


# HCV Testing and Linkage to Care

## One-Time Hepatitis C Testing

<b>Recommendations for One-Time Hepatitis C Testing</b>	
RECOMMENDED	RATING 
<p>One-time hepatitis C testing is recommended for persons born<sup>a</sup> from 1945 through 1965 without prior ascertainment of risk.</p>	I, B
<p>Other persons should be screened for HCV infection risk factors. One-time testing should be performed for all persons with behaviors, exposures, and conditions or circumstances associated with an increased risk of HCV infection.</p> <p><b>Risk Behaviors</b></p> <ul style="list-style-type: none"> <li>• Injection-drug use (current or ever, including those who injected only once)</li> <li>• Intranasal illicit drug use</li> </ul> <p><b>Risk Exposures</b></p> <ul style="list-style-type: none"> <li>• Persons on long-term hemodialysis (ever)</li> <li>• Persons with percutaneous/parenteral exposures in an unregulated setting</li> <li>• Healthcare, emergency medical, and public safety workers after needle-stick, sharps, or mucosal exposures to HCV-infected blood</li> <li>• Children born to HCV-infected women</li> <li>• Prior recipients of transfusions or organ transplants, including persons who:                         <ul style="list-style-type: none"> <li>◦ Were notified that they received blood from a donor who later tested positive for HCV</li> <li>◦ Received a transfusion of blood or blood components, or underwent an organ transplant before July 1992</li> <li>◦ Received clotting factor concentrates produced before 1987</li> </ul> </li> <li>• Persons who were ever incarcerated</li> </ul> <p><b>Other Conditions and Circumstances</b></p> <ul style="list-style-type: none"> <li>• HIV infection</li> <li>• Sexually-active persons about to start pre-exposure prophylaxis (PreP) for HIV</li> <li>• Unexplained chronic liver disease and/or chronic hepatitis, including elevated alanine aminotransferase (ALT) levels</li> <li>• Solid organ donors (deceased and living)</li> </ul>	I, B
<p><sup>a</sup> Regardless of country of birth</p>	

There are an estimated 3.5 million HCV-infected persons in the United States, including 2.7 million in the general noninstitutionalized population ([Denniston, 2014](#)) and 800,000 incarcerated, institutionalized, or homeless persons ([Edlin, 2015](#)). Approximately 50% of all infected people are unaware that they have HCV ([Denniston, 2012](#)); ([Holmberg, 2013](#)).

HCV testing is recommended in select populations based on demographics, possible exposures, high-risk behaviors, and medical conditions. Testing recommendations are based on HCV prevalence in these populations; proven benefits of care and treatment in reducing the risk of hepatocellular carcinoma and all-cause mortality; and the potential public health benefit of reducing transmission through early treatment, viral clearance, and reduced risk behaviors ([Smith, 2012](#)); ([USPSTF, 2013](#)); ([CDC, 1998](#)).

HCV is primarily transmitted through percutaneous exposure to infected blood. Other modes of transmission include mother-to-infant and contaminated devices shared for noninjection drug use. Sexual transmission also occurs but generally seems inefficient except among HIV-infected men who have unprotected sex with men ([Schmidt, 2014](#)).

Injection drug use poses the most significant risk for HCV infection, accounting for at least 60% of acute HCV infections in the United States. Healthcare exposures are important sources of transmission, including the receipt of blood products prior to 1992 (after which routine screening of the blood supply was implemented); receipt of clotting factor concentrates before 1987; long-term hemodialysis; needle-stick injuries among healthcare workers; and patient-to-patient transmission resulting from poor infection control practices.

Other risk factors include having been born to an HCV-infected mother, having been incarcerated, and percutaneous or parenteral exposures in an unregulated setting. Examples of these settings include tattoos received outside of licensed parlors and medical procedures done internationally or domestically where strict infection control procedures may not have been followed (eg, surgery before implementation of universal precautions) ([Hellard, 2004](#)).

The importance of these risk factors might differ based on geographic location and population ([USPSTF, 2013](#)); ([CDC, 1998](#)). An estimated 29% of incarcerated persons in North America are HCV-antibody-positive, supporting the recommendation to screen this population for HCV ([Larney, 2013](#)).

Because of shared transmission modes, persons with HIV infection are at risk for HCV. Sexual transmission is a particular risk for HIV-infected men who have unprotected sex with men ([Hosein, 2013](#)); ([van de Laar, 2010](#)). Screening sexually active, non-HIV-infected persons before they start pre-exposure prophylaxis (PrEP) for HIV infection prevention should also be considered ([Volk, 2015](#)).


Recent data support testing in all deceased and living solid organ donors because of the risk of HCV infection posed to the recipient ([Seem, 2013](#)); ([Lai, 2013](#)). Although hepatitis C testing guidelines from the US Centers for Disease Control and Prevention (CDC) and the US Preventive Services Task Force (USPSTF) do not specifically recommend testing immigrants from countries with a high prevalence of HCV infection (eg, Egypt and Pakistan), such persons should be tested if they were born from 1945 through 1965, or if they have risk factors for infection (see [One-Time Testing Recommendations](#)).

CDC established risk-based HCV testing guidelines in 1998 ([CDC, 1998](#)). These guidelines were expanded in 2012 with a recommendation to offer a one-time HCV testing to all persons born from 1945 through 1965 without prior ascertainment of HCV risk factors (see [One-Time Testing Recommendations](#)). This recommendation was supported by evidence demonstrating that a risk-based strategy alone failed to identify more than 50% of HCV infections, due in part to patient underreporting of their risk and provider limitations in ascertaining risk factor information. Furthermore, persons in the 1945 through 1965 birth cohort account for nearly 75% of all HCV infections, with a 5-fold higher prevalence (3.25%) than other adults. This reflects a higher incidence of HCV infections in the 1970s and 1980s (peaking at 230,000 annually in the US, compared to an estimated 30,500 in 2014) ([CDC, 2016](#)). A retrospective analysis published in 2013 showed that 68% of persons with HCV infection would have been identified with a birth cohort testing strategy, whereas only 27% would have been screened with the risk-based approach ([Mahajan, 2013](#)). The cost-effectiveness of one-time birth cohort testing is comparable to that of current risk-based screening strategies ([Smith, 2012](#)).

Both CDC and the USPSTF recommend a one-time HCV test in asymptomatic persons belonging to the 1945 through 1965 birth cohort, as well as other individuals based on exposures, behaviors, and conditions or circumstances that

increase HCV infection risk.


## HCV Testing for Persons With Ongoing Risk Factors

Recommendation for HCV Testing for Persons With Ongoing Risk Factors	
RECOMMENDED	RATING 
Annual HCV testing is recommended for <a href="#">persons who inject drugs</a> and for HIV-infected <a href="#">men who have unprotected sex with men</a> . Periodic testing should be offered to other persons with ongoing risk factors for HCV exposure.	Ila, C

Evidence regarding the frequency of testing in persons at risk for ongoing exposures to HCV is lacking. Therefore, clinicians should determine the periodicity of testing based on the risk of infection or reinfection. Because of the high incidence of HCV infection among persons who inject drugs and HIV-infected men who have unprotected sex with men, HCV testing at least annually is recommended for these populations ([Aberg, 2014](#)); ([Linac, 2012](#)); ([Wandeler, 2012](#)); ([Witt, 2013](#)); ([Bravo, 2012](#)); ([Williams, 2011](#)).

Implementation of clinical decision support tools or prompts for HCV testing in electronic health records could facilitate reminding clinicians of HCV testing when indicated ([Hsu, 2013](#)); ([Litwin, 2012](#)); (<http://nvhr.org/EMR>).

## Initial HCV Testing and Follow-Up

Recommendations for Initial HCV Testing and Follow-Up	
RECOMMENDED	RATING 
An HCV-antibody test is recommended for initial HCV testing. If the result is positive, current infection should be confirmed by a sensitive HCV-RNA test.	I, A
Among persons with a negative HCV-antibody test who are suspected of having liver disease, testing for HCV RNA or follow-up testing for HCV antibody is recommended if exposure to HCV occurred within the past 6 months; testing for HCV RNA can also be considered for persons who are immunocompromised.	I, C
Among persons at risk of reinfection after previous spontaneous or treatment-related viral clearance, initial HCV-RNA testing is recommended because an HCV-antibody test is expected to be positive.	I, C
Quantitative HCV-RNA testing is recommended prior to initiation of antiviral therapy to document the baseline level of viremia (ie, baseline viral load).	I, A
HCV genotype testing is recommended to guide selection of the most appropriate antiviral regimen.	I, A
Persons found to have a positive HCV-antibody test and negative results for HCV RNA by polymerase chain reaction (PCR) should be informed that they do not have evidence of current (active) HCV infection.	I, A

All persons recommended for HCV screening should initially be tested for HCV antibody ([CDC, 2013](#)); ([Alter, 2003](#)) using an assay approved by the US Food and Drug Administration (FDA). FDA-approved tests include laboratory-based assays and a point-of-care assay (ie, OraQuick HCV Rapid Antibody Test [OraSure Technologies]) ([Lee, 2011](#)). The latter is an indirect immunoassay with a sensitivity and specificity similar to those of laboratory-based HCV-antibody assays.

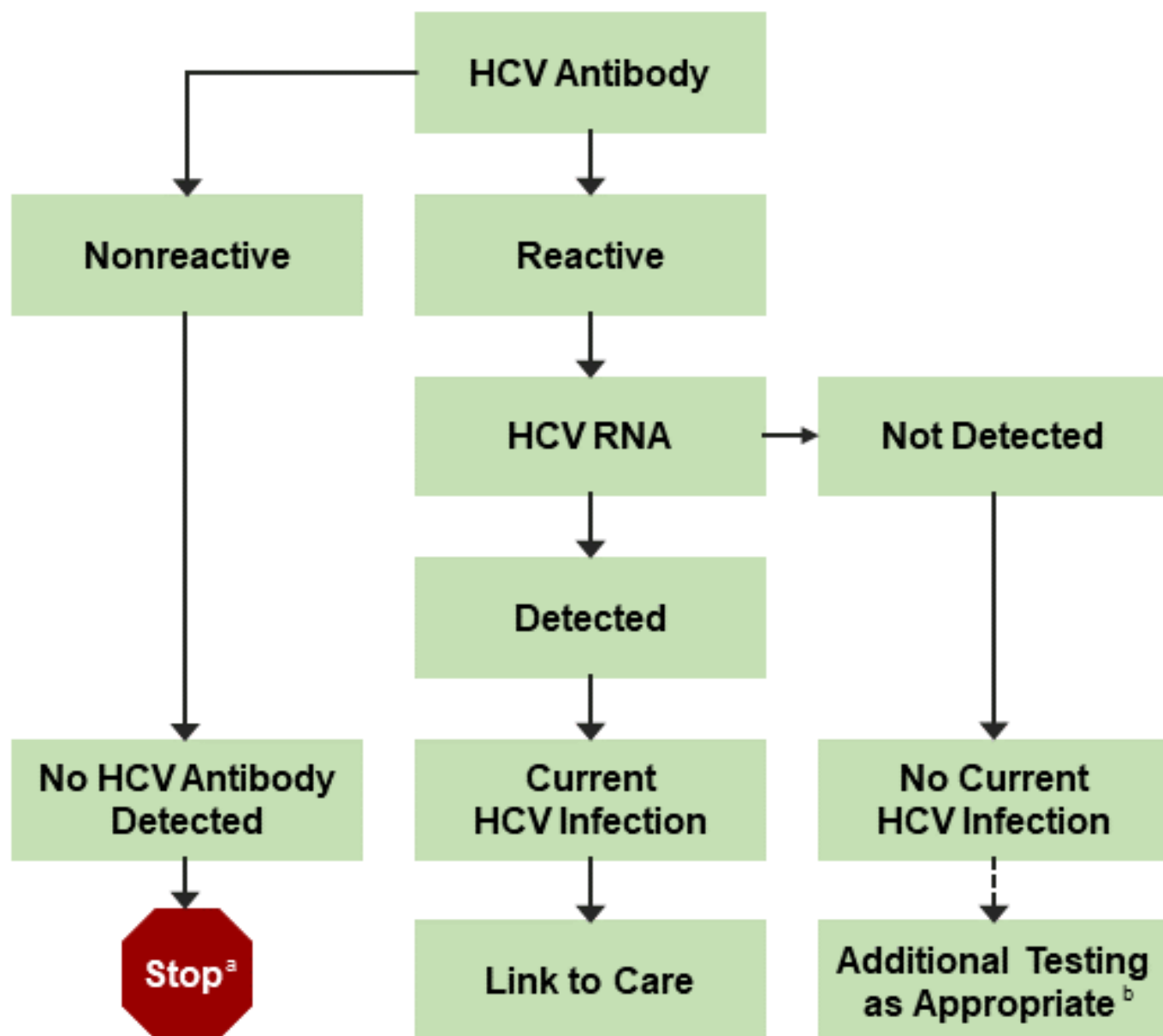
A positive test result for HCV antibody indicates either current (active) HCV infection (acute or chronic), past infection that has resolved, or a false-positive result ([Pawlotsky, 2002](#)). Therefore, an HCV nucleic acid test (NAT) to detect viremia is necessary to confirm active HCV infection and guide clinical management, including initiation of HCV treatment. HCV-RNA testing should also be performed in persons with a negative HCV-antibody test who are either immunocompromised (eg, persons receiving chronic hemodialysis) ([KDIGO, 2008](#)) or who might have been exposed to HCV within the last 6 months because these persons may be HCV-antibody-negative. An HCV-RNA test is also needed to detect reinfection in HCV-antibody-positive persons after previous spontaneous or treatment-related viral clearance.

An FDA-approved quantitative or qualitative NAT with a detection level of 25 IU/mL or lower should be used to detect HCV RNA. Table 1 lists FDA-approved, commercially available HCV-antibody screening assays. Figure 1 shows the CDC-recommended testing algorithm.

**Table 1. FDA-Approved HCV-Antibody Screening Assays**

Assay	Manufacturer	Format
Abbott HCV EIA 2.0	Abbott Laboratories Abbott Park, IL, USA	EIA <sup>a</sup> (manual)
Advia Centaur HCV	Siemens Healthcare Malvern, PA, USA	CIA <sup>b</sup> (automated)
Architect Anti-HCV	Abbott Laboratories Abbott Park, IL, USA	CMIA <sup>c</sup> (automated)
AxSYM Anti-HCV	Abbott Laboratories Abbott Park, IL, USA	MEIA <sup>d</sup> (automated)
OraQuick HCV Rapid Antibody Test	OraSure Technologies, Inc. Bethlehem, PA, USA	Immunochromatographic (manual)
Ortho HCV Version 3.0 ELISA Test System	Ortho-Clinical Diagnostics, Inc. Raritan, NJ, USA	EIA <sup>a</sup> (manual)
VITROS Anti-HCV	Ortho-Clinical Diagnostics, Inc. Raritan, NJ, USA	CIA <sup>b</sup> (automated)
<sup>a</sup> EIA: enzyme immunoassay <sup>b</sup> CIA: chemiluminescent immunoassay <sup>c</sup> CMIA: chemiluminescent microparticle immunoassay <sup>d</sup> MEIA: microparticle enzyme immunoassay Table prepared by Saleem Kamili, PhD, Centers for Disease Control and Prevention.		

Figure 1. CDC-Recommended Testing Sequence for Identifying Current HCV Infection



<sup>a</sup> For persons who might have been exposed to HCV within the past 6 months, testing for HCV RNA or follow-up testing for HCV antibody should be performed. For persons who are immunocompromised, testing for HCV RNA should be performed.

<sup>b</sup> To differentiate past, resolved HCV infection from biologic false positivity for HCV antibody, testing with another HCV-antibody assay can be considered. Repeat HCV-RNA testing if the person tested is suspected to have had HCV exposure within the past 6 months or has clinical evidence of HCV disease, or if there is concern regarding the handling or storage of the test specimen.


Adapted from Centers for Disease Control and Prevention (CDC), 2013 ([CDC, 2013](https://www.cdc.gov/hepatitis/c/hcv/testing/))

Persons who have a positive HCV-antibody test and negative results for HCV RNA by polymerase chain reaction (PCR) should be informed that they do not have laboratory evidence of current HCV infection. Additional HCV testing is typically unnecessary. The HCV-RNA test can be repeated when there is a high index of suspicion for recent infection or in patients with ongoing HCV infection risk.

Clinicians (or patients) may seek additional testing to determine whether a positive HCV-antibody test represents a remote HCV infection that has resolved or a false positive. For patients with no apparent risk for HCV infection, the likelihood of a false-positive HCV-antibody test is directly related to the HCV prevalence in the tested population. False-positive HCV-antibody tests most commonly occur in populations with a low prevalence of HCV infection ([Alter, 2003](#)). If further testing is desired to distinguish between a true positive vs biologic false positivity for HCV antibody, repeat testing may be done with a different FDA-approved, HCV-antibody assay. A biologic false result should not occur with two different assays ([Vermeersch, 2008](#)); ([CDC, 2013](#)).

Prior to initiation of antiviral therapy, quantitative HCV-RNA testing may be used to determine the baseline level of viremia (ie, viral load), which may affect treatment duration with certain regimens. The degree of viral load decline after initiation of treatment is less predictive of sustained virologic response (SVR) in the era of direct-acting antiviral (DAA) therapy compared to previous interferon-based treatment (see [Pretreatment and On-Treatment Monitoring](#)). Testing for HCV genotype helps guide selection of the most appropriate antiviral regimen.

## Counseling Persons With Active HCV Infection

Recommendations for Counseling Persons With Active HCV Infection	
RECOMMENDED	RATING 
Persons with current HCV infection should receive education and interventions aimed at reducing liver disease progression and preventing HCV transmission.	IIa, B
Abstinence from alcohol and, when appropriate, interventions to facilitate cessation of alcohol consumption should be advised for all persons with HCV infection.	IIa, B
Evaluation for other conditions that may accelerate liver fibrosis, including hepatitis B and HIV infections, is recommended for all persons with active HCV infection.	IIb, B
Evaluation for advanced fibrosis using liver biopsy, imaging, and/or noninvasive markers is recommended for all persons with HCV infection to facilitate an appropriate decision regarding HCV treatment strategy, and to determine the need for initiating additional measures for cirrhosis management (eg, hepatocellular carcinoma screening) (see <a href="#">Monitoring</a> section).	I, A
Vaccination against hepatitis A and hepatitis B is recommended for all susceptible persons with HCV infection.	IIa, C
Vaccination against pneumococcal infection is recommended for all patients with cirrhosis.	IIa, C
All persons with HCV infection should be provided education about how to avoid HCV transmission to others.	I, C

In addition to receiving antiviral therapy, HCV-infected persons should be educated about how to prevent further liver damage. Most important is prevention of the potential deleterious effect of alcohol. Numerous studies have found a strong association between excess alcohol use and the development or progression of liver fibrosis, and the development of hepatocellular carcinoma ([Poynard, 1997](#)); ([Harris, 2001](#)); ([Wiley, 1998](#)); ([Corrao, 1998](#)); ([Bellentani, 1999](#)); ([Noda, 1996](#)); ([Safdar, 2004](#)).

Daily consumption of more than 50 grams of alcohol has a high likelihood of worsening fibrosis. Some studies indicate that daily consumption of smaller amounts of alcohol also has a deleterious effect on the liver; however, these data are controversial ([Westin, 2002](#)); ([Younossi, 2013b](#)); ([Hagström, 2017](#)). Excess alcohol intake may also cause steatohepatitis. Alcohol screening and brief interventions, such as those outlined by the [National Institute on Alcohol Abuse and Alcoholism](#), have been demonstrated to reduce alcohol consumption and episodes of binge drinking in the general population and among HCV-infected persons who consume alcohol heavily ([Whitlock, 2004](#)); ([Dieperink, 2010](#)); ([Proeschold-Bell, 2012](#)). Persons identified as abusing alcohol and having alcohol dependence require treatment and consideration for referral to an addiction specialist.

Hepatitis B virus (HBV) and HIV coinfection have been associated with a poorer HCV prognosis in cohort studies ([Zarski, 1998](#)); ([Thein, 2008a](#)); ([Kruse, 2014](#)); ([Puoti, 2017b](#)). Because of overlapping risk factors for these infections and benefits associated with their identification and treatment, HCV-infected persons should be tested for HIV antibody and hepatitis B surface antigen (HBsAg) using standard screening assays ([Moyer, 2013](#)); ([CDC, 2008](#)); (see [USPSTF HIV screening recommendations](#) and [CDC hepatitis B screening recommendations](#)). Patients should also be counseled about how to reduce their risk of acquiring these infections, including through HBV vaccination.

Patients with obesity and metabolic syndrome having underlying insulin resistance are at increased risk for nonalcoholic fatty liver disease, which is a risk factor for accelerated fibrosis progression in HCV-infected persons ([Hourigan, 1999](#)); ([Ortiz, 2002](#)). Therefore, HCV-infected persons who are overweight or obese (defined by a body mass index of 25 to 29.9 kg/m<sup>2</sup>, and ≥30 kg/m<sup>2</sup>, respectively) should be counseled regarding strategies to reduce body weight and improve insulin resistance via diet, exercise, and medical therapies ([Musso, 2010](#)); ([Shaw, 2006](#)). HCV-infected patients with hyperlipidemia or cardiovascular comorbidities may also benefit from lipid-lowering drugs. Prospective studies have demonstrated the safety and efficacy of statins in patients with chronic HCV and others with compensated chronic liver disease ([Kamal, 2017](#)); ([Lewis, 2007](#)). Therefore, these agents should not be withheld from HCV-infected patients.

The severity of liver disease associated with chronic HCV infection is a key factor in determining the initial and follow-up evaluation of patients. Although patients with more advanced disease may have a lower response to HCV therapy, they are also most likely to derive the greatest survival benefit ([Ghany, 2011](#)). A liver biopsy can provide objective, semiquantitative information regarding the amount and pattern of collagen or scar tissue in the liver, which can help inform the development of treatment and monitoring plans. The Metavir fibrosis score (F0 to F4) and Ishak fibrosis score (0 to 6) are commonly used to quantify the amount of hepatic collagen. A liver biopsy can also help assess the severity of liver inflammation and hepatic steatosis, and aid in excluding competing causes of liver injury ([Kleiner, 2005](#)). However, the procedure has a low but real risk of complications, and sampling artifact makes its serial use in most patients less desirable ([Regev, 2002](#)).

Noninvasive methods frequently used to estimate liver disease severity include:

- Liver-directed physical exam (normal in most patients)
- Routine blood tests (eg, ALT, AST, albumin, bilirubin, international normalized ratio [INR], and CBC with platelet count)
- Serum fibrosis marker panels
- Liver imaging (eg, ultrasound, or CT scan)
- Transient elastography

Simple calculations derived from routine blood tests—such as the serum AST-to-platelet ratio index ([APRI](#)) ([Wai, 2003](#)) and fibrosis-4 ([FIB-4](#)) ([Sterling, 2006](#))—as well as assessment of liver surface nodularity and spleen size by liver ultrasound or other cross-sectional imaging modalities can help determine if patients with HCV have occult portal hypertension. The presence of portal hypertension is associated with a greater likelihood of developing future hepatic complications in untreated patients ([Chou, 2013](#)); ([Rockey, 2006](#)).

Liver elastography provides instant information regarding liver stiffness at the point of care and can reliably distinguish patients with a high versus low likelihood of cirrhosis ([Castera, 2012](#)); ([Bonder, 2014](#)). A more detailed discussion regarding fibrosis assessment is found in the [When and In Whom to Initiate Therapy](#) section.

Because persons with known or suspected bridging fibrosis and cirrhosis are at increased risk of developing complications of advanced liver disease, they require frequent follow-up. They should also avoid hepatotoxic drugs, such as excessive acetaminophen (>2 g/d) and certain herbal supplements. Nephrotoxic drugs, such as nonsteroidal anti-inflammatory drugs, should also be avoided. Ongoing imaging surveillance for liver cancer and gastroesophageal varices is also recommended for these patients ([Sangiovanni, 2006](#)); ([Fontana, 2010](#)). Persons with cirrhosis are more susceptible to invasive pneumococcal infection ([Marrie, 2011](#)) and should receive pneumococcal vaccination ([CDC, 2012](#)).


Exposure to infected blood is the primary mode of HCV transmission. HCV-infected persons must be informed of the precautions needed to avoid exposing others to infected blood. This is particularly important for persons who use injection drugs given that HCV transmission in this population primarily results from sharing needles and other contaminated drug injection equipment. Epidemics of acute HCV due to sexual transmission in HIV-infected men who have sex with men have also been described recently ([van de Laar, 2009](#)); ([Urbanus, 2009](#)); ([Fierer, 2008](#)). Table 2 outlines measures to avoid HCV transmission. HCV is not spread by sneezing, hugging, holding hands, coughing, or sharing eating utensils or drinking glasses, nor is it transmitted through food or water.

**Table 2. Measures to Prevent HCV Transmission**

HCV-infected persons should be counseled to avoid sharing toothbrushes and dental or shaving equipment, and be cautioned to cover any bleeding wound to prevent the possibility of others coming into contact with their blood.
Persons should be counseled to stop using illicit drugs and enter substance abuse treatment. Those who continue to inject drugs should be counseled to: <ul style="list-style-type: none"> <li>• Avoid reusing or sharing syringes, needles, water, cotton, and other drug preparation equipment.</li> <li>• Use new sterile syringes and filters, and disinfected cookers.</li> <li>• Clean the injection site with a new alcohol swab.</li> <li>• Dispose of syringes and needles after 1 use in a safe, puncture-proof container.</li> </ul>
Persons with HCV infection should be advised not to donate blood and to discuss HCV serostatus prior to donation of body organs, other tissue, or semen.
Persons with HIV infection and those with multiple sexual partners or sexually transmitted infections should be encouraged to use barrier precautions to prevent sexual transmission. Other persons with HCV infection should be counseled that the risk of sexual transmission is low and may not warrant barrier protection.
Household surfaces and implements contaminated with visible blood from an HCV-infected person should be cleaned using a dilution of 1 part household bleach to 9 parts water. Gloves should be worn when cleaning up blood spills.



## Linkage to Care

Recommendation for Linkage to Care	
RECOMMENDED	RATING 
All persons with active HCV infection should be linked to a clinician who is prepared to provide comprehensive management.	Ila, C

Improvement in identification of active HCV infection and advances in treatment regimens will have limited impact on HCV-related morbidity and mortality without concomitant improvement in linkage to care. All patients with current HCV infection and a positive HCV-RNA test result should be evaluated by a clinician with expertise in assessment of liver disease severity and HCV treatment. Subspecialty care and consultation are required for persons with HCV infection who have advanced fibrosis or cirrhosis (Metavir stage  $\geq$ F3), including possible referral for consideration of liver transplantation.

In the United States, only an estimated 13% to 18% of HCV-infected persons had received treatment by 2013 ([Holmberg, 2013](#)). Lack of appropriate clinician assessment and delays in linkage to care can result in negative health outcomes. Furthermore, patients who are lost to follow-up fail to benefit from evolving evaluation and treatment options.

Commonly cited patient-related barriers to treatment initiation include contraindications to treatment (eg, medical or psychiatric comorbidities); lack of acceptance of treatment (eg, asymptomatic nature of disease, competing priorities, low treatment efficacy, long treatment duration, and adverse effects); and lack of access to treatment (eg, cost and distance to specialist) ([Khokhar, 2007](#)); ([Arora, 2011](#)); ([Clark, 2012](#)).

Common clinician-related barriers include perceived patient-related barriers (eg, fear of adverse effects, treatment duration, cost, and effectiveness); lack of expertise in HCV treatment; lack of specialty referral resources; resistance to treating persons currently using illicit drugs or alcohol; and concern about the cost of HCV treatment ([Morrill, 2005](#)); ([Reilley, 2013](#)); ([McGowan, 2013](#)).

Data are lacking to support exclusion of HCV-infected persons from considerations for hepatitis C therapy based on the amount of alcohol intake or use of illicit drugs. Based on data from interferon-based treatment, SVR rates among people who inject drugs are comparable to those among people who do not inject drugs ([Aspinall, 2013](#)). Some possible strategies to address barriers to HCV treatment are listed in Table 3.

**Table 3. Common Barriers to HCV Treatment and Potential Strategies**

Barrier	Strategy
Contraindications to treatment (eg, comorbidities, substance abuse, and psychiatric disorders)	<ul style="list-style-type: none"> <li>• Conduct counseling and education</li> <li>• Refer for services (eg, psychiatry and opioid substitution therapy)</li> <li>• Optimize treatment with simpler, less toxic regimens</li> </ul>
Competing priorities and loss to follow-up	<ul style="list-style-type: none"> <li>• Conduct counseling and education</li> <li>• Engage case managers and patient navigators (HIV model)</li> <li>• Co-localize services (eg, primary care, medical homes, and drug treatment)</li> </ul>
Long treatment duration and adverse effects	<ul style="list-style-type: none"> <li>• Optimize treatment with simpler, better tolerated regimens</li> <li>• Conduct appropriate education and monitoring</li> <li>• Utilize directly observed therapy (tuberculosis model)</li> </ul>
Lack of access to treatment (eg, high cost, lack of insurance, geographic distance, and/or lack of availability of specialists)	<ul style="list-style-type: none"> <li>• Leverage expansion of coverage through the Patient Protection and Affordable Care Act</li> <li>• Participate in models of care involving close collaboration between primary care clinicians and specialists</li> <li>• Liaise with pharmaceutical patient assistance programs</li> <li>• Co-localize services (primary care, medical homes, drug treatment)</li> </ul>
Lack of practitioner expertise	<ul style="list-style-type: none"> <li>• Collaborate with specialists (eg, Project ECHO-like models and telemedicine)</li> <li>• Develop accessible, clear HCV treatment guidelines</li> <li>• Develop electronic health record performance measures and clinical decision support tools (eg, pop-up reminders and standing orders)</li> </ul>

One strategy that addresses several barriers is co-localization (integrated care) of HCV screening, evaluation, and treatment with other medical or social services. Co-localization has already been applied to settings with a high prevalence of HCV infection (eg, correctional facilities, needle exchange programs, substance abuse treatment centers, and methadone maintenance facilities) but this type of care is not uniformly available ([Islam, 2012](#)); ([Stein, 2012](#)); ([Bruggmann, 2013](#)). A study conducted by Ho and colleagues demonstrated that integrated care—consisting of multidisciplinary care coordination and patient case management—increased the proportion of patients with HCV infection and psychiatric illness or substance use who begin antiviral therapy and achieve a sustained virologic response, without serious adverse events ([Ho, 2015](#)).

A strategy that addresses lack of access to specialists—a primary barrier to hepatitis C care—is participation in models involving close collaboration between primary care practitioners and subspecialists ([Arora, 2011](#)); ([Rossaro, 2013](#));

([Miller, 2012](#)). Such collaborations have used telemedicine and knowledge networks to overcome geographic distances to specialists ([Arora, 2011](#)); ([Rossaro, 2013](#)). For example, Project ECHO ([Extension for Community Healthcare Outcomes](#)) uses videoconferencing to enhance primary care practitioner capacity in rendering HCV care and treatment to New Mexico's large rural and underserved population ([Arora, 2011](#)). Through case-based learning and real-time feedback from a multidisciplinary team of specialists (gastroenterology, infectious disease, pharmacology, and psychiatry practitioners), Project ECHO has expanded access to HCV treatment in populations that might have otherwise remained untreated. The short duration of treatment and few serious adverse events associated with DAA therapy present an opportunity to expand the number of midlevel practitioners and primary care physicians engaged in the management and treatment of HCV infection.

Additional strategies for enhancing linkage to and retention in care could be adapted from other fields, such as tuberculosis and HIV. For example, use of directly observed therapy has enhanced adherence to tuberculosis treatment, and use of case managers and patient navigators has reduced loss of follow-up in HIV care ([Govindasamy, 2012](#)). Recent hepatitis C testing and care programs have identified the use of patient navigators or care coordinators as important interventions in overcoming challenges associated with linkage to and retention in care ([Trooskin, 2015](#)); ([Coyle, 2015](#)). Ongoing assessment of efficacy and comparative effectiveness of this and additional strategies is a crucial area of future research for patients with HCV infection. Replication and expansion of best practices and new models for linkage to HCV care will also be crucial to maximize the public health impact of newer treatment paradigms.

**Last update:** May 24, 2018

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