



Using Hepatitis C Donor Organs in Adult Kidney Transplant Candidates: Frequently Asked Questions

If you are a kidney transplant candidate, you may be able to receive a Hepatitis C (HCV) donor organ. Doctors have begun using HCV donor organs for recipients without HCV infection to improve access to transplantation and reduce time on dialysis.

At Michigan Medicine, we have transplanted over 20 anti-HCV + (infected) livers into anti- HCV + (infected) recipients and also transplanted anti-HCV + (infected) livers and kidneys into a growing number of selected anti-HCV - (uninfected) recipients with good outcomes.

Continue reading to learn more about highly effective oral medications for HCV (DAA's), HCV testing, and receiving an HCV donor organ.

What is Hepatitis C?

Hepatitis C is a virus that infects the liver. If left untreated, it can lead to slowly progressing liver disease over 10 to 20 years. Due to the large number of people infected with the **Hepatitis C Virus (HCV)** in the United States (about 4-5 million people), chronic (long-term) HCV has been a leading reason for liver transplantation. However, the number of people developing liver failure or liver cancer from HCV infection and needing a

HCV: Hepatitis C Virus

Direct Acting Antivirals (DAAs): highly effective Hepatitis C medications.

anti-HCV (+): HCV antibodies are present, indicating the person had HCV.

NAT: Nucleic Acid Testing, searches for HCV genetic material (RNA) in the blood
HCV-RNA (the genetic material of the Hepatitis C Virus)

Anti-HCV (+) NAT (-) :- the person was infected with Hepatitis C, but the virus has now been cleared from the body

transplant has been decreasing recently due to the availability of highly effective medications called **Direct Acting Antivirals (DAA's)**.

<p>Anti-HCV (+) NAT (+) -person currently has the virus in their blood</p> <p>Anti- HCV (-): Someone who does not have HCV antibodies in their blood, never infected.</p>

How is Hepatitis C spread and diagnosed?

Hepatitis C is most commonly spread from one person to another through direct exposure to contaminated blood. Persons Who Inject Drugs (PWID) or use illicit drugs are at increased risk of acquiring and spreading HCV to others. The majority of people who get hepatitis C are unaware that they carry the virus because they do **NOT** develop symptoms like abdominal (belly) pain, fatigue, or jaundice during the acute infection.

The diagnosis of hepatitis C virus infection is made when an **antibody to the virus (anti-HCV)** is found in the blood. **Antibodies** are chemicals released into the bloodstream when someone gets infected. The antibody must turn positive within 2-4 weeks of exposure and remain detectable for prolonged periods of time for a reactive (positive) diagnosis to be made.

What do my HCV test results mean?

Non-reactive or a negative Hepatitis C Antibody Test result

- A non-reactive, or negative, antibody test means that a person does not have Hepatitis C.
- However, if a person has been recently exposed to the Hepatitis C virus, they will need to be tested again.

Reactive (positive) Hepatitis C Antibody Test result

- A **reactive (positive)** antibody test means the person has been infected with the Hepatitis C virus at some point in time.

- A reactive antibody test does not necessarily mean that the person currently has Hepatitis C.
- Once people have been infected, they will always have antibodies in their blood. This is true if they have cleared the virus or still have virus in their blood.
- A reactive antibody test requires an additional, follow-up test to determine if a person is currently infected with Hepatitis C.

What to do if the Hepatitis C Antibody Test is reactive?

Nucleic Acid Testing (NAT) is the final step to determine if a person with a positive HCV antibody test has a current or past (resolved) HCV infection. This blood test is very sensitive and looks for **HCV-RNA** (the genetic material of the Hepatitis C Virus).

- If the NAT follow-up test is negative - this means the person was infected with Hepatitis C, but the virus has now been cleared from the body.
- If the NAT follow-up test is positive- this means the person currently has the virus in their blood. If there is a reactive antibody test and a positive follow-up test, this means the person is HCV (+) and NAT (+) and the person needs to talk to a doctor experienced in diagnosing and treating Hepatitis C
- Among the 4 million Americans exposed to HCV, nearly 20 out of 100 (20%) have **protective immunity** to the virus (anti-HCV + but NAT (-)) and are not infectious to others.
- The remaining 80 out of 100 (80%) people with HCV + in the general population are NAT (+) and do have HCV that can be transmitted to others. **HCV genotypes refer to the strain of the virus that the person was exposed to when they were infected.** HCV genotypes 1, 2 and 3 account for over 95 out of 100 (95%) of the patients infected in the US.

Is Hepatitis C virus infection curable?

Yes. Oral medications for HCV (DAA's) have been very effective in curing infected HCV patients that are treated for 8 to 12 weeks. Currently, infected HCV patients have a 98-100% chance of achieving sustained virologic response at 12 weeks after completing treatment. **Virologic response** means that the hepatitis C virus is not detected in the blood during treatment. When the virus continues to be undetectable 12 weeks or more after completing treatment, this is a “**sustained**” virologic response (SVR).

Medications

Numerous DAA regimens have been approved for use in patients with chronic HCV infection by the US Food and Drug Administration (FDA).

- **Glecaprevir/ Pibrentenasvir (Mavyret® or GP)** is one of the newly approved DAA regimens that works for people with HCV genotypes 1 to 6 and is also safe and effective in people with advanced kidney failure or on kidney dialysis. It is typically given for 8 weeks.
- **Sofosbuvir/ Velpatasvir (Epclusa® or SOF/ VEL)** is approved for people with HCV genotypes 1 to 6 (pangenotypic) and can also be given to people with advanced kidney disease or on dialysis. It is typically given for 12 weeks.

How many organ donors have hepatitis C virus infection?

Deceased organ donors have a higher rate of carrying HCV infection compared to the general adult donor population.

- Deceased organ donors carrying HCV: 5 to 10 out of 100 (5-10%)
 - Among these, 70 to 80 out of 100 (70-80%) are **infectious** (i.e. NAT or HCV RNA positive) and capable of transmitting HCV during transplantation.

- Of the estimated 10,000 annual deceased organ donors in the US, it is estimated that as many as 500 to 600 of them may have HCV infection.

In the past, HCV infected organs were directed to recipients with pre-existing HCV infection. This is no longer the case as the number of potential kidney recipients with HCV has declined. Doctors have begun using anti-HCV + donor organs for recipients without HCV infection to improve access to transplantation and reduce waitlist time. Anti-HCV+ organs have HCV antibodies, meaning they had HCV at some point in the past, but this does not mean they still do.

How often are hepatitis C donor organs used in the United States?

Kidneys from organ donors with HCV infection have been used for over 20 years in the United States largely for recipients who already have HCV infection. Over **3,000** of these kidney transplants have been completed to date.

Over the past 5 years, multiple transplant centers in the US have reported good outcomes when using anti-HCV + donor livers and kidneys into uninfected recipients. In this circumstance, the recipients provide written informed consent immediately before the transplant and they are carefully monitored for the appearance of detectable HCV RNA (HCV genetic material) in their blood for up to 12 months post- transplant.

What steps are taken if an uninfected recipient gets an anti-HCV+ kidney and becomes infected?

If the recipients develop detectable HCV RNA, they are treated with potent DAA's for 8 to 12 weeks to rid the body and blood of detectable HCV RNA. Although the numbers are small (less than 500) and the duration of follow-up is

limited (less than 3 years in most), uninfected kidney recipients of anti-HCV + donor kidneys have experienced excellent outcomes and survival.

Furthermore, use of a DAA regimen starting at 1 to 4 weeks after transplantation has been highly effective and well tolerated post-transplant. To date, nearly **99 out of 100 (99%)** of patients receiving an infected donor organ are cured at 1-year post-transplantation after receiving a course of DAA therapy.

What is the risk of becoming infected with HCV if I receive an infected donor kidney?

Donors with detectable HCV RNA at the time of transplantation have a nearly **100%** chance of spreading HCV infection to the recipient. Our protocol is to start DAA therapy in all recipients of a hepatitis C donor organ who become infected (HCV RNA +) after transplantation.

In contrast, donors who have had HCV but now have undetectable HCV RNA, spread active infection to only 5 to 20 out of 100 (5-20%) patients. If you receive one of these organs we would test you for HCV RNA at 1 week, 1 month, and monthly for the first year to see if you have acquired HCV infection and provide DAA therapy if HCV RNA is confirmed.

Why should I consider receiving an anti-HCV + donor organ if I currently don't have HCV infection?

Over the past 10 years, the number of deceased organ donors with HCV infection has been rapidly increasing. In 2010 there were an estimated 500 of these donors while in 2022 the number has increased to over 1000. Since many of these donors are young and otherwise healthy, these anti-HCV + donor kidneys function very well. Remember, anti-HCV (+) means antibodies are

present because the donor had HCV *at some point*, it is not certain whether there is a *current* infection.

Since there are more anti-HCV + kidneys compared to anti-HCV + recipients, kidney transplant candidates without HCV infection who are willing to consider these organs can often get transplants more quickly. Therefore, potential advantages of receiving an anti-HCV + donor kidney is a **shorter waiting** time to transplant and less time receiving dialysis.

Potential downsides to accepting an anti-HCV + kidney is that these recipients will **have to take a DAA regimen such as GP for 8 weeks or SOF/ VEL for 12 weeks after transplantation in case of a current infection.** People receiving GP or SOF/ VEL are required to undergo additional blood test monitoring and be seen in clinic during and after treatment (Table 1, page 8). **Recipients of a hepatitis C donor kidney must take all of the GP or SOF/VEL medication as prescribed.** The antiviral medication regimen has been well tolerated in liver and kidney transplant recipients so far. Nonetheless, there is a small (<less than 1%) chance that the GP or SOF/VEL regimen may not be effective and the HCV RNA could remain detectable at 1-year post-transplant. In those circumstances, we will get you a Michigan Medicine liver doctor who can prescribe other DAA drugs to you.

Am I at risk of acquiring other infections if I chose to receive an anti-HCV + donor organ?

All deceased organ donors undergo antibody and specialized testing for hepatitis C, hepatitis B, and HIV infection before they are used in transplantation. However, due to shared risk factors, hepatitis C donors are at greater risk of having hepatitis B or HIV infection but the overall likelihood of these viruses not being detected during organ donor screening is less than 1 in

100,000. Therefore, to maximize safety, all recipients of a hepatitis C donor kidney will undergo testing for hepatitis B and HIV infection 4-8 weeks after transplantation. If hepatitis B or HIV is transmitted, you would have a consultation with a Transplant Infectious Disease specialist and start antiviral therapy.

What direct acting oral antiviral agents are available to treat hepatitis C?

These are the DAA regimens that our center most commonly uses to treat patients with chronic HCV infection.

Type	Dose	Who can take it
Sofosbuvir/ Velpatasvir (Epclusa®, SOF/ VEL)	Fixed dose combination given once a day in the morning with food for 12 weeks	Effective in all HCV genotypes with an SVR in 98 to 100% of HCV patients. SOF/ VEL can be safely prescribed to patients with advanced kidney disease.
Glecaprevir/ Pibrentenasvir (Mavyret®, GP)	Fixed dose combination of Glecaprevir and Pibrentenasvir. 3 tabs taken together in the morning with food for 8 weeks	Effective in all HCV genotypes with an SVR in HCV patients of 98 to 100%. GP is safe for patients with advanced kidney disease.

A note about GP and SOF/VEL: In kidney transplant recipients, GP needs to be given for 8 weeks while SOF/VEL needs to be given for 12 weeks. Daily doses should not be skipped since missing or delayed doses can lead to breakthrough infection and viral resistance. We will delay starting GP or SOF/VEL therapy

until the person is stabilized and able to swallow pills and food. Our goal is to start GP and SOF/VEL in all recipients of anti-HCV + kidneys **within 2 weeks** from their transplant admission.

When will I receive antiviral medication for newly acquired HCV infection?

If you develop detectable HCV RNA, we will plan to start the medication during your transplant admission. Plans for further refills (to complete at a total of 8 or 12 weeks of treatment) will be made at the time of discharge. If you are discharged to a rehab facility, we will arrange to give you an adequate supply of GP or SOF/VEL.

If you do not develop evidence of active HCV infection with detectable HCV RNA by the time of discharge, you will continue to be monitored for late appearance of HCV RNA up to 1-year post-transplant. All recipients of anti-HCV + donor organs are required to undergo a series of blood tests and clinic visits as follows:

Table 1- Lab monitoring schedule during GP or SOF/VEL therapy in recipients of anti-HCV (+) kidneys

Testing	HCV RNA	HCV Genotype	Blood, chemistry, CSA/ Tacro	Clinic visit
Day 1	x	x	x	x
Day 3	x			
Day 7	x		x	x
Week 2	x			
Week 4	x		x	x
Week 8	x		x	x
Week 12*	x		x	x
Follow-up week 4	x			

Follow-up week 12	x		x	
Follow-up week 24	x		x	x
Follow-up week 48	x		x	x

- * SOF/VEL treated patients only

Will my insurance company cover the costs of the antiviral medications for hepatitis C?

Most insurers will provide coverage for DAAs to recipients of a hepatitis C donor organ. Before transplantation, we will check your pharmacy benefits and determine if GP or SOF/VEL is a covered medication and what your anticipated co-pay will be. We will let you know if it is not a medication on the formulary of your prescription medication plan, and will not plan to use a hepatitis C donor organ unless a financial payment plan has been pre-arranged. The exact cost of GP treatment for 8 weeks or for SOF/ VEL for 12 weeks is difficult to know with certainty but the average wholesale price in the US as of January 2022 is **\$30,000**.

If your insurance changes or if they refuse to provide the DAA regimen after receipt of a hepatitis C donor kidney, the Michigan Medicine Transplant center will work with you and your insurance company to develop a plan to cover the costs of a course of GP, SOF/VEL or other effective DAA treatment.

Will any of the DAA medications interact with my other transplant medications?

DAA medications will not interact with the standard anti-rejection medications (tacrolimus, mycophenolate, steroids) and other medications to prevent bacterial, viral, and fungal infections. People who are on a statin medication for high cholesterol and other people receiving some anti-convulsants may have to

have those medications held or temporarily discontinued during GP therapy. Patients on amiodarone should not be treated with SOF/VEL.

What if I develop recurrent hepatitis C infection despite taking these medications?

If you do not achieve SVR (are not cured) after a full course of GP or SOF/VEL and remain HCV RNA +, you may have developed drug resistant infection. In that case, we will do specialized testing of your blood. Based upon that testing you will be offered treatment with an alternative DAA regimen that contains sofosbuvir.

Would I be eligible to receive a 2nd kidney transplant if needed after I receive an anti-HCV + donor kidney?

Yes. If you develop graft failure after your first transplant (which happens in less than 5% of all recipients), you would still be eligible to receive a second transplant based upon your medical and surgical status.

Will I be infectious to family members if I receive an anti-HCV + donor organ?

Yes. Any individual with detectable HCV RNA in their blood can potentially transmit the virus to another person. To minimize the risk of accidental transmission, you will be counseled on how to avoid blood to blood contact with your significant other and household contacts. In addition, you will receive the Centers for Disease Control's (CDC) recommendations on how to minimize the risk of sexual transmission of HCV. If you achieve SVR, you will not need to follow these precautions.

References

1. Goldberg D, et al. Changes in the Prevalence of Hepatitis C virus infection, NASH, and ALD among patients with cirrhosis or liver failure on the waitlist for liver transplantation.

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- Gastroenterology 2018; 152; 1090-1099.
2. Levitsky J, et al. The American Society of Transplantation Consensus Conference on the Use of Hepatitis C viremic Donors in Solid organ transplantation. Am J Transplant 2017; 1-13.
 3. Martins SS, et al. Changes in US Lifetime heroin use and heroin use disorder: Prevalence from the 2001-2012 National Epidemiologic survey on alcohol and related conditions. JAMA Psychiatry 2017; 74: 445-455.
 4. Bari KM, Lockett K, Kaiser T, et al. Hepatitis C transmission from seropositive, nonviremic donors to non-hepatitis C liver Transplant recipients. Hepatology 2018; 67: 1673-1682.
 5. Sise ME, Goldberg DS, Kort JJ, et al. Multicenter Study to Transplant Hepatitis C-Infected Kidneys (MYTHIC): An Open-Label Study of Combined Glecaprevir and Pibrentasvir to Treat Recipients of Transplanted Kidneys from Deceased Donors with Hepatitis C Virus Infection. J Am Soc Nephrol. 2020;31(11):2678-2687.
 6. AASLD-IDSA. Organs from HCV-Viremic Donors. Recommendations for testing, managing, and treating hepatitis C. <http://www.hcvguidelines.org/unique-populations/organs-from-viremic-donors>. [01/27/2021]. HRSA-SRTR. OPTN/SRTR 2018 Annual Report: Hepatitis C. https://srtr.transplant.hrsa.gov/annual_reports/2018/Hepatitis%20C.aspx#HEP_15_KI_ctr_hcv_chg_1_b64.103/08/2021.

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