



Complications of Hepatitis C

# Liver Transplant

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In some cases, hepatitis C causes liver cancer or severe damage to the liver, resulting in end-stage liver disease and ultimately liver failure. The only effective treatment for end-stage liver disease is a liver transplant. Complications from HCV are the most common reason for adult liver transplantation in the United States. The majority of people living with hep C will never progress to the point where transplantation will be necessary.

The first human liver transplant was attempted in Denver, Colorado, in 1963 by a team headed by Thomas Starzl, MD. Four years later, the procedure was performed successfully. Survival rates have been steadily improving, particularly with the introduction of anti-rejection medications. Liver transplantation is a complicated surgery, requiring lifelong follow-up care. However, liver transplant recipients are usually able to return to normal activities after recovering for several months.

## Transplant Evaluation

You may be referred for a transplant evaluation, although you may not actually need a liver transplant. The evaluation is an extensive process, conducted by a transplant team. Eligibility is determined on a case-by-case basis, but there are general guidelines. Some of these criteria are absolute and some are relative, depending on the practices of specific transplant centers.

Potential disqualifications for liver transplantation:

- Active alcohol or substance abuse with less than six months of abstinence
- Metastatic cancer and active septic infections
- Other serious health issues; advanced heart, lung or kidney disease; severe infection; other terminal conditions; whether or not a center transplants people living with HIV

Other factors that may affect liver transplantation qualifications:

- Morbid obesity
- Inability to follow medical instructions
- Lack of support to help manage post-surgical medication regimen

- Advanced age
- Smoking or marijuana use

If you are determined to be eligible, you will be placed on the transplant waiting list. The sickest people are at the top of the list. The time you have to wait for a donated liver will vary, depending on factors such as how ill you are, your blood type, and the availability of a matching donor. In some parts of the U.S., more people need livers than there are donors. To reduce their risk of dying before being transplanted, some people relocate to states where the waiting list is shorter.

### The MELD Score

The severity of your liver disease determines your position on the transplant list. A scoring system called the Model for End-Stage Liver Disease, or MELD, is used to evaluate how advanced liver disease is in adults, and predicts survival rate. MELD scores range from 6 to 40, with 6 being the least ill.

The transplant team keeps track of MELD scores. Online [MELD calculators](#) are available, but in order to use them, you need to know your most recent lab values for bilirubin, creatinine, and prothrombin time (international normalized ratio or INR).

### Transplantation for Hepatocellular Carcinoma

Some people with cirrhosis will develop hepatocellular carcinoma (HCC) and need a liver transplant. This occurs in people with active hep C, and in those who were treated and cured of HCV after they already had cirrhosis. Transplantation for HCC is more likely to be successful if the procedure is done in the early stages of cancer. To select candidates who are suitable for transplantation, the Milan criteria are applied. These are:

- One lesion smaller than 5 cm
- Up to 3 lesions smaller than 3 cm
- No extrahepatic manifestations (cancer has not spread beyond the liver)
- No vascular invasion

### Living Donor Liver Transplantation

Most liver transplants use deceased donors. However, a person may wait months or years before a suitable organ is available. Because the liver has the remarkable ability to regenerate, another option is to transplant part of a liver from a living donor. A living donor doesn't have to be a blood relative, but must have a compatible blood type. About 40 to 60 percent of the donor's liver is removed. Within eight weeks, the partial livers of both the donor and the recipient are usually completely regenerated.

Living donor transplants are done only when the potential risk to the donor is small and the potential benefit to the recipient is unquestionable. It is difficult to find current data on live liver

transplantation, but it appears that there are 250 to 400 liver donor transplants a year. One in 300 donors die and about 30 percent suffer a complication.

The advantages of living donor transplants are:

- Better survival of the graft (transplanted liver)
- Lower graft rejection rates
- Recipients spend less time on liver transplant waiting list

#### Post-transplant HCV Recurrence and Treatment

Liver transplantation is not a cure for HCV. The virus is still in the blood, so HCV returns after the surgery. Below are the AASLD/IDSA [HCV guidelines](#) for treating people who have HCV recurrence post-liver transplant. [Click here](#) to read about drug interactions between HCV antiviral medications and the antirejection drugs called Calcineurin Inhibitors.

#### AASLD HCV Treatment Recommendations for Post-Liver Transplant HCV Recurrence

(Medications are listed first by evidence level according to the [HCVGuidelines.org](#), then listed alphabetically.)

	Recommended	Alternative
Genotype 1 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"><li>• Harvoni* + ribavirin for 12 weeks</li><li>• Mavyret for 12 weeks</li></ul>	<ul style="list-style-type: none"><li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li></ul>
Genotype 1 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"><li>• Harvoni* + ribavirin for 12 weeks</li></ul>	<ul style="list-style-type: none"><li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li><li>• Mavyret for 12 weeks</li></ul>
Genotype 1 treatment-naive and - experienced decompensated cirrhosis	<ul style="list-style-type: none"><li>• Harvoni* + low initial dose of ribavirin for 12 weeks</li></ul>	
Genotype 2 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"><li>• Mavyret for 12 weeks</li><li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li></ul>	
Genotype 2 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"><li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li></ul>	<ul style="list-style-type: none"><li>• Epclusa* + ribavirin for 12 weeks</li><li>• Mavyret for 12 weeks</li></ul>
Genotype 2 treatment-naive and - experienced decompensated cirrhosis	<ul style="list-style-type: none"><li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li><li>• Epclusa* + ribavirin for 12 weeks</li></ul>	

	Recommended	Alternative
Genotype 3 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"> <li>• Mavyret for 12 weeks</li> <li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li> </ul>	
Genotype 3 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Epclusa* + ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>
Genotype 3 treatment-naive and - experienced decompensated cirrhosis	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks</li> <li>• Epclusa* + ribavirin for 12 weeks</li> </ul>	
Genotype 4 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> </ul>
Genotype 4 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>
Genotype 4 treatment-naive and - experienced decompensated cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + low initial dose of ribavirin for 12 weeks</li> </ul>	
Genotype 5 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> </ul>
Genotype 5 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>
Genotype 5 treatment-naive and - experienced decompensated cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + low initial dose of ribavirin for 12 weeks</li> </ul>	
Genotype 6 treatment-naive and - experienced no cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> </ul>
Genotype 6 treatment-naive and - experienced compensated cirrhosis	<ul style="list-style-type: none"> <li>• Harvoni* + ribavirin for 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks</li> <li>• Mavyret for 12 weeks</li> </ul>

Recommended

Alternative

Genotype 6  
treatment-naive and -  
experienced  
compensated cirrhosis

- Harvoni\* + low initial dose of ribavirin for 12 weeks

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**Genotype 1  
treatment-naive and -experienced  
no cirrhosis**

- Recommended
- Harvoni\* + ribavirin for 12 weeks
  - Mavyret for 12 weeks
- Alternative
- Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks

**Genotype 1  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended
- Harvoni\* + ribavirin for 12 weeks
- Alternative
- Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks
  - Mavyret for 12 weeks

**Genotype 1  
treatment-naive and -experienced  
decompensated cirrhosis**

- Recommended
- Harvoni\* + low initial dose of ribavirin for 12 weeks
- Alternative

**Genotype 2  
treatment-naive and -experienced  
no cirrhosis**

- Recommended
- Mavyret for 12 weeks
  - Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks
- Alternative

**Genotype 2  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended
- Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks
- Alternative
- Epclusa\* + ribavirin for 12 weeks
  - Mavyret for 12 weeks

**Genotype 2  
treatment-naive and -experienced  
decompensated cirrhosis**

- Recommended
- Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks
  - Epclusa\* + ribavirin for 12 weeks
- Alternative

**Genotype 3  
treatment-naive and -experienced  
no cirrhosis**

- Recommended
- Mavyret for 12 weeks
  - Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks

Alternative

**Genotype 3  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended
- Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks

- Alternative
- Epclusa\* + ribavirin for 12 weeks
  - Mavyret for 12 weeks

**Genotype 3  
treatment-naive and -experienced  
decompensated cirrhosis**

- Recommended
- Daklinza + Sovaldi + low initial dose of ribavirin for 12 weeks
  - Epclusa\* + ribavirin for 12 weeks

Alternative

**Genotype 4  
treatment-naive and -experienced  
no cirrhosis**

- Recommended
- Harvoni\* + ribavirin for 12 weeks
  - Mavyret for 12 weeks

- Alternative
- Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks

**Genotype 4  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended
- Harvoni\* + ribavirin for 12 weeks

- Alternative
- Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks
  - Mavyret for 12 weeks

**Genotype 4  
treatment-naive and -experienced  
decompensated cirrhosis**

- Recommended
- Harvoni\* + low initial dose of ribavirin for 12 weeks

Alternative

**Genotype 5  
treatment-naive and -experienced  
no cirrhosis**

- Recommended
- Harvoni\* + ribavirin for 12 weeks
  - Mavyret for 12 weeks

- Alternative
- Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks

**Genotype 5  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended                      • Harvoni\* + ribavirin for 12 weeks
- Alternative                         • Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks  
   • Mavyret for 12 weeks

**Genotype 5  
treatment-naive and -experienced  
decompensated cirrhosis**

- Recommended                      • Harvoni\* + low initial dose of ribavirin for 12 weeks
- Alternative

**Genotype 6  
treatment-naive and -experienced  
no cirrhosis**

- Recommended                      • Harvoni\* + ribavirin for 12 weeks  
   • Mavyret for 12 weeks
- Alternative                         • Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks

**Genotype 6  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended                      • Harvoni\* + ribavirin for 12 weeks
- Alternative                         • Daklinza + Sovaldi + low initial dose ribavirin for 12 weeks  
   • Mavyret for 12 weeks

**Genotype 6  
treatment-naive and -experienced  
compensated cirrhosis**

- Recommended                      • Harvoni\* + low initial dose of ribavirin for 12 weeks
- Alternative

\*Generic version is available in the United States.

Medications that are NOT recommended for post-transplant individuals, including those with compensated cirrhosis:

- Regimens containing peginterferon
- Monotherapy with peginterferon, ribavirin or a direct-acting antiviral
- Regimens using Incivek, Victrelis, or Zepatier

Medications that are NOT recommended for post-transplant individuals with decompensated cirrhosis:

- Regimens containing Incivek, Olysio, Incivek, peginterferon, Technivie, Victrelis, Viekira Pak, or Zepatier
- Monotherapy with peginterferon, ribavirin or a direct-acting antiviral

### Organ Rejection

After the transplant, the recipient must receive immunotherapy to prevent the body from rejecting the new liver. The transplanted liver (allograft) is foreign to the body, so the immune system may go on the offense. Transplant recipients are given drugs that suppress the immune system, and prevent rejection of the new liver. Rejection commonly occurs a week or two following transplantation; however, rejection can occur at any time.

The signs of organ rejection after liver transplant often start with elevated liver enzymes. Symptoms of liver rejection include fatigue, loss of appetite, nausea, abdominal tenderness or pain, fever, jaundice, dark-colored urine, or light-colored stools.

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<http://beta.docker.hepmag.com/basics/hepatitis-c-basics/transplantation>