

# Curricular Guidelines for Training in Transplant Hepatology

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Since the National Institutes of Health consensus development meeting in 1983 concluded that liver transplantation was no longer an experimental procedure and deserved broader application, liver transplantation has emerged as the standard of care for patients with irreversible acute and chronic liver failure and various metabolic disorders (e.g., primary hyperoxaluria).<sup>1</sup> Each year, approximately 5,000 patients undergo orthotopic liver transplantation in North America, and more than 36,000 patients have received liver transplants since 1990.<sup>2</sup> Moreover, the number of patients on the liver transplant waiting list increased almost 16-fold between 1988 and 1997, and the number of waiting-list deaths increased almost 6-fold over the same period.<sup>2</sup> A number of new approaches, including split-liver and living related liver transplantation, have evolved recently as potential methods to expand the donor pool.<sup>3</sup> The specific administrative issues associated with the selection and allocation of organs have become increasingly complex.

As a result of these dynamics, the need for qualified hepatologists to manage patients before and after liver transplantation (e.g., recurrent disease, long-term complications) has dramatically increased. Accordingly, the field of transplant hepatology has emerged as a distinct focus of professional activity that encompasses aspects of gastroenterology and hepatology, surgery, immunology, pathology, multidisciplinary internal medicine, and intensive care. Transplant hepatology represents a unique discipline, with its own requisite skills and training requirements.

The American Society of Transplantation (AST) and American Association for the Study of Liver Diseases (AASLD) have developed guidelines for the standardization of transplant hepatology training.

## Training Program Requirements

The following criteria are needed to qualify as a training program for transplant hepatology:

1. The transplant program must be United Network for Organ Sharing (UNOS)-approved (or Canadian equivalent), in good standing as a liver trans-

plant program, and be affiliated with an ACGME-approved gastroenterology training program.

2. The transplant program must perform at least 30 liver transplantations per year or 20 transplantations per year for each liver transplant fellow to be trained.
3. The program must have a full-time faculty member or members capable of teaching a curriculum with a broad base of knowledge in transplant medicine and hepatology. At least one faculty member must be a fully trained hepatologist, defined by the Task Force on Training in Hepatology.<sup>4</sup> The medical director of the program must have recognized expertise in liver diseases, including ongoing productivity in clinical or basic research related to liver diseases and transplantation.<sup>4</sup> The program must provide patient comanagement responsibility with transplant surgeons from the preoperative phase to the outpatient period. The program must provide training in the indications for, performance of, and interpretation of liver transplant biopsies. Furthermore, the program must provide didactic experi-

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ence with the trainee reviewing liver transplant biopsy specimens with an experienced liver transplant pathologist.

4. The curriculum designed by the training program director should follow the guidelines summarized next and must include training and experience in end-stage liver disease; training in the selection of appropriate transplantation recipients and donors (cadaveric and living), including ethical issues; understanding of surgical procedures; and experience in the immediate and long-term medical care of the transplant recipient (e.g., recurrent disease). Additionally, there must be an emphasis on the management of immunosuppressive agents (including pharmacokinetics and drug-drug interactions) and evaluation of liver allograft dysfunction. It is strongly recommended that the didactic section of the program follow the AST's *Primer on Transplantation*.
5. The program must have a close working affiliation with an interventional radiology program experienced in the broad range of interventions pertinent to the management of hemodynamic, vascular, and biliary problems occurring in end-stage liver disease and transplant recipients.
6. The liver transplant fellowship program must provide training in living donor transplantation. If such training is not available on site, the program must provide the fellow with travel and accommodation to gain this experience. Specifically, a multidisciplinary approach to issues in donor selection and evaluation and recipient criteria in a well-established program are recommended.

### Goals of Training

It is expected that the trainee will meet, either before or during a specialized year of training in transplant hepatology, criteria for levels 1 and 2 hepatology training detailed in the Gastroenterology Core Curriculum/Task Force on Training in Hepatology documents.<sup>5</sup> The minimum requirement for level 2 training includes preparation of the individual to diagnose and manage all types of liver disease, including proficiency in performing liver consultations.

In addition, the following training goals must be met:

1. The trainee must have at least 1 year of specialized training in liver transplantation under the direct supervision of a qualified (UNOS-certified) transplant hepatologist and in conjunction with a liver transplant surgeon at a UNOS-approved (or Canadian equivalent) liver transplant center. The 12 months of training would preferably be contiguous, but must consist of a minimum of 4 months on the clinical inpatient adult liver transplant service, with weekly continuity clinic for the 12 months. The remaining months should consist of other hepatology or transplant-related experience, including involvement in basic or clinical transplant research.
2. The trainee must be thoroughly acquainted in principle and practice with the management of patients with acute and chronic end-stage liver disease. This will include the following criteria: (a) Experience in the comprehensive management of patients at high listing status in the intensive care setting, with complications including refractory ascites and hepatic hydrothorax, hepatorenal syndrome, hepatopulmonary and portopulmonary syndromes, and refractory portal hypertensive bleeding. A detailed familiarity with the principles and application of transjugular intrahepatic portosystemic shunts is essential. (b) The diagnosis and management of hepatocellular carcinoma and cholangiocarcinoma, including transplantation, non-transplantation surgical, and nonsurgical approaches. (c) The management of chronic viral hepatitis in the pretransplantation, peritransplantation, and posttransplantation settings. (d) The management of fulminant liver failure, including principles of intracranial pressure monitoring. (e) The psychosocial evaluation of all candidates, in particular, those with a history of substance abuse. (f) A working knowledge of transplant immunology, including blood group matching, histocompatibility and tissue typing, and infectious and malignant complications of immunosuppression. (g) Drug hepatotoxicity and the interaction of drugs and the liver. (h) Nutritional support of patients with chronic liver disease. (i) Use of interventional radiology in the diagnosis and management of portal hypertension, as well as biliary and vascular complications. (j) Ethical considerations relating to liver transplant donors, including questions related to living donors, non-heart-beating donors, criteria for brain death, and appropriate recipients.
3. The trainee must be involved in the primary evaluation, presentation, and discussion at selection conferences of 20 or more potential transplant candidates.
4. The trainee must follow up at least 20 new liver transplant recipients for a minimum of 3 months

from the time of their transplantation. The trainee will be directly supervised in the evaluation and management of patients from the preoperative to outpatient period. The liver transplantation trainee must actively participate in transplant recipients' medical care, including acute cellular rejection, recurrent disease, infectious diseases, and biliary tract complications. Furthermore, the trainee must serve as a primary member of the transplantation team and participate in making decisions about immunosuppression.

5. The trainee must be involved in the follow-up of 30 or more liver transplant recipients who have survived more than 1 year after liver transplantation to gain familiarity and expertise with the management of common long-term problems (e.g., cardiovascular disease, nephrotoxicity, screening for malignancies, and diagnosis and treatment of recurrent disease).
6. The trainee must understand the indications, contraindications, complications, and interpretation of allograft biopsies and must perform a minimum of 30 percutaneous biopsies during the training period. The trainee also should be familiar with the appropriate use of ultrasound-localized and laparoscopy-guided liver biopsies.
7. The trainee must acquire a current working knowledge of the organizational and logistical aspects of liver transplantation, including the training and role of nurse coordinators and other support staff (e.g., social work), organ procurement, and UNOS policies.
8. The trainee must participate as an observer in three cadaveric liver procurements and three liver transplantations. The trainee is expected to learn the principles of donor selection and rejection (e.g., hemodynamic management, donor organ steatosis, and indication for liver biopsy).
9. The trainee should be exposed to the evaluation of at least five adult-to-adult living donor liver transplantations, even though this procedure is not available in the current training program (see training program requirements). During this experience, the trainee must become familiar with the principles of living donor selection, including

appropriate surgical, psychosocial, and ethical considerations.

10. The trainee must become familiar with the following factors: (a) principles and practice of pediatric liver transplantation, (b) principles and application of artificial liver support, and (c) clinical research issues in transplant hepatology.

### Documentation of Training

The liver transplant fellowship program director must provide a letter within 2 months of successful fellowship completion stating that the trainee has met all criteria as a liver transplantation physician. Monitoring of each individual fellow will be the responsibility of the fellowship program director at each center. Documentation of participation in the required didactic sessions and patient management experiences for each individual trainee should be kept on file by the Liver Transplant Fellowship Director at each transplant center applying for certification. It is recommended that documentation will need to be provided that the liver transplant fellow has performed the requisite number of patient encounters, surgical (including procurement) observations, and liver transplant biopsies. At a minimum, documentation should be in the form of a log that contains the date of patient contact, type of examination, and type of procedure performed or observed. Documentation that fellow trainees have completed appropriate training should be maintained for at least 3 years.

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