



Fellowship in HPB Surgery Education and Training

Dated 25th March 2022



Curriculum

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 disorders/disease of the liver, pancreas, biliary tract, duodenum and spleen. The curriculum for training will consist of 5 modules. The modules of the curriculum include:

Module I Anatomy

Module II Pathophysiology

Module III Peri operative Care

Subunit A General Principles

Subunit B Radiology

Subunit C Oncology

Module IV Clinical

Subunit A Biliary tract

Subunit B Pancreas and Duodenum spleen

Subunit C Liver

Module V Research and Education

MODULE I

ANATOMY

Recommended Reading

Mandatory Courses

Optional Courses: Diploma in Anatomy

Assessment: Continuous assessment, Written exit examination

1. Objectives:

- (a) Embryology of the dorsal mesogastrium (liver, biliary tract, pancreas and spleen), diaphragm and potential anomalies.
- (b) The anatomy of the liver, biliary tract, pancreas and spleen and relationship with the adjacent foregut structures.

2. Content

2.1 Embryology of the liver, biliary tract, pancreas, spleen and diaphragm with knowledge of developmental anomalies.

2.2 Liver

2.2.1 Intrahepatic anatomy of the liver:

- Segmental anatomy and portal triad structures
- Hepatic veins and variants of normal
- Histology of the normal liver

2.2.2 Extrahepatic anatomy of the liver

- Lobes, sectors and segments
- Nomenclature systems
- Ligaments, fissures and incisures
- Anomalies

2.2.3 Anatomy of the porta and extrahepatic veins

- Portal vein, hepatic artery and anomalies
- Gallbladder and bile ducts and anomalies
- Lymphatic drainage and nodal anatomy

2.2.4 Anatomy of the diaphragm, subphrenic and retrohepatic spaces

- Anatomy of the diaphragm including structure and composition, Ligamentous attachments and relations to adjacent structures
- Relationship of bare area, subphrenic and subhepatic spaces
- IVC and its branches including extrahepatic veins
- Adrenal and right kidney

2.3 Biliary Tract including Gallbladder

- 2.3.1 Anatomy of the hepatic ducts and biliary plate
 - Segmental duct anatomy and variants of normal
 - Blood supply and lymphatic drainage
 - Relationship with other portal structures

- 2.3.2 Anatomy of the gallbladder, cystic duct and bile duct
 - Structure, relationship to other portal and adjacent structures
 - Sphincter of Oddi and Ampulla of Vater
 - Blood supply and lymphatic drainage
 - Variants of normal and anomalies
 - Histology of gallbladder and biliary tract

2.4 Pancreas and Duodenum

- 2.4.1 Anatomy of the pancreas
 - Spectrum of normal anatomy and variants including pancreatic divisum and annular pancreas
 - Arterial supply and venous drainage
 - Lymphatic drainage and regional lymph nodes
 - Relationship with major arterial and venous structures and adjacent organs including bile duct
 - Anatomy of the pancreatic duct including normal/abnormal variants
 - Histology of pancreas

- 2.4.2 Anatomy of the Duodenum
 - Spectrum of normal anatomy and variants
 - Lymphatic drainage and regional lymph nodes
 - Relationship with major arterial and venous structures and adjacent organs including bile duct
 - Histology of duodenum

2.5 Spleen

- 2.5.1 Anatomy of the spleen
 - Spectrum of normal anatomy and relationship to adjacent structures
 - Developmental anomalies including site of possible splenunculi
 - Normal and anomalous anatomy of splenic venous and arterial blood supply including patterns of segmental branching

2.6 Diaphragm

- 2.6.1 Embryology and composition of the diaphragm
- 2.6.2 Knowledge of the attachments of the diaphragm and traversing structures
- 2.6.3 Relationships of adjacent organs

MODULE II

PATHOPHYSIOLOGY

Recommended Reading:

Assessment: Continuous assessment, written exit examination

1. Objectives:

Upon completion of this module, the Fellow will:

- 1.1 Have a thorough knowledge and understanding of the normal physiology of the liver, biliary tract, pancreas and spleen.
- 1.2 Have a thorough knowledge of relevant investigations including interpretation of normal and abnormal biochemical parameters correlating with the clinical situation.
- 1.3 A thorough knowledge of the underlying aetiology, pathogenesis and natural history of pathological conditions of the liver, biliary tract, pancreas and spleen.

2. Content

2.1 Physiology of the Liver and Biliary tract

- 2.1.1 Bilirubin metabolism, bile production and synthesis
- 2.1.2 Coagulation factors – synthesis and pathways
- 2.1.3 Clinically relevant metabolic pathways of the liver
- 2.1.4 Hemodynamics and regulation of hepatic blood flow
- 2.1.5 Mechanisms of liver regeneration
- 2.1.6 Underlying mechanisms involved in liver hyperplasia hypertrophy and atrophy
- 2.1.7 Cellular function (hepatocytes, kupffer cells, stellate cells)
- 2.1.8 Liver immunology
- 2.1.9 Hormonal influences on the liver and biliary tract
- 2.1.10 Biliary tract motility (including gallbladder and sphincter of Oddi)
- 2.1.11 Biliary epithelium and gallbladder function
- 2.1.12 Factors in the production of biliary pain

2.2 Interpretation of Liver Function Tests

- 2.2.1 Normal
- 2.2.2 Markers of cholestasis and cholangitis
- 2.2.3 Synthetic function: INR, clotting factors, albumin, bilirubin
- 2.2.4 Tumour markers: CEA, alpha FP
- 2.2.5 Significance of liver function clearance tests ICG, MEGX
- 2.2.6 Interpretation of liver biopsy

2.3 Pathology of the gallbladder and biliary tract

Non neoplastic

- 2.3.1 The epidemiology, aetiology, pathogenesis and complications of gallstones and common duct stones
- 2.3.2 Aetiology and pathogenesis of biliary dyskinesia
- 2.3.3 Biliary sepsis and obstruction
 - The role of bacteria, endotoxins and cytokines in biliary sepsis
 - Aetiology and pathophysiology of suppurative ascending cholangitis
 - Aetiology and pathophysiology of obstructive jaundice
 - Epidemiology, aetiology and pathogenesis of acute and Chronic cholecystitis, including acalculous, empyema and emphysematous cholecystitis
 - Aetiology and pathophysiology of biliary peritonitis
 - Parasitic infections of the biliary tree – aetiology and pathology
 - Epidemiology, aetiology, pathogenesis and complications of intrahepatic stones and recurrent pyogenic cholangitis
- 2.3.4 Benign biliary strictures
 - Cholecystectomy related bile duct strictures-classification, mechanisms of injury and complications.
 - Sclerosing cholangitis- epidemiology, pathogenesis associated disorders
 - Idiopathic and inflammatory strictures
 - Biliary atresia
- 2.3.5 Biliary fistulas – etiology, pathogenesis and complications
 - External
 - Internal - including gallstone ileus and Mirizzi Syndrome
- 2.3.6 Biliary cysts including Caroli's Disease
 - Epidemiology, aetiology, classification, pathogenesis and complications
- 2.3.7 Blunt and penetrating trauma to the biliary tract
 - Hemobilia and AV fistulas: Incidence, aetiology, pathogenesis and complications

- 2.3.8 Congenital
- Biliary atresia, congenital hepatic fibrosis Alagille syndrome

Tumours of the gallbladder and biliary tract

This section should include knowledge of the basic pathophysiology of neoplasia. This includes mechanisms of carcinogenesis, genetic alterations, mechanisms of chronic inflammation and principles of tumour biology and mechanisms involved in the metastatic process

- 2.3.9 Benign tumours and pseudotumours of the biliary tract
- Incidence, pathological classification

- 2.3.10 Tumours of the Gallbladder
- Benign: gallbladder polyps-incidence, etiology, pathogenesis and natural history
 - Malignant: incidence, aetiology and pathogenesis, histological classification, molecular biology and patterns of spread. Staging

- 2.3.11 Intrahepatic and extrahepatic biliary cancer
- Pathophysiology of malignant obstructive jaundice
 - Hilar cholangiocarcinoma: Incidence, aetiology and histological classification patterns of spread genetics and molecular biology Staging

2.4 Pathology of the Liver

Non neoplastic disorders

- 2.4.1 Liver Infections
- Viral epidemiology, molecular aspects of carcinogenesis, mechanisms of chronic inflammation, serological markers of disease activity prognosis and complications.
 - Pyogenic and fungal infections: Classification, incidence, microbiology and pathogenesis of bacterial abscess, risk factors and natural history.
 - Amoebiasis and other parasitic infestations. Epidemiology, aetiology, pathogenesis and complications Hydatid disease; terminology and classification, aetiology, life cycle development and complications; serological testing.
- 2.4.2 Acute Liver Failure
- Etiology and pathophysiology, complications and prognosis
 - Classifications
- 2.4.3 Chronic Liver Disease and Portal Hypertension
- Etiology, pathogenesis and natural history
- Classification (Childs Pugh)
- Pathophysiology and complications of portal hypertension
- Pathophysiology of ascites

2.4.4 Vascular

- Budd Chiari and venous occlusive disease
Etiology pathophysiology and complications
- Hepatic artery aneurisms and its branches
Etiology and pathology and complications

2.4.5 Liver Injury

- Liver Trauma:(blunt and penetrating)
Classification and mechanisms of injury, pathophysiology and complications
- Liver ischemia and ischemia reperfusion injury
Etiology and pathophysiology

Neoplasms of the Liver

This section implies a knowledge of the basic pathophysiology of neoplasia: This includes mechanisms of carcinogenesis, genetic alterations, mechanisms of chronic inflammation and principles of tumour biology including the metastatic process.

2.4.6 Benign neoplasms: Classification, histology, aetiology and pathogenesis natural history

- Cystic disease
- Hemangioma
- Adenoma
- FNH
- Other benign lesions of the liver, local fatty change

2.4.7 Primary malignancies

- Hepatocellular carcinoma
Epidemiology and risk factors, staging, pathology and pathogenesis, complications and natural history
- Cholangiocarcinoma intrahepatic or peripheral
- Epitheloid hemangioendothelioma, lymphoma sarcoma and other malignancies

2.4.8 Secondary malignancies. Staging, pathogenesis, prognostic variables including molecular markers, natural history

- Colorectal
- Neuroendocrine
- Other secondaries breast, melanoma, renal, other GIT tumours

2.5 Physiology of the Pancreas and Duodenum

2.5.1 Exocrine enzyme physiology –synthesis, excretion and activation

2.5.2 Neural and hormonal influences of exocrine secretion

2.5.3 Endocrine metabolism – islet cell function, neuroendocrine hormones

2.5.4 Mechanisms of pancreatic pain

2.5.5 Regulation of duodenal motility

2.5.6 Neuroendocrine (gut) hormone physiology

2.6 Investigations of the Pancreas and Duodenum

- 2.6.1 Markers of pancreatic injury
- 2.6.2 Measurement of exocrine and endocrine pancreatic function
- 2.6.3 Markers of blood and urinary endocrine hormones
- 2.6.4 Interpretation of pancreatic tumour markers
- 2.6.5 Interpretation of biopsy – pancreas, duodenum and ampulla

2.7 Pathology of Pancreas and Duodenum

Non neoplastic

- 2.7.1 Definition and classification of Pancreatitis
- 2.7.2 Acute Pancreatitis
 - Aetiology and pathogenesis of acute pancreatitis including extrapancreatic organ manifestations
 - Assessment of severity
 - Hemodynamic, biochemical and metabolic abnormalities
 - Pancreatic necrosis: pathogenesis and natural history
- 2.7.3 Pancreatic fistulas
 - Aetiology, pathophysiology and complications
- 2.7.4 Pancreatic Pseudocysts
 - Aetiology, natural history and complications
- 2.7.5 Pancreatic vascular manifestations
 - Haemorrhage thrombosis
- 2.7.6 Pancreatic Infections
 - Pancreatic abscess
 - Fungal infections
 - TB
- 2.7.7 Chronic Pancreatitis
 - Aetiology, pathophysiology natural history
- 2.7.8 Congenital anomalies of the pancreas and pancreatic duct
 - Pancreatic Divisum
 - Annular pancreas
 - Von Hippel

Neoplastic conditions of the Pancreas and Duodenum

- 2.7.9 Benign Cysts and Neoplasms of the Pancreas: A detailed knowledge of the classification, aetiology, pathogenesis, histology and natural history is required of the following conditions:
- Microcystic serous adenoma
 - Mucinous cystic neoplasm
 - IPMN
 - Solid pseudopapillary tumours
 - Neuroendocrine tumours
- 2.7.10 Malignant Tumours of the Pancreas - Histological classification
- Primary adenocarcinoma: Epidemiology and risk factors; Pathogenesis - genetics and molecular biology, pathology and patterns of spread; Staging classification
 - Metastatic disease to the pancreas-renal cell, melanoma, colorectal
 - Lymphoma pancreas
 - Endocrine tumours of the pancreas – classification and pathogenesis
- 2.7.11 Ampullary and duodenal tumours
- Staging and histological classification
 - Epidemiology, risk factors, pathogenesis and association with other diseases
 - Patterns of spread and natural history
- 2.7.12 Pancreatic and duodenal injuries
- Epidemiology, pathophysiology and mechanisms of injury
 - Classification

2.8 Physiology of the spleen

- 2.8.1 Immune and haematological function of the spleen
- 2.8.2 Interpretation of tests of immune spleen function

2.9 Pathology of the spleen

- 2.9.1 Etiology and pathogenesis of hypersplenism
- 2.9.2 Etiology, pathophysiology and prognosis of hyposplenism including OPSI
- 2.9.3 Splenic Infarct and abscesses
- 2.9.4 Parasitic Infections of the spleen including Hydatid disease
- 2.9.5 Splenic Tumours: Etiology, pathology and natural history
- Benign: splenic cysts
 - Malignant: lymphoproliferative disorders, sarcoma, hemangiothelioma
- 2.9.6 Vascular: Etiology, pathophysiology and complications
- splenic vein thrombosis
 - splenic artery aneurism

MODULE III

PERIOPERATIVE CARE

This module will consist of 3 subunits. These include: (a) General principles in the peri operative care of patients with HPB disorders, (b) Principles of Imaging (c) Principles of Oncology.

Subunit I

GENERAL PRINCIPLES

Objectives

During this module the fellow should learn the following concepts:

1. Demonstrate the ability to manage the perioperative assessment and complications of patients with Hepatobiliary disorders.
2. Develop a detailed perioperative and operative strategy for liver, biliary and pancreatic resections based on preoperative assessment and imaging of the patient with HPB disease.
3. Assess the overall risk of surgery by recognizing the implications of abnormalities of liver hematologic and biochemical testing on both hepatic and non-hepatic procedures.

Content

- 1.1 Demonstrate a detailed knowledge of the impact of comorbidities and other risk factors on the impact of management of HPB disease.
 - 1.1.1 Evaluation of the high risk patient in HPB surgery - correlation of ASA and APACHE scores with operative morbidity and mortality in HPB disorders.
 - 1.1.2 Prognostic effect of obstructive jaundice on perioperative morbidity and measures to minimise these effects.
 - 1.1.3 The impact of renal failure on the jaundiced patient and strategies to minimise these effects.
The impact of cirrhosis and portal hypertension, Childs Pugh score on non shunt surgery.
Disorders of coagulation and management.
Minimising the impact of diabetes and cardiorespiratory disorders on HPB surgery.
- 1.2 Perioperative complications and critical care management in patients with complex HPB disorders including:
 - 1.2.1 Preoperative assessment of liver function prior to surgery including.
 - Hepatic risk for surgical conditions.
 - Assessment of liver function, portal hypertension.
 - Volumetric assessment of liver remnant.
 - Requirements and assessment of portal vein embolisation.
 - 1.2.2 Prophylaxis against common complications.
 - Understanding of DVT prophylaxis and treatment.
 - Measures to prevent sepsis.
 - 1.2.3 Neuroendocrine hormonal blockade.

- 1.2.4 Detailed operative plan based on preoperative Imaging.
- 1.3 Management of complications.
 - 1.3.1 Liver failure, encephalopathy.
 - 1.3.2 Bleeding and coagulation disorders.
 - 1.3.3 Vessel occlusion syndromes: hepatic artery, portal vein hepatic veins.
 - 1.3.4 Biliary, pancreatic and enteric fistula and abdominal collections.
- 1.4 Sepsis
 - 1.4.1 Acquire a detailed knowledge of the various syndrome of systemic sepsis and its management including multi organ failure and supportive therapy.
 - 1.4.2 Management of abdominal collections and abscesses.
Radiological percutaneous techniques for abdominal collections: indications and outcomes.
 - 1.4.3 Approaches to peritoneal sepsis.
 - 1.4.4 Knowledge of the spectrum of organisms involved in sepsis associated with HPB diseases.
 - 1.4.5 Knowledge of common antibiotics used in the treatment of HPB sepsis including indications and toxicity.
 - 1.4.6 Gut enteric organisms - translocation and pathogenesis in HPB sepsis.
Selective bowel decontamination.
- 1.5 Nutrition
 - 1.5.1 Nutritional assessment: identification of malnutrition and nutritional risk factors.
 - 1.5.2 Specific metabolic and nutritional problems associated with HPB.
Disease: jaundice, pancreatic insufficiency, pancreatic sepsis.
 - 1.5.3 Alterations in metabolism following major hepatic or pancreatic resection.
 - 1.5.4 Indications and timing for perioperative nutrition enteral or parenteral.
Methods of administration: jejunostomy, nasoenteric, parenteral.
 - 1.5.5 The role of preoperative nutrition in malignancy, obstructive jaundice and pancreatitis.
Principles of dietary immunomodulation.
Basic understanding of calorific requirements and protocols in nutrition.
 - 1.5.6 Complications of parenteral and enteral nutrition.

Subunit II

IMAGING

1. Objectives

Upon completion of this unit, the Fellow will:

- 1.1 Understand the physics and technology of Ultrasound and Doppler, CT Scan, MRI Scan, PET Scan and other nuclear imaging procedures including biliary excretion scan (HIDA), RBC scan, Octreotide scan and radionuclide Liver-Spleen Scan.
- 1.2 Understand the relative advantages, disadvantages and indications of each modality.
- 1.3 Interpret the detailed information provided by the imaging of the liver biliary tract, pancreas duodenum and spleen to the clinical situation.
- 1.4 Perform and interpret intraoperative ultrasound.

2. Content

- 2.1 The applied physics and technology of Ultrasound, Doppler, CT scan, MRI scan, PET Scan, radionuclide Liver Spleen Scan and other nuclear medicine imaging procedures.
- 2.2 The interpretation of images and application to clinical investigation.
- 2.3 Imaging algorithm for the investigation of hepatobiliary, pancreatic and splenic disorders including:
 - 2.3.1 Cystics lesions of the liver, pancreas and spleen.
 - 2.3.2 Non cystic lesions of the liver, pancreas and spleen.
 - 2.3.3 Biliary dilatation and /or jaundice.
 - 2.3.4 Periampullary tumours.
 - 2.3.5 Biliary strictures.
 - 2.3.6 Gallstones including biliary and gallbladder dyskinesia.
 - 2.3.7 Pancreatitis and pancreatic inflammatory lesions.

3. Clinical Skills

- 3.1 Apply the understanding of the relative merits of each imaging modality to efficiently investigate and stage lesions of the liver, biliary tract pancreas and spleen.
- 3.2 Interpret images to correctly identify normal structure, anomalies and pathological abnormalities.
- 3.3 Integrate the findings of the various images with the clinical situation.
- 3.4 Perform and interpret intra operative ultrasound.

Subunit III

ONCOLOGY

Objectives

- 1.1.1 Understand the mechanisms of action of the classes of chemotherapeutic agents currently available for HBP malignancies.
- 1.1.2 Understand the physics, mechanism of action and technology of radiation therapy.
- 1.1.3 Apply this understanding to the multidisciplinary management of HBP malignancies.

- 1.1.4 **Chemotherapy**
Knowledge should include:
 - (1) Classes of drugs
 - (2) Mechanisms of action
 - (3) Toxicities
 - (4) Combination therapy and available protocols

- 1.1.5 **Radiation therapy**
 - (1) Applied physics and technology
 - (2) Mechanism of action
 - (3) Toxicity
 - (4) Combination protocols with chemotherapy

- 1.1.6 **Multidisciplinary management**

- 1.1.7 **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

- 1.1.8 **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.

MODULE IV

CLINICAL

Objectives:

Upon completion of this unit the fellow will understand:

- (a) The pathophysiology, presentation and natural history of disorders of the liver bile ducts pancreas and spleen.
- (b) The investigative procedures available to efficiently diagnose the disease.
- (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.

Optional: Advanced laparoscopic workshop(s) in HPB surgery.

Assessment: Continuous, Exit examination

Subunit I

BILIARY

Content:

Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Techniques
<p>Biliary Calculi</p> <p>Biliary colic/ chronic cholecystitis</p> <ul style="list-style-type: none"> - Empyema/mucocoele - Mirrizis syndrome - Acalculous cholecystitis - Gallbladder dyskinesia 	<p>Describe and differentiate the clinical features of these conditions</p> <p>Describe the appropriate imaging and biochemical investigations to define and differentiate these conditions</p> <p>Describe the relative risks of these conditions with associated comorbidities eg portal hypertension</p> <p>Detailed knowledge of operative and postoperative complications of cholecystectomy</p>	<p>Describe and evaluate the management of these conditions, including asymptomatic gallstones. This should include:</p> <p>A detailed knowledge of appropriate antibiotics and the management of sepsis</p> <p>Indications and options of conservative management, percutaneous, minimally invasive and open surgical techniques</p>	<ul style="list-style-type: none"> - Laparoscopic cholecystectomy - Operative cholangiogram - Technical options for the difficult cholecystectomy - Open cholecystectomy - Percutaneous cholecystotomy

	Detailed knowledge of outcomes following various treatment options including QOL		
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
Common duct stones Acute suppurative Cholangitis	Describe the clinical features and various presentations of obstructive jaundice and ascending cholangitis Determine the optimum imaging techniques to detect CBD stones comparison and limitations	Detailed knowledge of the management of suppurative cholangitis including optimum antibiotic and supportive therapy Detailed knowledge of various techniques of interventional access to CBD with outcomes Timing and optimum techniques for combined treatment of CBD stones and cholecystolithiasis	Open exploration of CBD including choledochoscopy, insertion of T tube, choledochoduodenostomy and sphincteroplasty Laparoscopic exploration of CBD including flushing, basket retrieval, choledochotomy and insertion of stents Radiological/endoscopic techniques and/or combination with surgery
Intrahepatic Stones	Describe the clinical presentation of this condition Have a detailed knowledge of the optimum imaging techniques in characterising and staging this disease Staging classification	Detailed knowledge of indications and options of management including sepsis and biliary obstruction Knowledge of follow up protocols, complications and outcomes	Percutaneous and endoscopic options for emergency and elective situations Techniques of choledoscopy, balloon dilatation, biopsy for intrahepatic strictures Biliary and liver resection Enterobiliary anastomosis Biliary access loops, stents

<p>Benign Biliary Strictures - Cholecystectomy related biliary injuries</p>	<p>Detailed knowledge of clinical presentation, classification and mechanisms of injury</p> <p>Optimum imaging techniques to define nature of biliary injury and other associated vascular or enteric injuries</p>	<p>Recognition of bile duct injuries operative and postoperative</p> <p>Appreciation of appropriate options (drainage, endoscopic, percutaneous and open surgical) for the emergency and elective management of bile duct injury and biliary strictures including the management of biliary peritonitis, biliary fistula and abdominal collections.</p>	<p>Bilio enterostomy with construction of Roux en y limb Access loops Duct-duct anastomosis Biliary stenting and dilatation via ERCP or PTC</p>
<p>- Primary sclerosing cholangitis - Idiopathic-inflammatory - Post traumatic</p>	<p>Detailed knowledge of clinical presentation, disease association, and complications</p>	<p>Management of PSC Screening and biopsy for cholangiocarcinoma</p> <p>Follow up protocols and detailed knowledge of potential long term complications following repair</p>	<p>PTC or ERCP with stents hepaticoenterostomy Resection Liver transplantation</p>

Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
<p>Biliary fistulas - internal - external</p>	<p>Detailed knowledge of the various clinical presentations of internal and external fistulas including Mirizzis syndrome and gallstone ileus</p> <p>An understanding of the optimum imaging techniques to define and characterise these fistulas</p>	<p>Management principles regarding the indications and appropriate techniques (conservative, endoscopic , percutaneous and laparoscopic) options for the treatment of fistulas</p>	<p>The use of stenting techniques by endoscopic or percutaneous methods Techniques of cholecystectomy and common bile duct exploration by laparoscopic or open surgical techniques Bilio enterostomy Bowel resection Enterotomy and closure</p>
<p>Biliary Cystic Disease Choledochal cysts Caroli's disease</p>	<p>Awareness of various modes of clinical presentation, natural history, complications and associated conditions</p>	<p>Management of choledochal cyst based on type and extent of disease'</p> <p>Appreciation of the role of endoscopic and percutaneous</p>	<p>Cholecochal resection and biliary reconstruction</p> <p>Associated liver and pancreatic resections</p>

	A detailed knowledge of the most appropriate imaging techniques and laboratory tests to define the characteristics and extent and other associated pathology	techniques in emergency presentations and subsequent appropriate surgical procedures Awareness of follow up protocol and potential complications	Liver transplantation Endoscopic stenting
Tumours of the Gallbladder and BT Benign tumours	Awareness of clinical presentation, natural history Knowledge of imaging modalities to distinguish between malignant and benign tumours of the gallbladder	Principles of management including indications for resection and follow up protocols	Principles of resection: - Laparoscopic or open surgical approaches - role of frozen section
Carcinoma of the gallbladder	Awareness of clinical presentation Knowledge of imaging and other investigations to diagnose and stage disease Complications	General principles of perioperative management Indications for curative or palliative procedures and likely outcomes The role of chemotherapy or radiotherapy in a palliative, neoadjuvant or adjuvant role Follow up protocols	Staging laparoscopy and/or biopsy Surgical bypass procedures Percutaneous or endoscopic stenting procedures Radical cholecystectomy, liver resection Lymph node clearance Vascular reconstruction

Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
Hilar cholangiocarcinoma	Clinical presentation of hilar cholangiocarcinoma Knowledge of radiology, laparoscopy and biochemical tests to assess and stage disease	Peri operative issues and management of the jaundiced patient including indications for biliary decompression Atrophy and PV embolisation Indications and suitability for	Staging laparoscopy and/or bypass Endoscopic or transhepatic stenting Intrahepatic bypass procedures

	Staging classification complications	resection The role of chemo/radiotherapy as neo/adjuvant or palliative setting Follow up protocols QOL	Radical Biliary resection and reconstruction Liver resection including caudate vascular reconstruction Lymph node clearance
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Operative skills required:

1. Insertion of ports or abdominal wall incisions appropriate for the intended procedure
2. Staging laparoscopy and biopsy
3. Intra operative ultrasound and intraoperative cholangiography, choledochoscopy
4. Laparoscopic and open cholecystectomy, subtotal cholecystotomy, radical cholecystectomy and
5. Portal lymph node clearance
6. Vascular and biliary reconstruction techniques
7. Common bile duct exploration (laparoscopic and open) extraction CBD stones: flushing. Instrument removal, basket extraction. Insertion of stents and T tubes
8. Sphincteroplasty and choledochoduodenostomy/enterostomy
9. Whipples procedure, portal node dissection
10. Liver resection and hepatico enterostomy with access loop
11. Biliary duct reconstruction
12. Duct to duct anastomosis
13. Intrahepatic cholangioenterostomy : right and left lobes
14. Duodenal exclusion procedures

Subunit II

DUODENUM, PANCREAS AND SPLEEN

Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
<p>Pancreatitis</p> <p>Acute Pancreatitis</p>	<p>Classification of pancreatitis</p> <p>Various modes of clinical presentation</p> <p>Radiological biochemical and haematological tests for diagnosis, aetiological factors and assessment of severity and prognosis</p> <p>Diagnostic tests to define complications including pancreatic infection</p>	<p>Management principles of acute pancreatitis and its complications including : use of antibiotics nutrition and septic complications</p> <p>Supportive and critical care principles</p> <p>Indications for endoscopic and surgical intervention</p> <p>Organ failure and SIRS</p>	<p>Operative recognition of acute pancreatitis laparoscopic cholecystectomy in acute gallstone pancreatitis</p> <p>Intervention therapy using endoscopic, arteriographic and laparoscopic techniques</p> <p>Necrosectomy including open, laparoscopic, endoscopic and percutaneous techniques</p> <p>Pseudo cyst gastrostomy/enterostomy surgical approaches to haemorrhage, perforations, gastric outlet obstruction</p> <p>Feeding jejunostomy, Peritoneal lavage</p>
<p>Chronic Pancreatitis including autoimmune pancreatitis</p> <p>Inflammatory mass head of pancreas</p>	<p>Clinical presentation</p> <p>Imaging, biochemical haematological and immunological tests to diagnose and characterise the disease</p> <p>Assessment and diagnosis of complications</p>	<p>Management principles including decision making in the indications for conservative, endoscopic or surgical management</p> <p>Strategies to diagnosis and manage the inflammatory pancreatic mass</p>	<p>Endoscopic stenting of main or accessory pancreatic duct and CBD</p> <p>ESWL/Endoscopic lithotripsy for stones</p> <p>Laparoscopic and open pseudocyst drainage procedures</p> <p>Pancreatic sphincteroplasty to main or accessory pancreatic ducts</p> <p>lateral pancreaticojejunostomy Freys or Begers procedures</p> <p>total pancreatectomy</p>

			Whipples, distal pancreatectomy, central pancreatectomy Pseudocyst gastro enterostomy Denervation procedures, coeliac axis block
Pancreatic Divisum	Clinical significance and methods of presentation and natural history	Indications and options of treatment including conservative, endoscopic and surgical techniques	Accessory papilla sphincteroplasty Pancreatico jejunostomy Pancreatic resection
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
Pancreatic Fistulas and ascites	Classification Clinical presentation(s) Imaging techniques to diagnose and characterise fistulas	Management principles of pancreatic fistula including treatment of sepsis, nutrition, pancreatic secretion suppression and general supportive therapy Indications of specific therapy including conservative, endoscopic and surgical options	ERCP and stenting Pancreaticoenteric bypass techniques Pancreatic resection
Pancreatic pseudocysts	Classification Clinical presentation and natural history Radiological tests	Indications for treatment including timing and method of intervention Endoscopic, radiological or surgical Treatment of complications Results and outcomes	ERCP Endoscopic insertion pancreatic stents Endoscopic cyst gastrostomy Radiological percutaneous drainage Radiological cystgastrostomy Surgical pseudocyst enterostomy/gastrostomy Pancreatic resection
Pancreatic Haemorrhage Portal and splenic vein thrombosis	Clinical presentation Appraisal of diagnostic tests to diagnose and characterise site of bleeding following acute pancreatitis or post operative pancreatic resection Clinical presentation and radiological assessment and characterisation (US, duplex, CT MRI angiography)	Management of bleeding including logarithm of plan of management. Options of endoscopic , arteriographic and surgical techniques with knowledge of outcomes and prognosis Options of conservative, radiological (embolic) and surgical treatment of bleeding varices secondary to PV and	Angiography and embolisation Surgical techniques Techniques for bleeding varices: Schlerotherapy, balloon tamponade embolisation

	and portography	splenic vein thrombosis	Emergency splenectomy Local devascularisation procedures
Congenital Anomalies Annular pancreas Ectopic and accessory pancreas Duodenal diverticulum Aplasia, hypoplasia of pancreas Pancreatic divisum Pancreatic cysts Variations of the venous, arterial and ductal drainage of the pancreas including pancreatic divisum	A detailed knowledge of the significance, clinical presentations and natural history of these conditions Radiological techniques to diagnose and characterise these abnormalities	Significance of the anomalies and Indications for intervention Other pathological conditions with the various anomalies	Duodeno-duodenostomy Pancreatic stenting Sphincteroplasty
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
Pancreatic duodenal trauma Endoscopic complications Haemorrhage, perforation, sepsis and acute pancreatitis	Classification and staging Modes of clinical presentation and mechanisms of injury Radiological, hematological and biochemical tests for diagnosis and definition of injury Knowledge of complications and natural history	Management of pancreatic trauma with options of conservative endoscopic or surgical (open or laparoscopic) techniques Follow up	Endoscopic stenting Radiological drainage Surgical techniques: - triple tube decompression - pyloric exclusion procedures - Drainage Operative assessment of pancreatic duct injury Distal pancreatectomy (spleen preserving) Internal drainage pancreaticojejunostomy Whipples
Neoplastic Conditions			

<p>Benign cysts and neoplasms</p> <p>Serous, mucinous cyst adenoma IPMN</p> <p>Cystic pancreatic incidentaloma</p>	<p>Classification and differentiation from pseudocyst and duodenal diverticulum</p> <p>Clinical presentations of cystic pancreatic tumours and differential diagnosis</p> <p>A detailed assessment of radiological (CT, US MRI) cytological, biochemical molecular markers to differentiate between benign, premalignant and malignant cystic tumours of the pancreas</p> <p>Role of endoscopic ultrasound</p>	<p>Management protocol including indications of conservative therapy or intervention</p> <p>Follow up protocols</p>	<p>Laparoscopic and /or open surgical techniques for pancreatic cystic tumours</p> <p>Local enucleation techniques</p> <p>Pancreatic resection: Whipples, central pancreatectomy, spleen preserving distal pancreatectomy,</p>
<p>Malignant tumours</p> <p>Primary :Pancreatic adenocarcinoma</p>	<p>Staging</p> <p>Clinical presentation</p> <p>Radiological and other tests to diagnose and stage the disease</p>	<p>Nutritional support</p> <p>Indications for biliary decompression</p> <p>Indications of resectability</p> <p>Indications for biopsy</p> <p>Choosing appropriate resection technique</p> <p>Role of neo/adjuvant therapy chemotherapy</p> <p>Follow up protocols including quality of life assessment</p>	<p>Staging laparoscopy, intraoperative ultrasound</p> <p>Palliative options: Gastrojejunostomy Hepatojejunostomy by laparoscopic or open surgical techniques</p> <p>Duodenal stenting, CBD and pancreatic stenting</p> <p>Nerve ablation techniques</p> <p>Pancreatic resection: Whipples, distal pancreatectomy, central pancreatectomy, total pancreatectomy</p>
<p>Condition</p>	<p>Clinical Assessment & Diagnostic Evaluation</p>	<p>Management Principles</p>	<p>Technique</p>

		<p>Palliative options of endoscopic, radiological or surgical techniques for pain, gastric outlet obstruction, jaundice</p> <p>Knowledge of outcomes of these procedures including long term survival and complications</p> <p>Management of post operative complications</p>	<p>Portal vein resection and vascular reconstruction</p>
<p>Pancreatic lymphoma</p> <p>Pancreatic metastases: Renal, melanoma colorectal</p> <p>Pancreatic incidentaloma</p>	<p>Clinical presentation</p> <p>Radiological and haematological tests to diagnose and stage disease</p>	<p>Management plan of the pancreatic incidentaloma</p> <p>Management plan regarding conservative or interventional treatment for pancreatic lymphoma and metastases</p>	
<p>Duodenal and Ampullary tumours</p>	<p>Staging, classification and associated syndromes and inherited conditions (FAP, VHL)</p> <p>Clinical presentation</p> <p>Imaging techniques including the role of EUS and biopsy</p>	<p>Management options including conservative, curative or palliative strategies</p> <p>Screening and surveillance in FAP FAP follow up</p> <p>Chemo preventative therapy</p> <p>Indications for biliary decompression</p>	<p>ERCP</p> <p>Palliative endoscopic or radiological decompression</p> <p>Laser, argon ablation of duodenal polyps, tumours</p> <p>Local transduodenal resection by endoscopic, laparoscopic and surgical techniques</p> <p>Pancreatic preserving duodenectomy Whipples</p>
<p>Endocrine tumours of the pancreas including adult nesidiobalastosis</p>	<p>Classification</p> <p>Presentation and differential diagnosis of various syndromes from secreting tumours</p> <p>MEA syndromes</p> <p>Radiological hormone assays</p>	<p>Options of management including conservative, medical, resection by laparoscopic and open techniques</p> <p>Knowledge of medical therapy including suppression and chemotherapy</p>	<p>Laparoscopy, intraoperative ultrasound</p> <p>Techniques of localisation at operation including intraoperative US, monitoring protocols of blood sugar, venous sampling</p> <p>Techniques to differentiate malignant and benign disease</p>

	and other tests to detect and stage	Antisecretory medication Management of metastatic disease chemotherapy, focal ablative, SIRT, resection , HAA embolisation	Pancreatic resection : Enucleation central pancreatectomy, distal pancreatectomy (spleen preservation). Whipples procedure
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
Spleen			
Splenic Trauma	Staging of splenic trauma Mechanisms of injury Clinical presentation Radiological investigations to diagnose, stage splenic injury as well as other injuries Complications and natural history of splenic trauma Detailed knowledge of acute and long term complications of splenectomy	Management principle of splenic trauma including the indications of conservative , radiological (angiography) and open surgical intervention The complications and relative merits of these techniques Management of the complications of splenic trauma including long term management and follow up of OPSI	Assessment of splenic trauma at laparotomy Total splenectomy Splenorraphy
Splenic tumours- Primary and secondary Cystic and solid Haematological and infections involvement of spleen	Clinical presentation Radiological investigation to differentiate the pathological nature Knowledge of complications of splenectomy		Splenectomy Techniques of splenectomy for massive spleen
Splenic Artery Aneurisms	Clinical presentation Radiological Tests	Managements Principle including conservative, Radiological and surgery	Occlusive techniques

Operative Skills

1. Abdominal incisions and placement of ports for appropriate procedure
2. Placement of and types of drains; principles of sump drainage and peritoneal lavage
3. Intraoperative ultrasound and laparoscopic staging of pancreatic tumours

4. Duodenotomy and identification of the main and accessory papilla and pancreatic ducts at operation
5. Kocherisation of the duodenum
6. Local excision of ampullary and duodenal tumours
7. Pancreatic necrosectomy by open, laparoscopic and percutaneous techniques
8. Insertion of feeding jejunostomy
9. Pancreatic gastrostomy/enterostomy
10. Distal pancreatectomy including splenic preserving
11. Pancreatic tumour enucleation
12. Central pancreatectomy
13. Pancreatico duodenectomy including pyloric preserving
14. Total pancreatectomy
15. Retroperitoneal node dissection
16. Pseudocyst enterostomy/gastrostomy
17. Puestows procedure and modifications
18. Duodenal preserving pancreatectomy
19. Resection techniques for chronic pancreatitis: Freys, Begers
20. Coeliac axis injection or ablation
21. Splenectomy for trauma
22. Splenorrhaphy
23. Splenectomy for massive spleens, portal hypertension and tumours
24. Ligation of splenic artery aneurisms

Subunit III

LIVER

Content

Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
<p>Liver Failure</p> <p>Acute Liver Failure</p>	<p>Classification system including Kings College Criteria</p> <p>Presentation, natural history and prognostic factors</p> <p>Investigations to diagnose, define aetiology and prognosis</p>	<p>Management strategy for acute fulminant hepatic failure including critical care supportive therapy,</p> <p>Define indications for extracorporeal support and surgery</p>	<p>Types of liver support systems</p> <p>Liver transplantation - OLT and axillary</p>
<p>Chronic liver failure</p> <ul style="list-style-type: none"> - Viral hepatitis - Alcoholic liver disease - NASH - Autoimmune disease - Primary Biliary cirrhosis - PSC 	<p>Classification (Childs- Pugh)</p> <p>Clinical presentation</p> <p>Complications prognosis and natural history</p> <p>Interpretation of investigations to confirm cirrhosis, identify</p>	<p>Management strategy for chronic liver disease including the indications for medical, endoscopic radiological and surgical options</p> <p>Follow up protocols</p>	<p>Laparoscopy</p> <p>Liver biopsy by laparoscopy, percutaneous, open and transjugular routes</p> <p>Modified surgical techniques in patients with</p>

- Wilsons - Hemochromatosis - Alpha I antitrypsin deficiency	cause, and prognosis Identify complications such as malignancy, hepatic and portal vein thrombosis,	Preoperative assessment and risks of patients with cirrhosis undergoing non liver/shunt surgery	cirrhosis undergoing non liver or shunt surgery
Ascites	Clinical presentation Investigations to confirm ascites, including tests to differentiate ascites from liver, lymphatics and malignant causes Tests to exclude infection Understanding of prognosis and complications	Medical management of ascites The indications and outcomes of TIPS, peritoneo venous shunts and surgical decompressive shunts in ascites Indications and role of transplantation	Laparoscopy and biopsy Percutaneous aspiration of ascites under US control TIPS and peritoneo venous shunt Decompressive surgical shunts Liver transplantation Surgical techniques in patients with ascites undergoing surgery such as abdominal wall hernias etc
Portal hypertension - Budd Chiari	Clinical presentations Investigations (radiology hematology biochemistry) to diagnose, define aetiology and	Indications for portal decompression - Non operative strategies and medical management	Esophageal sclerotherapy and banding Variceal embolisation TIPS
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
	characterise the anatomy of portal hypertension, including sites of variceal bleeding Prognosis and complications	- The indications and outcomes of endoscopic and radiological techniques - Laparoscopic and surgical techniques - Indications for liver transplantation - Risks and benefits of TIPS and surgical shunts for PHT	Shunt surgery: portacaval, splenorenal, mesocaval and variants Local devascularisation procedures Surgical techniques in patients undergoing non shunt surgery with portal hypertension eg cholecystectomy, hernias
Liver Infections Pyogenic and fungal liver abscesses Other liver abscesses including amoebic	Clinical presentation Investigations to diagnose, evaluate and identify possible sources and organisms	Management of liver abscesses including conservative, percutaneous endoscopic, and surgical options	Percutaneous, Laparoscopic and open surgical drainage of liver abscesses

abscess and TB		Detailed knowledge of organisms, appropriate antibiotic therapy and length of therapy Indication for biliary tract imaging and decompression Indications for surgical options	
Hydatid Liver Disease	Classification, epidemiology and staging Modes of clinical presentation Radiological and serological investigation for detection and complications Detailed knowledge of specificity and sensitivity of serological tests for diagnosis and follow up Knowledge of complications and natural history	Management of hydatid liver disease and its complications including : role of anti helminthics as definitive or adjuvant /neoadjuvant to surgery including timing and length of administration Surgical options including surgical, radiological and endoscopic Complications including peritoneal rupture and dissemination, Biliary tract involvement including rupture, Biliary bronchial/peritoneal fistulas Follow up	ERCP and spincterotomy Radiological techniques of aspiration and instillation of chemotherapy Laparoscopic and open surgical techniques including pericystectomy, endocystectomy Omental pedicle Liver resection CBD exploration
Liver trauma Blunt and penetrating	Classification Mechanisms of injury Clinical presentation(s) Investigations to define extent of injury and other injuries Complications Prognosis	Overall management principles and triage of liver trauma. Indications for operative or non operative management Principles of management of resuscitation, sepsis, coagulation and multi organ support Assessment of the options of minimally invasive or open surgical intervention Role of laparoscopic, endoscopic and radiological invasive techniques	Role of radiological – embolisation, vascular stenting percutaneous techniques ERCP and biliary stents including timing and role Laparoscopy and liver debridement and drainage of sepsis including timing Operative assessment of abdominal injuries Liver packing, lacerations, debridement, omental pedicle Vascular injuries and repair
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
		Complications and follow up	Total vascular exclusion,

			VVP Shunting procedures
Congenital anomalies			
Liver tumours Benign lesions Hemangioma FNH Adenoma Other benign tumours Hepatic incidentaloma	Classification Patterns of Clinical presentation Differential diagnosis Complications and natural history Optimum investigations for assessment and differentiation of benign lesions of the liver	Management strategies including the role of conservative management, and the indications for resection Role of liver biopsy Follow up protocols	Laparoscopy Liver biopsy Enucleation Open and laparoscopic liver resection
Malignant lesions Primary Hepatocellular carcinoma Other primary malignant lesions of	Classification and staging Clinical presentations Investigations – radiological biochemical and haematological to diagnose and stage the disease Relative merits of CT scan, PET, MRI Knowledge of the complications and natural history	Management principles of the treatment of HCC -Assessment of residual liver function - Role of resection - Focal ablative techniques and TACE: indications, limitations and relative merits including complications, patient survival and as bridge to transplantation Criteria for transplantation: Milan, UCSF, Pittsburgh etc The role of neo/adjuvant chemotherapy The palliative management of HCC including ascites jaundice and haemorrhage Outcomes and results including QOL	Staging laparoscopy and biopsy Including IOUS RFA subsegmental resection transplantation palliative techniques

the liver			
Metastatic Colorectal Neuroendocrine Non CRC/NNE Melanoma, renal breast	Staging Clinical presentation Role of PET, CT, MRI, laparoscopy in diagnosis and	Management principle for the treatment of CRC liver metastases including the relative merits of surgery, chemotherapy, focal ablation and SIRT	Laparoscopy and indications for biopsy Intraoperative staging: assessment of resectability at laparotomy and laparoscopy
Condition	Clinical Assessment & Diagnostic Evaluation	Management Principles	Technique
others	staging Tumour and molecular markers Complications following liver resection natural history Nomenclature for liver resections	Indications for resection Evaluate the co-morbidities of patients for liver resection Assessment of chemotherapy on liver function and residual liver function following liver resection Indications for portal vein embolisation Impact of prognostic variable (clinical, radiological and molecular markers) on survival The role of adjuvant/ neo adjuvant chemotherapy in CRC liver metastases including a knowledge of the commonly used chemotherapy agents, toxicity and implications in timing of liver resection Diagnose and treat complications following liver resection Follow up protocols of patients following resection for CRC liver metastases. MDT interactions	IOUS Liver resections using different approaches and techniques: subsegmental, segmental, lobar, extended Two stage hepatectomy, ex situ surgery, total vascular exclusion Insertion of vascular infusion devices

Skills for Liver Surgery

1. Perform liver resections using a variety of approaches and transection techniques
2. Place abdominal incisions and ports for intended procedure
3. Staging laparoscopy, liver biopsy - assessment of respectability at laparoscopy or laparotomy
4. Types of liver resection (Nomenclature of liver resection using Brisbane system)
 - a. Laparoscopic, laparoscopic-assisted, open laparotomy
 - b. Non anatomic, segmental, lobectomy, extended lobectomy

- c. Staged resections
- d. Combination with ablation
- e. Vascular control: none, Pringle maneuver, total vascular isolation, VVP
- f. Vascular resection and reconstruction
- g. Various parenchymal transaction techniques
- h. Modified techniques for fatty, fibrotic and cirrhotic parenchyma
- i. Concomitant resection of IVC, diaphragm, portal vein and bile duct
- j. Extrahepatic nodal clearance

MODULE V

EDUCATION AND RESEARCH

Clinical research must be included in the clinical program. HPB fellows must meet the following research requirements as part of the fellowship:

- a. Have published or accepted for publication an article in an international peer reviewed journal (not case report/abstract)
- b. Presented at a national or international forum (not a poster)
- c. Should carry out or participate in a research project

Laboratory research or enrolment in a higher degree is optional and will not replace any time in the clinical fellowship. In addition, the fellow should have:

- 1. Knowledge of the design and implementation of a prospective data base
- 2. Knowledge of the principles of evidence based medicine
- 3. Knowledge of the design and conduct of prospective clinical trials
- 4. Knowledge of the process of translational research
- 5. Knowledge of statistical methods to properly evaluate the results of published research studies
- 6. Knowledge and skills to train students and residents in the multidisciplinary management of HPB patients
- 7. Skills to organize and conduct HPB related public education programs