair injuries to the liver, bile duct, portal structures, pancreas, and duodenum
   e. Manage complications of operative intervention

<u>Unit 7 – Transplantation</u>

1. Objectives: Upon completion of this unit the fellow will have a working knowledge of:
   a. Organ procurement and preservation
   b. Indications for liver transplantation
   c. Outcomes including complications of transplantation
   d. Immunosuppression and its toxicities

2. Content:
   a. Organ procurement
      (1) Brain death and donor management
         (a) Deceased donor hepatectomy and pancreatectomy
      (5) Living donor assessment
         (a) Living donor left or right hepatectomy
   d. Organ preservation
      (1) Principles and application
   e. Transplantation
      (1) Indications for liver transplantation
         (a) Acute and chronic liver failure
         (b) Hepatocellular carcinoma and other liver tumors
         (c) Childs' and MELD scores and organ allocation
      (2) Liver
         (a) Transplant hepatectomy
         (b) Liver transplant techniques
      (3) Pancreas
         (a) Back bench reconstruction
         (b) Pancreas transplant
      (4) Immunosuppression
         (a) Drugs, mechanisms of action, toxicities and combination therapy
      (5) Complications of transplantation
         (a) Surgical
         (b) Infectious
         (c) Immunologic

3. Clinical Skills:
   a. Apply understanding of liver transplantation to recommend a liver transplant to the appropriate patient at the appropriate time
   b. Recognize the oncologic impact of immunosuppression on recurrence of hepatocellular carcinoma following liver transplantation and the increased risk of de-novo malignancies