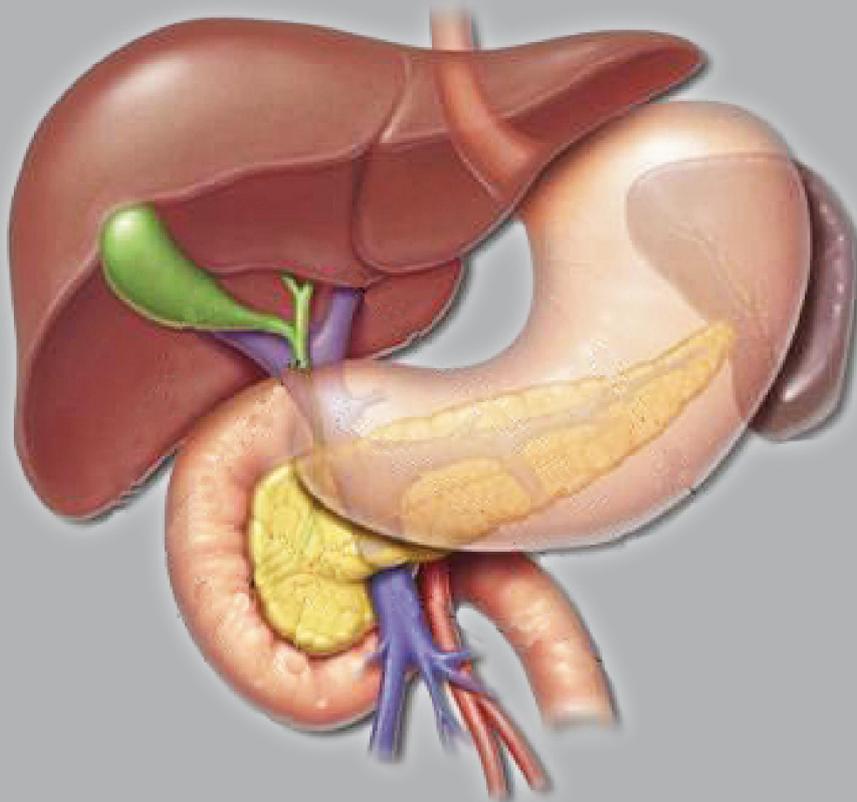




# Curriculum for Fellows in Hepato-Pancreato-Biliary and Transplantation Surgery



## SWISS HPB CENTER ZÜRICH



## Curriculum for Fellows in Hepato-Pancreato-Biliary and Transplantation Surgery

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## Word from the Chairman



*The fellowship in HPB and Transplant Surgery was established at the University Hospital in Zurich in 2005 to bring the concept of structured training in highly specialized surgery from the British and American training systems to Switzerland. Since then we have trained 5 fellows who have all advanced on to successful careers in academic surgery in the United States, South America, Europe and Africa.*

*The aim of the fellowship is to train general surgeons to be able to independently perform as Junior Attendings or Consultants in academic HPB and transplant centers worldwide. We currently offer a 2-year fellowship (European graduates) and a 1-year fellowship (international graduates). Using the U.S. model for surgical fellowship training, our program has a defined curriculum, weekly teaching conferences and a case log system that is consistent with the requirements for surgical specialty training by the European Board in Surgical Qualifications (EBSQ) and other professional organizations like the European Hepato-Pancreato-Biliary Association (EHPBA), the International Hepato-Pancreato-Biliary Association (IHPBA) and the American Society of Transplant Surgeons (ASTS).*

*The mission of the fellowship is to educate talented fellows from Europe and abroad in accordance with the highest professional standards to become capable clinicians, skilled surgeons and knowledgeable academic teachers in HPB and abdominal transplant surgery.*

*I am proud to offer this fellowship to candidates selected based on accomplishments, competence and potential.*

*Sincerely,*



*Pierre-Alain Clavien, MD, PhD, FACS  
Chairman and Professor*

## INTRODUCTION

The purpose of fellowship education in HPB Surgery is to provide the structured educational and training experience which is needed in order to achieve expertise in the field of hepato-pancreato-biliary (HPB) Surgery.

The curriculum was developed to provide a checklist for our fellows in HPB and transplant surgery. It also guides visiting physicians in their course of study and defines key areas of knowledge necessary for understanding the basic concepts of transplantation surgery.

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 as well as patients with abdominal transplants. This will include the ability to investigate, diagnose, recommend appropriate treatment options, perform operative procedures and provide a guide to the topics of study and the knowledge and skills required to become an HPB and Transplant surgeon.

### *The curriculum in Blocks:*

- Block I                    The Liver**
- Anatomy, Embryology, Physiology, Testing
  - Congenital and acquired non-neoplastic liver disease
  - Neoplastic liver disease
  - Liver surgery
- Block II                    The Biliary Tract including Gallbladder**
- Anatomy, Embryology, Physiology, Testing
  - Congenital and acquired non-neoplastic biliary disease
  - Neoplastic biliary disease
- Block III                    The Pancreas and Duodenum**
- Anatomy, Embryology, Physiology, Testing
  - Congenital and acquired non-neoplastic pancreatic disease
  - Neoplastic pancreatic disease
  - Diseases of the Duodenum
- Block IV:                    Kidney Transplantation**
- Block V:                    Pancreas Transplantation**
- Block VI:                    Liver Transplantation**
- Block VII:                    Organ Procurement**
- Block VIII:                    Imaging**
- Block IX:                    Oncology**

Each Block is organized into 3 Sections:

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

*Required Reading:*

- 1. Malignant Liver Tumors: Current and Emerging Therapies**  
*Pierre-Alain Clavien, et al.*
- 2. Diseases of the Gallbladder and Bile Ducts : Diagnosis and Treatment**  
*Pierre-Alain Clavien, et al.*
- 3. Surgery of the Liver, Biliary Tract and Pancreas**  
*L. H. Blumgart et al.*
- 4. Transplantation of the Liver**  
*Ronald W. Bestial, Goran B. Klintmalm et al.*
- 5. Medical Care of the Liver Transplant Patient: Total Pre-, Intra- and Post-Operative Management**  
*Paul G. Killenberg , Pierre-Alain Clavien, et al.*
- 6. Kidney Transplantation: Principles and Practice**  
*Peter Morris, et al.*
- 7. Handbook of Kidney Transplantation**  
*Gabriel M. Danovitch, et al.*
- 8. Atlas of Upper Gastrointestinal and Hepato-pancreato Biliary Surgery**  
*Pierre-Alain Clavien, et al.*

*Rotation Schedule:*

The fellowship includes a rotation between the Transplantation and HPB services. The senior Fellow starts with the HPB service and the junior Fellow starts with Transplantation. Elective cases are handled by both Fellows.

	<i>July - September</i>	<i>October - December</i>	<i>January - March</i>	<i>April – June</i>
<b>Senior Fellow (first year)</b>	HPB	TX	HPB	TX
<b>Junior Fellow (first year)</b>	TX	HPB	TX	HPB

## *Schedule for Fellows*

### Daily

Fellows are to see all patients with clinical problems on the service and all patients operated on the day before prior to the morning report at 7:30 or 7:00. A status report is to be given to the respective Attending at or prior to the morning report.

Fellows are expected to attend afternoon report at 15:30 in the Surgical Library. They are excused from this duty, if they are in the operating room or taking care of extremely urgent clinical matters.

### Morning report

Monday	7:30 am
Tuesday	7:00 am
Wednesday	7:30 am
Thursday	7:15 am
Friday	7:30 am

Morning report is performed by the residents. It is the responsibility of the fellows however to ensure that all relevant imaging studies are scheduled the day before and put into the system. On Friday, it is especially important to schedule all operative cases for Tuesday and Wednesday the following week.

### IPS (Surgical ICU)

Fellows are expected to attend the SICU rounds after the morning report. They are excused from this duty if they have to go to the operating room. The rounds are led by the SICU service (Dr. Bechir's team) but the fellow should always be involved in the discussions. Fellows should be prepared to cover for another colleague, if the colleague is absent. The fellows are the first to be informed by the SICU team when there is a problem. In turn, the Fellows will report to the respective Attending.

### IMC

- IMC rounds are led by the night float resident.
- Fellows are expected to be present to discuss the patients they operated on.
- Fellows are responsible for writing the postoperative orders in KISM for the patients they operated on.

### Attending Rounds

The Attending has the option to round on the patients they have operated on, at some point during the day. Both Fellows are expected to be present during these rounds.

If possible, Fellows should support the hospitalist (Dr. Bonani and Dr. Gräsel) during the general rounds in the morning.

### Clinics

- The HPB clinic on Monday is to be attended by the Fellow assigned to the HPB Team. The list of scheduled patients is reviewed on Friday with the clinical nurse (Ms. Brigitte Strube). Fellows could see patients with or without residents. This depends on how comfortable they are with the documentation system. All patients have to be discussed with an Attending.
- The Kidney Transplant clinic on Thursday morning is to be attended by the Fellow on the transplant service.
- The Liver Transplant clinic on Thursday afternoon is to be attended by the Fellow on the

transplant service.

#### Weekly Meetings

- The HPB meeting on Thursday at 11:00 (HOER E 12) is prepared and run by the HPB Fellow. It serves to:
  - review the tumor board decision from the morning
  - discuss the patients on the schedule for the following week
  - discuss the WORK UP LIST of patients and distribute jobs to be done
- The Kidney Transplant meeting is to be attended by the Fellow on the kidney service.
- The Liver Transplant meeting on Thursday at 16:30 is to be attended by the Fellow on transplant service.
- The Journal club is on the first Friday of every month at 16:30. Three papers (one by the Senior Fellow, one by the Junior Fellow and one by the Senior Resident on the service) should be discussed during 90 minutes; 30 minutes for each paper. The papers chosen by the Fellows will be distributed one month in advance and should be discussed with the program director ahead of time. Residents and students are encouraged to participate.
- Tumor board cases to be discussed on Thursday at 7:30 am should be booked by the residents under the supervision of the Fellow on the HPB service.
- Grand Rounds are to be attended by both Fellows unless they are in the operating room.

#### HPB and Transplant Rounds

- Multidisciplinary HPB rounds on Thursday at 9:00 start in the IMC and should be limited to 1 hour. The list of patients is to be reviewed the day before with the residents.

#### Patient List

- The Fellow on the HPB service should see every patient on the HPB service and co-sign the resident's notes every day.
- The Fellow on the transplant service should see every patient and co-sign the resident's notes every day.

#### Absences

- Vacation or meetings of the Fellow on the transplant service are to be covered by the hospitalist for transplant (Dr. Bonani). Liver transplant patients however will be covered by the HPB fellow. When assistance is required in the operating room, the HPB Fellow is expected to help.
- Vacation or meetings of the Fellow on the HPB service will be compensated by switching the fellow from transplant to HPB during this period. Liver transplant patients are to always be followed by a Fellow who is also responsible for the PITTSBRUGH flowsheets.

#### English speaking fellow

- One fellowship position will generally be filled by a one-year FOREIGN FELLOW. Fluency in German is not a prerequisite for this fellowship. This one-year fellowship is also a cultural exchange experience and this Fellow will be encouraged to learn German. Nonetheless, this Fellow will clinically be dependent on the residents, the hospitalist and the nurses.
- The one-year Fellow will have full access to KISIM in order to do documentation and to put in orders.
- Operating notes may be written in English with a special module available in KISIM.

**Weekly Plan: HPB Fellow**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday		
7:00		Morning Report		Morning Report					
7:30	Morning Report	Education Rounds	Morning Report	Tumor Board	Morning Report				
8:00									
8:30		Elective OR Cases	Elective OR Cases						
9:00	OPD: HPB Team				HPB Chairman Rounds	HPB Rounds			
9:30									
10:00								Weekend Rounds (Tx-HPB Fellow alternately)	Weekend Rounds (Tx-HPB Fellow alternately)
10:30									
11:00							HPB Team Meeting		
11:30									
12:00									
12:30									
13:00								Occasional OPD	
13:30									
14:30									
15:30									
16:00									
16:30					Journal Club (1 <sup>st</sup> and 3 <sup>rd</sup> Friday)				
17:00									
17:30		Grand Rounds							
18:00	Evening Check Out		Evening Check Out	Evening Check Out	Evening Check Out	Evening Check Out			

**Weekly Plan: Transplant Fellow**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday		
7:00		Morning Report		Morning Report					
7:30	Morning Report	Education Rounds	Morning Report	Tumor Board	Morning Report				
8:00									
8:30				Morning Rounds	Live Kidney Donor and Transplantation				
9:00	Morning Rounds	Morning Rounds	Morning Rounds	OPD: Kidney					
9:30									
10:00		Kidney Transplantation Indication Conference	HPB OR				Weekend Rounds (Tx-HPB Fellow alternately)	Weekend Rounds (Tx-HPB Fellow alternately)	
10:30									
11:00									
11:30									
12:00									
12:30									
13:00									
13:30									
14:30									
15:30									
16:00									
16:30			Multidisciplinary Transplantation Rounds	Liver Transplantation Indication Conference	Journal Club (1 <sup>st</sup> and 3 <sup>rd</sup> Friday)				
17:00									
17:30		Grand Rounds							
18:00	Evening Check Out		Evening Check Out	Evening Check Out	Evening Check Out	Evening Check Out			

**Journal Club:**

An additional didactic feature of the fellowship program is the Journal Club. The Journal Club meets biweekly from 4:15 p.m. to 5:45 p.m. The topics are organized in the following matrix. Fellows are encouraged to present 2-3 recent papers on chosen topics which are to serve as a catalyst for engaging discussions with attending physicians and residents.

	<b>1<sup>st</sup> Wednesday</b>	<b>3<sup>rd</sup> Wednesday</b>
<b>January</b>	Surgical anatomy of the liver	Clinical scores in liver resection and transplantation
<b>February</b>	Surgical Anatomy of the biliary system	Lymph nodes in HPB surgery
<b>March</b>	Surgical anatomy of the pancreas	New studies in liver tumors
<b>April</b>	Kidney transplantation	<i>Topic of choice</i>
<b>May</b>	Pancreas transplantation	Neuroendocrine tumor studies
<b>June</b>	Liver transplantation - surgical technique	Operative techniques in pancreas surgery
<b>July</b>	Organ procurement preservation studies	<i>Topic of choice</i>
<b>August</b>	Imaging of the liver/pancreas studies	New studies in living related transplantation
<b>September</b>	<i>Topic of choice</i>	<i>Topic of choice</i>
<b>October</b>	New chemotherapy studies	Medical topics in liver transplantation
<b>November</b>	New radiotherapy studies	Immunosuppression studies in transplantation
<b>December</b>	Resection of the liver-surgical techniques	Clinical management in HPB surgery papers

We are dedicated to provide Fellows with the structured educational and training experience which is needed in order to achieve expertise in the field of hepato-pancreato-biliary (HPB) and Abdominal Transplant Surgery.

Philipp Dutkowski, MD

Henrik Petrowsky, MD

## BLOCK I: THE LIVER

Mentor: **Henrik Petrowsky, MD, FACS**

### A. ANATOMY, EMBRYOLOGY, PHYSIOLOGY, TESTING

#### I. Objectives: Upon completion of this Block the Fellow will understand:

- a. Intra-hepatic and extra-hepatic anatomy of the liver and the relationship with the adjacent and surrounding structures
- b. embryology of the liver and biliary tract and the potential abnormalities
- c. 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 interpretation
- f. Implications of interventions and surgical procedures on the liver

#### II. Content:

- a. Embryology of the liver
  1. Relationship to other foregut structures
- b. Anatomy of the liver
  1. Lobes, segments, sectors
  2. Nomenclature systems
  3. Ligaments, fissures and incisures
  4. Aberrant anatomy
- c. Anatomy of the porta
  1. Portal vein, hepatic artery
  2. Bile duct, gallbladder
  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. Measurements 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. Ultrasonography (US) and Doppler, Computerized Tomography (CT), Magnetic Resonance Imaging (MRI)
  - 2. Nuclear tests: Proton Emission Tomography (PET), Liver/Spleen Scintigraphy, Biliary Excretion Scintigraphy (e.g. HIDA), RBC Scintigraphy
- i. Application of investigations to hepatic surgery

### III. Clinical Skills:

- a. Identify, recognize and describe anatomic structures in and around the liver
  - 1. By reading and interpreting imaging of the liver on CT, MRI and U/S
  - 2. Intra-operatively
- b. Perform and interpret intraoperative U/S of the liver and porta
- c. Perform liver biopsy – laparoscopic or open
- d. Identify aberrant structures 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 and MELD scores and their variations)
- k. Assess the overall risk and the hepatic risk of surgery – recognizes 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

## B. CONGENITAL AND ACQUIRED NON-NEOPLASTIC LIVER DISEASE

### I. Objectives: Upon completion of this Block the Fellow will understand:

- a. The pathophysiology and the presentation and natural history of the congenital and acquired non-neoplastic diseases of the liver
- b. The investigative procedures available and useful to the diagnosis and efficiently diagnose the disease/disorder
- c. The treatment options available for the condition and will understand the results, including the risks and benefits of the operative and non-operative procedures
- d. The pre-, intra- and post-operative management, including the management of complications of therapy

## II. Content:

- a. Pediatric liver diseases
  1. Biliary atresia and Alagille'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 and 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. 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
    - 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 CAH
        - 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 testing and imaging
- iii. Non-operative treatment options and strategies
- iv. Portosystemic decompression
- c) indications and sequelae
  - i. risks and benefits of TIPS and surgical shunts
  - ii. types and benefits of TIPS and surgical shunts
  - iii. relative indications
- d) Sugiura procedure
  - i. indications for liver transplantation

### III. 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)
- c. Diagnose and classify acute and chronic liver failure
- e. Diagnose, investigate and manage patients with portal hypertension
  - Perform portosystemic shunt – portocaval, mesocaval, splenorenal and their variants
  - Perform the Sugiura procedure

## C. NEOPLASTIC LIVER DISEASE

### I. Objectives: Upon completion of this Block the Fellow will understand:

- a. The pathophysiology and the presentation and natural history of the benign, and primary and secondary malignant neoplasm 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 post-operative management, including the management of complications of therapy
- f. The role of neo-adjuvant and adjuvant therapy of malignant liver neoplasms

### II. Content:

- a. Benign neoplasm of the liver
  - 1. Presentation, investigation and 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 and diagnosis and natural history of HCC
    - b) Role of screening and the staging systems for HCC. Treatment options and the risk/benefit ration for each: resection, transplantation, ablation chemotherapy +/- , embolization, radiation
  - 2. Biliary Cholangiocarcinoma
    - a) Diagnosis, investigation and staging (CT, MRCP, PET)

- b) Treatment options including palliative procedures
- 3. Intrahepatic Cholangiocarcinoma
- 4. Epithelioid hemangioendothelioma, lymphoma, sarcoma and other neoplasms
  - a) Diagnosis, investigation and staging (CT, MRI)
  - b) Treatment options
- c. Secondary malignancies of the liver
  - 1. Colorectal primary
    - a) Pathogenesis, staging of colorectal cancer
    - b) Investigation and staging (CT, MRI, PET)
    - c) Treatment options
      - i. indications and risk: benefit ration of ablation/resection
      - ii. neo-adjuvant, down-staging and adjuvant chemotherapy
  - 2. Neuroendocrine and other primary
    - a) Investigation and staging (PET CT, Dotatate, OctreoScan)
    - b) Treatment options
    - c) neo-adjuvant and adjuvant therapy

### III. 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 patients with primary and secondary hepatic malignancies
- f. Participate in multi-disciplinary tumor review conferences
- g. Perform liver resections
- h. Provide pre- and post-operative 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

### I. Objective: Upon completion of this block the Fellow will understand:

- a. The types of and techniques for liver resections
- b. Pre-operative patient assessment and the cumulative risks of the proposed procedure
- c. Preoperative management
- d. Intraoperative management during a liver resection
- e. Post-operative management including complications

### II. Content:

- a. Types of liver resection
  - 1. Nomenclature of liver resections (Brisbane system)

2. Laparoscopic, laparoscopic-assisted, open laparotomy
  3. Non-anatomic, segmental, lobectomy, extended lobectomy
  4. Vascular control: none, Pringle maneuver, total vascular isolation
  5. Vascular resection and reconstruction
  6. Staged resections
  7. Combination of resection with ablation
- b. Preoperative assessment and the cumulative risks to the proposed procedure
1. Patient comorbidities by organ systems
  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 like DVT, infection
  2. Neuroendocrine hormonal blockade in the case of special tumors
  3. Detailed operative plan based on pre-operative 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

### III. 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 post-operative periods and diagnoses and treat complications of the resection

## BLOCK II: THE BILIARY TRACT INCLUDING GALLBLADDER

Mentor: **Henrik Petrowsky, MD, FACS**

### A. ANATOMY, EMBRYOLOGY, PHYSIOLOGY, TESTING

#### I. Objectives: Upon completion of this Block the Fellow will understand:

- a. The anatomy of the biliary tract including the intra and extrahepatic duct, the gallbladder and cystic duct, the intra- and extra-pancreatic 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 the 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

#### II. 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 and MRI, 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

### III. Clinical Skills:

- a. Identify and describe biliary tract structures (normal and abnormal)
  1. By reading and interpreting images of the biliary tract
  2. Intra-operatively
- b. Perform and interpret intraoperative U/S of the liver and biliary tract
- c. Perform and interpret intraoperative cholangoscopy
- d. Identify anatomic anomalies and explain their embryologic origin
- e. Understand the indications for and be able to interpret the biochemical tests and explain the underlying physiology
- f. Apply understanding of the relative advantages and disadvantages of the different modalities of biliary tract imaging to determine optimal investigation
- g. Determine the abdominal wall incisions that are appropriate for open procedures on the biliary tract and the relative indications for each
- h. 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

## B. CONGENITAL AND NON-NEOPLASTIC BILIARY DISEASE

### I. Objective: Upon completion of the Block the Fellow will understand:

- a. The pathophysiology and the presentation and natural history of the congenital and acquired non-neoplastic diseases of the biliary tract including the gallbladder
- b. The investigative procedures available and the 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 one-operative treatments
- d. The pre-, intra- and post-operative management, including the management of complications of therapy

### II. Content:

- a. Congenital and pediatric
  1. Choledochal cyst, Caroli's disease, congenital hepatic fibrosis, biliary atresia and Alagille'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, Mirizzi's Syndrome, gallstone ileus
  3. Treatment: percutaneous, laparoscopic and open
  4. Cholecystectomy-related biliary injuries
    - a) mechanism of injury and 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 drainage (PTC-D), ERCP with endobiliary stent
  - iii. resection
  - iv. transplantation
- 2. post-traumatic and idiopathic
  - a) mechanism of injury and classification
  - b) management options
- d. Recurrent Pyogenic Cholangitis (RPC)
  - 1. Pathophysiology, presentation and investigation
  - 2. Common infectious bacteria
  - 3. Surgical options including liver resection, biliary access (Hutson) choledochojejunostomy and hepaticojejunostomy with transhepatic stents

### III. 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 non-operative biliary manipulation (PTC-D and ERCP 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, RPC and benign strictures
- f. Evaluate and manage the patient with the complications of PSC

## C. NEOPLASTIC BILIARY DISEASE

### I. Objective: Upon completion of this Block the Fellow will understand:

- a. The presentation and natural history of the benign and malignant neoplasms of the bile duct and gallbladder
- b. The investigative procedures available to efficiently diagnose 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 post-operative management, including the management of complications of surgery
- f. The role of neo-adjuvant and adjuvant chemo- and radiation therapy of malignant biliary neoplasms

### II. 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
    - i. neo- and/or adjuvant therapy
    - ii. definitive management
  - e) Palliative care options
- b. Bile duct
1. Adenoma of Ampulla of Vater
    - a) Presentation, natural history, investigation
    - b) Resection options
      - i. endoscopic, transduodenal resection and reconstruction
  2. Adenocarcinoma
    - a) Location: Bifurcation (Klatskin), mid-third, lower third, ampulla
    - b) Type – polypoid, structuring
    - c) Presentation, investigation and staging, including laparoscopic staging
    - d) Resection and reconstruction – indications and contraindication
    - e) Palliative options
      - i. PTC-D or ERCP stent
      - ii. surgical bypass

### III. 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 Klatskin 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 mid- and lower-third bile duct tumors
  1. Perform pancreatoduodenectomy
- d. Participate in multi-disciplinary tumor review conferences
- e. Provide post-operative 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 gallbladder or bile duct

## BLOCK III: PANCREAS AND DUODENUM

**Mentor: Henrik Petrowsky, MD, FACS**

### A. ANATOMY, EMBRYOLOGY, PHYSIOLOGY, TESTING

#### I. Objective: upon completion of this Block the Fellow will understand:

- a. Anatomy of the 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 and 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 technique and their indications and interpretation
- h. Implications of investigations on surgical procedures on the pancreas and duodenum

#### II. 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, splenica 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, splenica and superior mesenteric veins and their branches
    - b) Retroperitoneum: IVC and its branches, aorta and SMA and their branches, adrenal glands, 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) Neutral 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 and MRI including MRCP
  2. Endoscopy and endoscopic U/S
  3. Direct contrast imaging
    - a) Endoscopic retrograde cholangiopancreatography (ERCP)
  4. Nuclear studies:
    - a) PET
    - b) Neuroendocrine imaging (Octreotide scan)
- i. Application of testing and imaging to pancreatic and duodenal surgery

### III. Clinical Skills:

- a. Identify, recognize and describe anatomic structures in and around the pancreas and duodenum
  1. By reading and interpreting images of the duodenum, pancreas and its duct
  2. Intra-operatively
- b. Perform and interpret intraoperative U/A of the pancreas and surrounding structures
- c. Identify anatomic anomalies and explain 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

## B. CONGENITAL AND ACQUIRED NON-NEOPLASTIC PANCREATIC DISEASE

### **I. Objective: upon completion of this Block the Fellow will understand:**

- a. The pathophysiology and the presentation and natural history of the congenital and acquired non-neoplastic diseases of the pancreas
- b. The investigative procedures available and useful to the diagnosis and efficiently diagnose the disease/disorder
- c. The treatment options available for the condition and will understand the outcomes, including the risks and benefits of the operative and non-operative procedures
- d. The pre-, intra- and post-operative management, including the management of complications of therapy

### **II. 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 non-operative 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

### **III. 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: pseudocystenterostomy, lateral pancreaticojejunostomy with/without limited resection of the head of the pancreas (Frey or Berger procedures), pancreatic resection

## **C. NEOPLASTIC DISEASES OF THE PANCREAS**

### **I. Objectives: upon completion of this Block the Fellow will understand:**

- a. The pathophysiology and the presentation and natural history of the benign and primary and secondary malignant neoplasm 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 non-operative procedures
- e. The pre-, intra- and post-operative management, including the management of complications of therapy
- f. The role of neo-adjuvant and adjuvant therapy of malignant pancreatic lesions

## II. Content:

- a. Benign cysts and neoplasm of the pancreas
  - 1. Serous cystadenoma
    - a) Presentation, investigation and diagnosis and natural history
    - b) Histology and indications for biopsy
    - c) Treatment options and indication for resection
  - 2. Mucinous cystic neoplasm
    - a) Presentation, investigation and 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 and 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 and 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 and diagnosis and natural history
    - b) Histology and indications for aspiration/biopsy
    - c) Treatment options and indication for resection
  - 6. Von Hippel Landau Syndrome
    - a) Pathology, associated lesions, investigation
    - b) Management
- B. Malignancies of the pancreas
  - 1. Primary
    - a) Adenocarcinoma
      - i. presentation, investigation and staging
      - ii. assessment of resectability
      - iii. pre-, peri- and post-operative management
      - iv. palliative procedures
    - b) Neuroendocrine neoplasms
      - i. presentation, investigation and staging
      - ii. assessment of resectability
      - iii. pre-, peri- and post-operative management
    - c) Lymphoma
      - i. presentation, investigation and staging
      - ii. role of surgery

2. Secondary
  - a) Renal cell carcinoma
    - i. presentation and management
  - b) Melanoma
    - i. presentation and management

### III. 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 enucleating of functional NE neoplasm and spleen preserving distal pancreatectomy
- b. Investigate and manage patients with adenocarcinoma of the pancreas
  1. Stage the tumor pre- and intra-operatively and determine respectability including staging laparoscopy
  2. Perform pancreatoduodenectomy +/- portal vein resection and reconstruction
  3. Perform distal pancreatectomy and regional lymphadenectomy with and without splenectomy, open and laparoscopic techniques
  4. Perform palliative procedures for unresectable tumors
- c. Participate in multi-disciplinary tumor review conferences
- d. Provide post-operative 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 interacts with medical and radiation oncologists

## D. DISEASES OF THE DUODENUM

### I. Objectives: upon completion of this Block the Fellow will understand:

- a. The pathophysiology and the 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 will understand the outcomes, including risks and benefits of the operative and non-operative procedures
- d. The pre-, intra- and post-operative management, including the management of complications of therapy

### II. Content:

- a. Congenital disorders of the duodenum
  1. Duodenal atresia and duplication
  2. Duodenal diverticula
- b. Duodenal ulcer disease
  1. Pathogenesis, investigation and diagnosis
  2. Non-operative 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 neoplasm (GIST) and sarcomas
    - a) Presentation, investigation, staging
    - b) Management
      - i. chemotherapy
      - ii. resection
  3. Neuroendocrine neoplasms
    - 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

### III. Clinical Skills:

- a. Investigate and manage patients with benign lesions of the duodenum
  1. Determine need for operative intervention
  2. Perform acid-reduction procedures, limited resection and duodenal bypass procedures
- b. Investigate and manage patients with malignant neoplasms of the duodenum
  1. Stage the tumor pre- and intra-operatively and determines 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 multi-disciplinary tumor review conferences
  5. Recommend appropriate therapy for unresectable duodenal malignancies
  6. Recommend appropriate neo- and adjuvant radiation and/or chemotherapy and interacts with medical and radiation oncologists
- c. Provide post-operative management including the diagnosis and treatment of complications of duodenal resection and/or bypass

## BLOCK IV: KIDNEY TRANSPLANTATION

Mentors: Philipp Dutkowski, MD

### I. Objectives: upon completion of this Block the Fellow will be able to:

- a. List the indications for kidney transplantation, explain the different disease processes resulting in end-stage renal disease, and describe the treatment options.
- b. Outline the basic of principles of donor and recipient selection and deceased donor organ allocation.
- c. Describe and perform living and deceased donor kidney transplant procedures;
- d. Explain the basic immunosuppressive strategies used in kidney transplantation, including induction and maintenance therapy.
- e. Recognize and diagnose renal transplant rejection, identify basic pathologic findings of rejection, and describe treatment strategies for rejection.
- f. Describe appropriate long term follow-up and be able to identify and treat short and long term complications of kidney transplantation.
- g. Describe the short and long term outcomes of kidney transplantation.
- h. Outline the basic principles of renal replacement therapy; identify indications for and surgical techniques necessary to place hemo- and peritoneal dialysis access.

### II. Content:

- a. List the indications for kidney transplantation, explain the different disease processes resulting in end-stage renal disease, and describe the treatment options for end-stage renal disease.
  1. Understand the process that result in end stage kidney disease in adults and children Including the pathophysiology, rate of progression, incidence of recurrent disease, and impact on transplantation for the following diseases:
    - a) Hypertensive nephropathy
    - b) Diabetic nephropathy
    - c) Glomerulonephritis
    - d) Reflux disease
    - e) Autoimmune kidney disease (e.g. Lupus, Wegners)
    - f) Inherited cystic diseases
  2. Define the evaluation process for patients considering kidney transplantation including the following components
    - a) Minimal pre-operative testing
    - b) Cancer screening and period of waiting following diagnosis
    - c) Cardiac evaluation
    - d) Serologic evaluation and importance of viral testing (CMV, EBV, Hep B+C, HIV)
  3. Understand when patients should be listed for transplant
    - a) Minimal listing criteria (CrCl < 20)
    - b) Pre-emptive vs. following the initiation of dialysis
  4. Properly and completely consent the patient and family and explain the risks and benefits of renal transplantation compared with dialysis
    - a) Compare life expectancy on dialysis vs. transplant for a variety of patient populations
    - b) Understand basic peri- -operative complications.
- b. Outline the basic principles of donor and recipient selection and deceased donor organ allocation.

1. Describe criteria used to assess the suitability of a deceased donor for organ transplant
  - a) Demographic factors (age, race, sex)
  - b) Cause of death
  - c) High risk behaviors
  - d) Presence of malignancy (CNS vs. others)
  - e) Viral status (Hep C, Hep B, HTLV-1)
  - f) Infection in donor
  - g) Hemodynamic status, vasopressor requirements
  - h) Length of cold ischemic time in all donors and warm ischemic time for DCDs
  - j) Anatomic considerations (multiple arteries, ureters, surgical damage)
2. Describe criteria used to assess the suitability of a living donor for organ transplant
  - a) Demographic factors (age, size, gender)
  - b) Evaluation of renal function including protein excretion
  - c) Presence of illnesses that may predispose the donor to renal insufficiency
  - d) Anatomic evaluation and considerations
    - i. multiple arteries
    - ii. Duplicated collecting systems
    - iii. Left vs. right kidney
  - e) Crossmatching
  - f) Psychological and psychosocial evaluation
  - g) Understand and perform the consent process for living donation including risks and benefits of laparoscopic and open nephrectomy, risk of short and long term complications, potential for transplant failure
  - h) Appreciate the ethical issues involved in living donor transplantation, the role of independent donor advocates, and the potential for coercion.

### III. Clinical Skills:

- a. Describe and perform living and deceased donor kidney transplant procedures;
  1. Prepare the kidney for transplantation
    - a) Strategies to deal with common anatomic features including multiple arteries and veins
  2. Understand possible surgical approaches for kidney transplant including extraperitoneal and intraperitoneal location
  3. Describe the technique for isolating the iliac vessels and performing vascular anastomoses
  4. Detail the procedure for implanting the ureter and importance of the blood supply to the ureter
    - a) Creation of anti-reflux tunnel
    - b) Indications for stent placement
  5. Use of intra-operative adjunctive medications
  6. Detail the post-operative care of renal transplant patients including:
    - a) Fluid and electrolyte management
    - b) Recognition and treatment of cardiac complications
  7. Identify and treat surgical complications
    - a) Bleeding
    - b) Ureteral leak
    - c) Lymphocoele
    - d) Vascular thrombosis
    - e) Wound complications

8. Describe and interpret relevant radiological evaluations
  - a) Ultrasound
  - b) CT scanning
  - c) Lasix-renogram
  - d) Interventional diagnostics (angiogram, percutaneous nephrostogram)
  
9. Identify and manage delayed graft function
  - a) Determine the need for post-operative dialysis
  - b) When should a biopsy be performed?
- b. Explain the rationale for immunosuppressive strategies used in kidney transplantation, including induction therapy.
  1. Induction immunosuppression
    - a) Understand the basics of induction immunosuppression
      - i. Steroids
      - ii. Antibody preparations
    2. Determine appropriate maintenance immunosuppressive regimen
      - a) Rationale for choice of CNI, anti-proliferative, and/or steroids
      - b) Appreciate issues of timing (e.g. delayed CNI for DGF)
    3. Counsel patients regarding the need for compliance, potential side effects and important drug interactions, and strategies to minimize side effects.
  - c. Recognize and diagnose renal transplant rejection including performing diagnostic biopsy and interpreting basic pathological findings
    1. Participate in the care of post-transplant patients
    2. Review and evaluate pertinent laboratory data to identify potential for rejection or other etiologies of graft dysfunction
    3. Determine the need for a percutaneous biopsy, ultrasound examination, or other diagnostic procedure
    4. Renal biopsy
      - a) Provide appropriate consent discussion for patients
      - b) Utilize ultrasound for location of graft
      - c) Perform needle biopsy with the assistance of the fellow or attending
      - d) Send specimen for appropriate diagnostic studies (H and E evaluation, C4D staining)
      - e) In cooperation with renal pathologist, review biopsy results and identify the basic pathologic features of rejection of renal allografts
    5. Describe the treatment approaches for acute allograft rejection
      - a) Understand the difference in treatment for cellular and humoral rejection
    6. Understand the impact on long term outcome from acute rejection episodes
  - d. Describe appropriate long term follow-up and be able to identify and treat short and long term complications of kidney transplantation.
    1. Participate in and understand the process of long term follow-up of transplant patients
    2. Appreciate the health maintenance needs of transplant patients
    3. Describe techniques to preserve long term graft function
    4. Understand the impact of cardiac disease on the long term outcome of renal transplant patients
  - e. Describe the short and long term outcomes of kidney transplantation
    1. Appreciate short and long term outcome of kidney recipients
  - f. Outline the basic principles of renal replacement therapy; identify indications for and surgical

techniques necessary to place hemo- and peritoneal dialysis access.

1. Describe the pre-operative evaluation of patients considering vascular access
2. Independently consent patients for vascular access and explain the risks, benefits, and options
3. Perform vascular access procedures including
  - a) Arm fistulas
  - b) Arm grafts
  - c) Place percutaneous lines for dialysis
4. Describe techniques for complicated access (leg fistula, chest grafts, leg grafts).
5. Identify and design treatment strategies for complications of access procedures
  - a) Stenosis/thrombosis
  - b) Steal syndrome
  - c) Poor maturation of fistula
6. Evaluate patients for peritoneal catheter placement
  - a) Describe surgical technique
  - b) Determine need for surgical removal in case of infection, malfunction

## BLOCK V: PANCREAS TRANSPLANTATION

Mentor: Philipp Dutkowski, MD

### I. Objectives: upon completion of this Block the Fellow will be able to:

- a. Outline the basic principles of donor and recipient selection and deceased donor allocation in pancreas transplantation
- b. Describe the different immunosuppressive strategies currently utilized in pancreas transplantation
- c. Understand and perform pancreas recovery from deceased donors and simultaneous and isolated pancreas transplant procedures; identify strategies which can be employed in the high risk recipient
- d. Understand the rationale for and advantages/disadvantages of exocrine (bladder versus enteric) and venous (systemic versus portal) drainage of the transplanted pancreas
- e. Recognize and diagnose pancreas transplant rejection including performing diagnostic biopsy and interpreting basic pathological findings
- f. Outline the outcomes associated with pancreas transplantation alone, simultaneous kidney/pancreas transplantation and pancreas after kidney transplantation
- g. Describe appropriate long term follow-up and be able to identify and treat short and long term complications of pancreas transplantation.
- h. Outline the basic principles and outcomes of islet transplantation
- i. Outline the basic principles of donor and recipient selection and deceased donor allocation in pancreas transplantation
- j. Know the indications for pancreas transplant alone (PTA) in the nonuremic diabetic
  1. State the difference between Type I and Type II diabetes and associated factors including Age at onset, obesity/BMI, and C-peptide levels/insulin resistance
  2. Outline factors that favor the candidacy of a recipient:
    - a) Hypoglycemic unawareness
    - b) Extreme lability with oscillating episodes of ketoacidosis and hypoglycemia
    - c) Inability to hold a job, attend school, or live independently
    - d) Extreme frequency of blood sugar checks
    - e) Failure of insulin pump or requirement for extraordinary measures
  3. Know the meaning of glycosylated hemoglobin levels and measures of adequacy of diabetic control
  4. Properly and completely consent the patient and explain the risks and benefits of pancreas transplantation:
    - a) Risks of surgery, immunosuppression, and postoperative complications versus benefits of being insulin free
    - b) Define the risk of peri- and post-operative complications of PTA
- k. Outline the considerations unique to the pancreas transplant candidate with renal failure
  1. Understand that insulin requirements may decrease in the setting of renal failure;
  2. Delineate the advantages and disadvantages of simultaneous pancreas/kidney transplantation (SPK) versus pancreas after live-donor kidney transplantation (PAK) and what may affect the choice between them:
    - a) Single versus sequential procedure;
    - b) Pancreas allocation algorithm and waiting time for PTA versus SPK versus PAK transplant

- c) Advantages of single versus repeated courses of induction
- d) Monitoring for rejection in the pancreas transplant
- e) Long-term survival of the kidney and pancreas grafts
- l. Understand the pre-transplant evaluation of the pancreas transplant recipient
  - 1. Particular attention to the cardiovascular system
  - 2. Use of invasive diagnostic and therapeutic cardiologic procedures
  - 3. Potential need for neurologic, ophthalmologic, metabolic, and renal functional testing.
- m. Outline the basic principles of donor selection and deceased donor organ allocation.
  - 1. List criteria used to assess the suitability of a deceased donor for pancreas transplant:
    - a) Age
    - b) Cause of death
    - c) BMI
    - d) Splenic injury
    - e) Previous gastric or splenic surgery
    - f) Hemodynamic status, vasopressor requirements
    - g) Length of cold ischemic time
    - h) Visualization and palpation of the gland at the time of procurement
    - i) Amylase, lipase, glucose levels
    - j) Injury during the procurement
  - 2. Understand that allocation of pancreata with regard to PTA versus SPK is determined locally;
  - 3. Know the geographic differences in pancreas utilization.

## II. Contents:

- a. Describe the different immunosuppressive strategies currently utilized in pancreas transplantation
  - 1. Understand Induction Immunosuppression
- b. Understand risks and benefits of available agents
  - 1. IL-2R blockers vs. ant-lymphocyte depleting agents
  - 2. Length of treatment
- c. Determine appropriate maintenance immunosuppressive regimen
  - 1. Rationale for choice of CNI, anti-proliferative, and/or steroids
  - 2. Describe appropriate monitoring intervals, dosing levels, and complications
- d. Counsel patients regarding the need for compliance, potential side effects and important drug interactions, and strategies to minimize side effects
- e. Understand the rationale for and advantages/disadvantages of exocrine (bladder versus enteric) and venous (systemic versus portal) drainage of the transplanted pancreas
- f. Describe in detail treatment approaches for acute allograft rejection based on the Drachenberg criteria
- g. Understand the impact of acute rejection episodes on long-term outcome
- h. Describe the impact of pancreas transplantation on the quality of life of diabetic patients
- i. Contrast short- and long-term graft survival for the three different types of pancreas transplants, and potential reasons for the differences
- j. Explain the survival benefit of pancreas transplantation and the pivotal studies addressing the topic
- k. Outline the basic principles and outcomes of islet transplantation
- l. List the short- and long-term complications of islet transplantation

- m. State the outcomes of islet transplantation
  1. Graft function
  2. Insulin independence
  3. Euglycemia
- n. Discuss islet transplantation, finance and reimbursement

### III. Clinical Skills:

- a. Understand and perform pancreas recovery from deceased donors and simultaneous and isolated pancreas transplant procedures; identify strategies which can be employed in the high risk recipient
- b. Know the surgical techniques of pancreas recovery:
  1. Organ procurement
  2. Use spleen as a handle to prevent over-manipulation of the gland
  3. Use of pancreas when right hepatic artery arises from superior mesenteric artery
  4. University of Wisconsin versus HTK preservation solution
- c. Back table preparation:
  1. Removal of spleen
  2. Role for shortening of duodenum
  3. Control of mesenteric vessels
  4. Y-graft or use of alternative arterial reconstruction
  5. Role for portal vein extension graft
- d. Know the surgical techniques of the pancreas transplant procedure:
  1. Intraperitoneal versus retroperitoneal placement of the pancreas graft;
  2. Describe the technique for isolating the iliac vessels and performing vascular anastomoses, including strategies to deal with complex anatomy;
  3. Use of intra-operative adjunctive medications
- e. Describe segmental pancreas transplantation:
  1. Rationale
  2. Surgical procedure
  3. Preoperative testing to minimize chance of developing diabetes in the live donor
- f. Place urinary/bladder drainages of exocrine secretions
  1. Understand the historical evolution of technique
  2. Understand hand-sewn versus stapled
  3. Understand advantages, including utility of urinary amylase monitoring
  4. Understand disadvantages and indications for postoperative duodenal-enteric conversion
- g. Place enteric drainage of exocrine secretions:
  1. Understand the historical evolution of technique
  2. Understand hand-sewn versus stapled
  3. Understand the use of Roux-en-Y limb and advantages/disadvantages
- h. Place systemic venous versus portal venous drainage and investigate advantages/disadvantages
- i. Recognize and diagnose pancreas transplant rejection including performing diagnostic biopsy and interpreting basic pathological findings
  1. Review and evaluate pertinent laboratory data (serum and urine amylase, serum lipase) to identify potential for rejection or other etiologies of graft dysfunction.
  2. Determine the need for a percutaneous biopsy, ultrasound examination, or other Diagnostic procedure

- j. Perform pancreas biopsy.
  1. Provide appropriate consent discussion for patients
  2. Role for protocol biopsy in solitary grafts
  3. Utilize ultrasound or CT for location of graft
  4. Perform needle biopsy;
  5. Send specimen for appropriate diagnostic studies (H and E evaluation, EM)
  6. Alternative biopsy techniques
- k. Describe the effect of pancreas transplantation on the metabolic and secondary complications of diabetes
  1. Glucose metabolism
  2. Cholesterol and lipid metabolism
  3. Retinopathy
  4. Neuropathy
  5. Nephropathy
  6. Microangiopathy
- l. Detail the postoperative care of pancreas transplant patients:
  1. Fluid and electrolyte management
  2. Insulin infusion
  3. Anticoagulation
  4. Role for octreotide use
  5. Antibiotic use
  6. Recognition and treatment of cardiac complications
- m. Identify and treat surgical complications:
  1. Thrombosis
  2. Bleeding
  3. Pancreatitis, and its various etiologies
  4. Duodenal leak
  5. Fluid collections, pseudocysts, abscesses
  6. Wound complications
- n. Describe and interpret relevant radiological evaluations:
  1. Ultrasound
  2. CT scanning
  3. Percutaneous drainage
- o. Appreciate the health maintenance needs of pancreas transplant patients
- p. Understand the impact of cardiac disease on the long-term outcome of pancreas transplant patients
- q. Determine the indications for bladder to enteric conversion (e.g. dehydration, electrolyte imbalance, renal injury).
- r. Determine the indications and technique of transplant pancreatectomy
- s. Appreciate the role of transplant surgeons in improving both long- and short-term outcomes of pancreas transplantation
- t. Describe recipient selection criteria for islet transplantation
  1. State how they differ from whole pancreas transplantation
  2. Know how to determine whether one is a candidate for islet or whole pancreas transplantation
- u. Know donor selection and recovery
  1. List how donor selection criteria for islet transplantation differ from whole pancreas transplantation

2. Describe how pancreas recovery requirements/techniques differ from that for whole pancreas transplantation
3. Discuss pancreas preservation modalities.
- v. Understand where islet transplantation fits into the pancreas allocation algorithm and know the islet isolation and transplantation process
  1. Describe the pancreas digestion process
  2. Describe islet purification methodology
  3. Delineate criteria that determine a transplantable islet preparation
  4. Describe operative and percutaneous transplant techniques

## BLOCK VI: LIVER TRANSPLANTATION

Mentors: **Philipp Dutkowski, MD** and **Beat Müllhaupt, MD**

### I. Objectives: upon completion of this Block the Fellow will be able to:

- a. List the different disease processes which may require liver transplantation; understand the management of complications of liver disease including end stage liver disease and the care of patients with fulminant hepatic failure
- b. Outline the basic principles of liver transplantation, donor and recipient selection as well as donor allocation
- c. Describe the operative steps necessary involved in performing liver allograft recovery from deceased donors and deceased donor liver transplant
- d. Describe the types of immunosuppressive therapy utilized in liver transplantation
- e. Describe the workup needed to diagnose liver transplant rejection.
- f. Diagnose and implement treatment approaches for both short and long term medical as well as surgical complications following liver transplantation
- g. Gain experience with specific operative skills necessary in hepatobiliary surgery
  1. Recipient hepatectomy
  2. Caval replacement (classic technique)
  3. Piggy-back technique
  4. side-to-side cavocavostomy
  5. Portal venous anastomosis
  6. Jump graft portal vein
  7. Hepatic artery anastomosis
  8. Jump graft to hepatic artery
  9. Choledochojejunostomy
  10. Roux-en-Y choledochojejunostomy or hepatojejunostomy

### II. Content:

- a. Organ preservation
  1. Principles and application
- b. Transplantation
  1. Indications for liver transplantation
    - a) Acute and chronic liver failure
    - b) Hepatocellular carcinoma and other liver tumors
    - c) Child's and MELD scores and organ allocation as well as other scores like SOFT and BAR
  2. Liver
    - a) Transplant hepatectomy
    - b) Liver transplant techniques
  3. Immunosuppression
    - a) Drugs, mechanisms of action, toxicities and combination therapy
  4. Complications of transplantation
    - a) Surgical
    - b) Infectious
    - c) Immunologic

### III. Clinical Skills:

- a. Upon completion of this section the fellow will:
  1. Be familiar with the common indications for liver transplantation including:
    - a) End-stage liver disease
      - i. alcoholic liver disease
      - ii. viral hepatitis (HBV, HCV)
      - iii. autoimmune hepatitis
      - iv. cholestatic liver disease (PBC, PSC)
      - v. non-alcoholic steatohepatitis (NASH)
    - b) Metabolic disease
      - i. alpha 1 antitrypsin disease
      - ii. hemochromatosis
      - iii. amyloidosis
      - iv. oxaluria
      - v. other
    - c) Acquired disease
      - i. Budd-Chiari syndrome
      - ii. Hepatopulmonary syndrome
    - d) Neoplasia
      - i. Hepatocellular carcinoma
    - e) Acute fulminant hepatic failure
  2. Understand and describe the management of common complications of chronic end-stage liver disease:
    - a) Portal hypertension
      - i. Ascites
      - ii. Variceal bleeding
      - iii. Hepatorenal syndrome
      - iv. Subacute bacterial peritonitis
      - v. Chronic hepatic encephalopathy
      - vi. Portopulmonary hypertension
    - b) Coagulopathy
  3. Understand and describe the management of common complications of acute hepatic failure:
    - a) Acute hepatic encephalopathy and Cerebral edema
    - b) Coagulopathy
  4. Understand the basics of evaluation and management of prospective liver transplant recipients
  5. Understand the basics of evaluation and management of prospective liver transplant donors:
    - a) Deceased donor
    - b) Live donor
    - c) Pediatric donor including split-liver grafts
  6. Understand the Swiss Transplant liver donor allocation system (MELD score)
  7. Be familiar with the basic technique of multi-organ and liver allograft alone, and deceased donor recovery for routine recipients
  8. Be familiar with the following immunosuppressive agents and their use in multi-drug regimens:
    - a) Cyclosporine

- b) Tacrolimus
  - c) Induction therapy
9. Understand the short-term medical and surgical complications of liver transplantation:
- a) Bleeding
  - b) Infection
  - c) Primary or delayed liver allograft function
  - d) Multi-organ failure including heart, lung, kidney, coagulation system
  - e) Neurological
10. Understand the long-term medical and surgical complications of liver transplantation:
- a) Recurrent disease
  - b) Renal insufficiency
  - c) Infection
  - d) Malignancy
  - e) Endocrine diabetes

## BLOCK VII: ORGAN PROCUREMENT

Mentor: Philipp Dutkowski, MD

### I. Objectives: upon completion of this Block the Fellow will:

- a. Understand the moral, ethical and legal issues and steps involved in determining brain death
- b. Understand the moral, ethical and legal issues and steps involved in live organ donation
- c. Describe the basic assessment of the medical, laboratory, and anatomic characteristics of a potential organ donor (live or deceased), the quality of a donor organ, and its suitability for a given recipient
- d. Outline in detail the procedure to safely recover abdominal organs from deceased donors, including those for donation after cardiac death (DCD)
- e. Understand the recovery processes for living donor organs and describe the steps necessary to perform relevant organ specific recovery (liver, kidney, or pancreas).
- f. Outline the basic principles and limits of organ preservation and be familiar with organ preservation techniques, including pulsatile perfusion.

### II. Clinical Skills:

- a. Understand the moral, ethical and legal issues and steps involved in determining brain death
  1. Be familiar with the historical development and evolution of brain death criteria
  2. Understand the moral, ethical and legal basis for declaration of brain death and the standard medical and radiologic criteria used to make this decision
- b. Understand the moral, ethical and legal issues and steps involved in live organ donation.
  1. Be familiar with the historical development and evolution of live donor organ donation
  2. Understand the ethical, moral and legal basis for live donor organ donation.
- c. Describe the basic assessment of medical, laboratory, and anatomic characteristics of a potential organ donor
  1. Understand the medical and surgical issues involved with determining the suitability of an organ from a deceased donor and its suitability for a given recipient
  2. Understand the psychosocial, medical, and surgical short-term and long term issues involved with determining the suitability of an organ from a live donor and its suitability for a given recipient
  3. Understand the medical and surgical issues involved with determining the suitability of an organ from a donor after cardiac death (DCD) retrieval and an extended criteria donor (ECD) and its suitability for a given recipient
- d. Outline in detail the procedure to safely recover abdominal organs from deceased donors, including those for donation after cardiac death (DCD).
  1. Understand and be able to perform safe recovery of abdominal organs from deceased donors
  2. Understand and be able to perform safe recovery of abdominal organs from deceased donors who are DCD
  3. Be familiar with appropriate courtesy and etiquette to organ procurement personnel, operative staff and other organ procurement teams during single and multi-organ procurement

- e. Understand the recovery procedures for living donor organs and describe the steps necessary to perform relevant organ specific recovery (liver, kidney)
  - 1. Understand the steps required to perform open and laparoscopic donor nephrectomy for the purposes of organ donation.
  - 2. Understand the surgical procedure of live donor liver donation. (Basic fellowship is not assumed to include competence in live donor liver organ recovery.)
- f. Outline the basic principles and limits of organ preservation and be familiar with organ preservation techniques, including pulsatile perfusion.
  - 1. Be familiar with basic principles of organ preservation and organ preservation fluids.
  - 2. Understand the limits of organ preservation for each organ and the attendant risk of organ dysfunction over time.
  - 3. Understand the basic principles of pulsatile kidney perfusion. (Basic fellowship is not assumed to include competence in pulsatile organ preservation.)

## BLOCK VIII: IMAGING

Mentor: **Oliver Riesterer, MD and Cäcilia Reiner, MD**

### I. Objectives: upon completion of this Block the Fellow will:

- a. Understand the physics and technology of Ultrasonography and Doppler, CT, MRI and other nuclear medicine imaging procedures including Octreotide scans, PET scans and Dotatate scans
- 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 ultrasonography of the liver and pancreas

### II. Content:

- a. The applied physics and technology of Ultrasonography and Doppler, CT, MRI, PET and the other nuclear medicine imaging procedures
- b. The clinical protocols available for each technology
  1. The information provided by each protocol, specifically in the liver MRI with liver specific contrasts
  2. The interpretation of images
  3. The application to clinical investigation
- c. Imaging algorithm for the investigation of hepato-biliary and pancreatic lesions including
  1. Liver cyst or tumor
  2. Jaundice
  3. Peri-ampullary tumor
  4. Cyst or mass in the pancreas

### III. 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 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

## BLOCK IX: ONCOLOGY

Mentors: **Ralph Fritsch and Bernhard Pestalozzi, MD**

### I. Objectives: upon completion of this Block the Fellow will:

- a. Understand the basic pathophysiology of neoplasia and the currently understand 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

### II. 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. Mechanisms of action
  3. Toxicity
  4. Combination protocols with chemotherapy
  5. Radiolabelled micro-spheres
- d. Multi-disciplinary 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

### III. Clinical Skills:

- a. Apply knowledge of tumor biology and 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

## OUR HPB/TRANSPLANTATION TEAM

### Department of Surgery and Transplantation



**Pierre-Alain Clavien, MD, PhD, FACS**  
Chairman and Professor of Surgery



**Henrik Petrowsky, MD; FACS**  
Head, HPB Surgery and  
Professor of Surgery  
Director Fellowship Programm



**Philipp Dutkowski, MD**  
Head, Transplantation  
Chief, Liver Transplantation and  
Professor of Surgery



**Michelle de Oliveira, MD**  
Attending Surgeon and  
Asst. Professor of Surgery



**Christian Oberkofler, MD**  
Attending Surgeon  
Asst. Professor of Surgery



**Kuno Lehmann, MD**  
Attending Surgeon  
Professor of Surgery



**Corina Morf**  
Clinical Nurse



**Ralph Fritsch, MD**  
Attending Oncologist  
Dept. of Oncology



**Bernhard Pestalozzi, MD**  
Chief, Oncology  
Dept. of Oncology



**Cécilia Reiner, MD**  
Attending Physician  
Dept. of Radiotherapy  
& Radio-Oncology



**Oliver Riesterer, MD**  
Attending Physician  
Dept. of Radiotherapy  
& Radio-Oncology



**Beat Müllhaupt, MD**  
Chief, Gastroenterology  
Dept. of Gastroenterology