HEPATITIS C

Jassin M. Jouria, MD

Dr. Jassin M. Jouria is a medical doctor, professor of academic medicine, and medical author. He graduated from Ross University School of Medicine and has completed his clinical clerkship training in various teaching hospitals throughout New York, including King’s County Hospital Center and Brookdale Medical Center, among others. Dr. Jouria has passed all USMLE medical board exams, and has served as a test prep tutor and instructor for Kaplan. He has developed several medical courses and curricula for a variety of educational institutions. Dr. Jouria has also served on multiple levels in the academic field including faculty member and Department Chair. Dr. Jouria continues to serves as a Subject Matter Expert for several continuing education organizations covering multiple basic medical sciences. He has also developed several continuing medical education courses covering various topics in clinical medicine. Recently, Dr. Jouria has been contracted by the University of Miami/Jackson Memorial Hospital’s Department of Surgery to develop an e-module training series for trauma patient management. Dr. Jouria is currently authoring an academic textbook on Human Anatomy & Physiology.

Abstract

Hepatitis C is a viral disease of the liver that is responsible for the death of over 350,000 people worldwide per year. However, there are six genotypes of the Hepatitis C virus and not all require treatment — some resolve on their own without medical intervention. Additionally, in many countries with modern healthcare services, treatment options are available to manage chronic forms of the virus. No vaccine is available, but exposure to the virus can be limited through universal precautions. This course aims to refresh the registered nurse’s approach to management in a patient with the Hepatitis C virus.
Continuing Nursing Education Course Director & Planners
William A. Cook, PhD, Director, Douglas Lawrence, MA, Webmaster,
Susan DePasquale, CGRN, MSN, FPMHNP-BC, Lead Nurse Planner

Accreditation Statement
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Credit Designation
This educational activity is credited for 2.5 hours. Nurses may only claim credit commensurate with the credit awarded for completion of this course activity.

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Statement of Need
Nurses at all levels of professional development need an enhanced understanding of hepatitis C in order to understand disease etiology, pathology, prevention, prognosis, and ongoing patient treatment and care.

Course Purpose
To provide nursing professionals with knowledge of hepatitis C diagnosis, prevention, prognosis and treatment.
Learning Objectives

1. Differentiate between the different types of Hepatitis.
2. Identify common symptoms of Hepatitis C.
3. Describe common transmission sources for Hepatitis C.
4. Explain Hepatitis C diagnostic tools.
5. Describe the role of medication in Hepatitis C treatment.
6. Describe the prognosis for an otherwise healthy patient with Hepatitis C.

Target Audience

Advanced Practice Registered Nurses, Registered Nurses, Licensed Practical Nurses, and Associates

Course Author & Director Disclosures

Jassin M. Jouria, MD, William S. Cook, PhD, Douglas Lawrence, MA, Susan DePasquale, CGRN, MSN, FPMHNP-BC – all have no disclosures

Acknowledgement of Commercial Support

There is no commercial support for this course.

Activity Review Information

Reviewed by Susan DePasquale, CGRN, MSN, FPMHNP-BC

Release Date: 4/15/2015 Termination Date: 4/15/2018

Please take time to complete the self-assessment Knowledge Questions before reading the article. Opportunity to complete a self-assessment of knowledge learned will be provided at the end of the course.
1. According to the Center for Disease Control, there are approximately ___________ new Hepatitis C infections annually.
   a. 5,000 – 10,000
   b. 10,000 – 15,000
   c. 15,000 – 20,000
   d. 21,000 – 25,000

2. Which of the following organs does Hepatitis C affect?
   a. Heart
   b. Liver
   c. Brain
   d. Kidneys

3. Hepatitis C is transmitted through which following substance?
   a. Blood
   b. Feces
   c. Saliva
   d. Semen

4. The most common form of transmission of Hepatitis C is:
   a. Vertical transmission
   b. Sexual Contact
   c. Unwashed hands
   d. Injection drug use

5. What are the symptoms of hepatitis?
   a. Fatigue
   b. Low fever
   c. Nausea
   d. All of the above
Introduction

Hepatitis C is a viral disease of the liver that is responsible for the death of over 350,000 people worldwide per year. However, there are six genotypes of the Hepatitis C virus and not all require treatment — some resolve on their own without medical intervention. Additionally, in many countries with modern healthcare services, treatment options are available to manage chronic forms of the virus. No vaccine is available, but exposure to the virus can be limited through universal precautions.

Hepatitis C is one of the leading causes of chronic liver disease and is the most common blood borne virus in the United States.\(^1\) While the virus can be transmitted through any contact with infected blood, the most common method of transmission is through injection drug use.\(^2\) In fact, approximately fifty percent of injection drug users are infected with Hepatitis C.\(^3\) According to the Center for Disease Control (CDC), there are approximately 15,000 – 20,000 new cases of Hepatitis C each year, with approximately 15,000 people dying of the virus annually.\(^4\) In most instances, death occurs as the result of end stage liver disease.\(^5\) However, while the CDC does collect information regarding new infections, the number of new cases is not completely accurate. The CDC is only able to report on those cases that are identified, which are typically chronic, symptomatic cases of Hepatitis C. In addition to these cases, a number of individuals remain undiagnosed due to as they have asymptomatic, acute Hepatitis C, which is difficult to identify.\(^6\)

While some patients will only experience acute hepatic infection, a number of individuals will develop chronic hepatitis, which can cause lifelong complications. In these cases, the patient will require regular monitoring and treatment to prevent the progression of the disease and repair any damage.
Individuals with chronic hepatitis are at risk of developing other disease and must be vaccinated to co-infection and subsequent liver damage. While Hepatitis C can be a lifelong illness, it will not cause extensive damage if properly managed.

**Differentiating Types Of Hepatitis**

There are five different types of hepatitis: A, B, C, D, and E. Of these, A, B, and C are the most common and widespread forms of the virus. Each strain affects the body differently and requires different treatment.

**Hepatitis A**

Hepatitis A is caused by the Hepatitis virus and is the mildest form of hepatitis infection. The virus is spread through feces and is commonly transmitted when an individual accidentally ingests fecal matter, typically through contaminated objects such as food, drinks or other objects. The illness can last as little as a few days or as long as a few months, and it will range in severity from very mild to quite severe.

**Hepatitis B**

Hepatitis B is caused by the Hepatitis B virus and is transmitted primarily through blood. In some instances, the virus will be transmitted through other body fluids (semen, vaginal fluid, etc.), but the concentrations of the virus are much lower in these fluids. Transmission occurs when and individual comes into contact with these infected fluids through needle sharing or sexual contact. The virus is also spread from an infected mother to her child at birth. The illness can either be acute or chronic, depending on a variety of factors, and will range in severity from a mild illness to a severe illness.
Hepatitis C

Hepatitis C is caused by the Hepatitis C virus and is the most common blood borne infection in the United States. The virus is transmitted through blood and is most common in injection drug users. While it is possible for Hepatitis C to be transmitted through sexual contact, it is quite rare. Hepatitis C infection can be acute or chronic and will range in severity on an individual basis. Most patients will be asymptomatic for a number of months, but as the disease progresses, they will begin to show signs of the illness. Approximately 74% of individuals with the virus will transition to the chronic phase of infection. The following fact sheet from the Center for Disease Control provides a thorough comparison of the three primary forms of Hepatitis: A, B and C.

<table>
<thead>
<tr>
<th>U.S. Statistics</th>
<th>HEPATITIS A is caused by the Hepatitis A virus (HAV)</th>
<th>HEPATITIS B is caused by the Hepatitis B virus (HBV)</th>
<th>HEPATITIS C is caused by the Hepatitis C virus (HCV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated 17,000 new infections in 2010</td>
<td>Estimated 38,000 new infections in 2010</td>
<td>Estimated 17,000 new infections in 2010</td>
<td></td>
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<tr>
<td>Estimated 1.2 million people with chronic HBV infection</td>
<td>Estimated 1.2 million people with chronic HCV infection</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Routes of Transmission</th>
<th>Ingestion of fecal matter, even in microscopic amounts, from:</th>
<th>Contact with infectious blood, semen, and other body fluids, primarily through:</th>
<th>Contact with blood of an infected person, primarily through:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close person-to-person contact with an infected person</td>
<td>Birth to an infected mother</td>
<td>Sharing of contaminated needles, syringes, or other injection drug equipment</td>
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<tr>
<td>Sexual contact with an infected person</td>
<td>Sexual contact with an infected person</td>
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<tr>
<td>Ingestion of contaminated food or drinks</td>
<td>Sharing of contaminated needles, syringes or other injection drug equipment</td>
<td>Needlesticks or other sharp instrument injuries</td>
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<tr>
<td>Ingestion of contaminated food or drinks</td>
<td>Sharing of contaminated needles, syringes or other injection drug equipment</td>
<td>Needlesticks or other sharp instrument injuries</td>
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<tr>
<td>Travelers to regions with intermediate or high rates of Hepatitis A</td>
<td>Infants born to infected mothers</td>
<td>Infants born to infected mothers</td>
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<tr>
<td>Sex contacts of infected persons</td>
<td>Sex partners of infected persons</td>
<td>Sex partners of infected persons</td>
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<tr>
<td>Household members or caregivers of infected persons</td>
<td>Persons with multiple sex partners</td>
<td>Persons with multiple sex partners</td>
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<tr>
<td>Men who have sex with men</td>
<td>Persons with sexually transmitted disease (STD)</td>
<td>Persons with sexually transmitted disease (STD)</td>
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<tr>
<td>Users of certain illegal drugs (injection and non-injection)</td>
<td>Men who have sex with men</td>
<td>Men who have sex with men</td>
<td></td>
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<tr>
<td>Persons with clotting-factor disorders</td>
<td>Injection drug users</td>
<td>Injection drug users</td>
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<td></td>
<td>Household contacts of infected persons</td>
<td>Household contacts of infected persons</td>
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<td></td>
<td>Healthcare and public safety workers exposed to blood on the job</td>
<td>Healthcare and public safety workers exposed to blood on the job</td>
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<td></td>
<td>Hemodialysis patients</td>
<td>Hemodialysis patients</td>
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<td></td>
<td>Residents and staff of facilities for developmentally disabled persons</td>
<td>residents and staff of facilities for developmentally disabled persons</td>
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<td></td>
<td>Current or former injection drug users</td>
<td>Current or former injection drug users</td>
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<td></td>
<td>Recipients of clotting factor concentrates before 1987</td>
<td>Recipients of clotting factor concentrates before 1987</td>
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<td></td>
<td>Recipients of blood transfusions or donated organs before July 1992</td>
<td>Recipients of blood transfusions or donated organs before July 1992</td>
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<td></td>
<td>Long-term hemodialysis patients</td>
<td>Long-term hemodialysis patients</td>
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<td></td>
<td>Persons with known exposures to HCV (i.e., healthcare workers after needlesticks, recipients of blood or organs from a donor who later tested positive for HCV)</td>
<td>Persons with known exposures to HCV (i.e., healthcare workers after needlesticks, recipients of blood or organs from a donor who later tested positive for HCV)</td>
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<tr>
<td></td>
<td>HIV-infected persons</td>
<td>HIV-infected persons</td>
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<td></td>
<td>Infants born to infected mothers</td>
<td>Infants born to infected mothers</td>
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<tr>
<td><strong>Incubation Period</strong></td>
<td>15 to 50 days (average: 28 days)</td>
<td>45 to 160 days (average: 120 days)</td>
<td>14 to 180 days (average: 45 days)</td>
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<tr>
<td><strong>Symptoms of Acute Infection</strong></td>
<td>Symptoms of all types of viral hepatitis are similar and can include one or more of the following: • Fever • Fatigue • Loss of appetite • Nausea • Vomiting • Abdominal pain • Gray-colored bowel movements • Joint pain • Jaundice</td>
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<tr>
<td><strong>Likelihood of Symptomatic Acute Infection</strong></td>
<td>• &lt; 10% of children &lt; 6 years have jaundice • 40%–50% of children age 6–14 years have jaundice • 70%–80% of persons &gt; 14 years have jaundice</td>
<td>• &lt; 1% of infants &lt; 1 year develop symptoms • 5%–15% of children age 1–5 years develop symptoms • 30%–50% of persons &gt; 5 years develop symptoms</td>
<td><strong>Note:</strong> Symptoms appear in 5%–15% of newly infected adults who are immunosuppressed</td>
</tr>
<tr>
<td><strong>Potential for Chronic Infection</strong></td>
<td>None</td>
<td>• Among unimmunized persons, chronic infection occurs in &gt;90% of infants, 25%–50% of children aged 1–5 years, and 6%–10% of older children and adults</td>
<td>• 75%–85% of newly infected persons develop chronic infection • 15%–25% of newly infected persons clear the virus</td>
</tr>
<tr>
<td>Severity</td>
<td>Most persons with acute disease recover with no lasting liver damage; rarely fatal</td>
<td>Most persons with acute disease recover with no lasting liver damage; acute illness is rarely fatal</td>
<td>Acute illness is uncommon. Those who do develop acute illness recover with no lasting liver damage.</td>
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<td></td>
<td>• 15%–25% of chronically infected persons develop chronic liver disease, including cirrhosis, liver failure, or liver cancer</td>
<td>• Estimated 3,000 persons in the United States die from HBV-related illness per year</td>
<td>• 60%–70% of chronically infected persons develop chronic liver disease</td>
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<tr>
<td></td>
<td>• Estimated 3,000 persons in the United States die from HBV-related illness per year</td>
<td>• 5%–20% develop cirrhosis over a period of 20–30 years</td>
<td>• Estimated 12,000 persons in the United States die from HCV-related illness per year</td>
</tr>
</tbody>
</table>

Hepatitis A, B and C are the three most common forms of Hepatitis in the United States. However, other forms of the virus do exist. These other strains of the virus are quite rare and not related to Hepatitis A, B and C.

**Hepatitis D**

Hepatitis D is caused by the Hepatitis D virus and is unrelated to the Hepatitis A, B and C virus. Hepatitis D is transmitted through blood, but can only be acquired by individuals who are already infected with Hepatitis B, as Hepatitis D requires HBV to replicate. Hepatitis D can be either acute or chronic and will range in severity.\(^1\)
Hepatitis E

Hepatitis E is caused by the Hepatitis E virus and is transmitted through fecal matter. The virus is rare in the United States, but is commonly found in other regions of the world and is commonly transmitted through outbreaks of contaminated water. Hepatitis E infection is acute and will range in severity.12

Symptoms Of Hepatitis C

Most individuals will experience a range of symptoms associated with Hepatitis C. In the early stages of infection, the symptoms will be mild and difficult to differentiate from common flu symptoms.13 However, as the disease progresses, they symptoms will become more pronounced and the patient will develop additional symptoms that are indicative of Hepatitis infection, such as jaundice. Initial symptoms of acute infection will often develop within 2 weeks to six months of exposure, while symptoms of chronic infection can take as long as thirty years to develop.14 Chronic symptoms will often occur after significant damage has been done to the liver, and are typically indicative of advanced illness.7

Fatigue

Chronic fatigue is the most common symptom associated with Hepatitis C. In fact, approximately 65 – 75 % of infected individuals will experience chronic fatigue. In most instances, fatigue is caused by damage to the liver, which affects the liver’s ability to convert food into glucose. When the liver converts food into glucose, it stores and releases it as needed for energy. When the liver is damaged, it is unable to maintain the regular production and subsequent release of glucose, thereby preventing the body from receiving proper energy.15
**Fever**

A low-grade fever is often a symptom of Hepatitis C. In many instances, the fever will be one of the only symptoms an individual will experience, which leads to misdiagnosis and improper treatment. In many patients, the fever will be recurring and will cause slight discomfort. Very few patients will experience a high fever as a symptom of Hepatitis C, but it is possible, especially if the individual is co-infected or is on medication that can cause an increase in body temperature.\(^{16}\)

**Nausea**

Nausea is a common symptom of Hepatitis C and can occur in both the acute and chronic stage of the illness. Some patients will experience chronic nausea, while others will only experience intermittent bouts. In some patients, the nausea will be severe and will impact the individual’s ability to eat or drink. However, other individuals may only experience mild feelings of general queasiness.\(^{17}\)

**Muscle and Joint Pain**

Muscle and joint pain is common in patients with Hepatitis C and can be the result of a variety of factors. It is especially common for patients to experience pain in the small joints of the hands, wrists and ankles. Many individuals will experience chronic joint pain similar to arthritis, while others will only experience mild pain that does not interfere with daily living.\(^{18}\)

**Jaundice**

Jaundice is a yellowish tinge to the white part of the eyes and the skin that is caused by an excessive amount of bilirubin in the blood. The term hyperbilirubinemia is used to describe the excess amount of bilirubin in the blood.
blood. The shade of yellow will vary depending on the amount of excess bilirubin in the blood. Patients who are experiencing mild elevation of bilirubin levels will typically display a yellowish tint. However, patients who have highly elevated levels of bilirubin may have a discoloration that appears dark yellow or brownish.

Bilirubin is a waste product that is left in the bloodstream after iron has been removed from the hemoglobin. The liver is responsible for filtering out the leftover bilirubin from the blood. When the liver is functioning properly, it filters the bilirubin, which becomes part of bile and is excreted through the liver. The bile is used by the body to digest food and break it down into essential nutrients. When the liver is not functioning properly, it is unable to adequately manage bilirubin processing. In damaged livers, bile production is disrupted, thereby impacting the proper management of bilirubin levels and causing excess levels in the body. This excess bilirubin is what causes the yellowing of the skin and whites of the eyes.

**Disease Transmission**

Hepatitis C is transmitted through the blood of infected individuals, and is most common in individuals who share needles. Hepatitis C can be transmitted through sexual contact or between mother and child during childbirth, but these methods of transmission are not as common as needle sharing. The following section provides full descriptions of each potential method of transmission and the level of risk involved.

**Needles/Sharps**

Hepatitis C virus can be transmitted through shared and needle stick injuries in healthcare settings. Sharps and needle stick injuries are a high concern in
the prevention of hepatitis C transmission. Healthcare workers and individuals who share personal items, such as razors or reuse needles, are at risk for disease transmission. The CDC website provides helpful information related to needle stick/sharp injuries as well as recommendations to prevent exposure. For healthcare professionals, in particular, the CDC recommends that individuals exposed to blood through needle stick and other sharps injuries follow current best practice guidelines to prevent such injuries and for follow up with a medical provider should it occur. Healthcare workers are encouraged to use blunt-tip needles for suturing and safety protective caps when delivering patient treatment. For further review of CDC recommendations, the following website is available at: http://www.cdc.gov/niosh/docs/2000-108/.

Transfusions/Transplants

Prior to thorough blood screening protocol, the risk of obtaining HCV through a blood transfusion was approximately 30%. With the establishment of universal screening, HCV antibody testing, and HCV nucleic acid testing with all blood donations, the risk of obtaining HCV through a blood transfusion has decreased to 1 in 2 million. To ensure that blood transfusions pose no risk of HCV transmission, blood banks utilize a multi-pronged system that uses 3rd generation enzyme-linked immunosorbent assay (ELISA) and NAT screening of multiple samples.23

Intravenous Drug Use

Intravenous (IV) drug use is the most common mechanism of transmission of the hepatitis C virus. At least fifty percent of all Hepatitis C cases are caused by sharing needles during IV drug use. The following fact sheet,
provided by the Center for Disease Control provides a thorough explanation of the relationship between Hepatitis C and injection drug use.²⁴

**Center for Disease Control: Fact Sheet - Viral Hepatitis and Injection Drug Users**

Because HBV and HCV are transmitted through exposure to infected blood and body fluids, IDUs are at very high risk of acquiring and transmitting both viruses. For example, it is estimated that 60%, or 17,000, of the 30,000 new cases of HCV that occurred in 2000 occurred among IDUs. Is it estimated that 17%, or 13,000 of the 73,000 new cases of hepatitis B that occurred in 2000, occurred among IDUs.

HBV and HCV infections are also acquired relatively rapidly among IDUs. Within 5 years of beginning injection drug use, 50%-70% of IDUs become infected with HBV. Between 50%-80% of IDUs become infected with HCV within 5 years of beginning injection drug use; it is usually the first blood borne virus they acquire. Several factors favor the rapid spread of HCV infection among IDUs:

- **Viral factors** – HCV is transmitted efficiently through blood exposure.
- **Host factors** – A large number of individuals are infected and this provides multiple opportunities for transmission to others.
- **IDU factors** – IDUs often jointly purchase drugs and prepare the drug solution together; this solution is divided among users. Sharing the drug solution, syringes, or other drug preparation equipment (such as water, drug mixing containers, and cotton filters) all increase the risk of transmission if any of these components are infected with HCV. Other circumstances also contribute to the heavy impact of viral hepatitis on IDUs:
  - IDUs are at very high risk of coinfection with HIV and HCV.
  - Many IDUs drink alcohol, which damages the liver and accelerates the progression of liver disease.
  - HAV infection can be severe and very dangerous in those who already have liver disease from chronic hepatitis B or chronic hepatitis C.
  - Treatment of chronic hepatitis B or chronic hepatitis C can be complicated and adherence difficult for infected IDUs because many have other conditions (HIV, mental illness, alcoholism, other illnesses), are poor, and have unstable living situations. The stigma surrounding injecting drugs also means that many IDUs are marginalized and have little or no contact with health care providers.
Tattoos/Piercings

There is very little risk of acquiring Hepatitis C from a tattoo or piercings, as long as it is done in a regulated, professional setting. Licensed tattoo artists and body piercers are required to adhere to health and safety guidelines that eliminate the risk of transmitting various viruses, including Hepatitis C. However, the risk of transmission is much higher in unregulated, unlicensed settings.25

Personal Care Items

While there is some possibility that individuals can acquire Hepatitis C from personal care items, the risk is relatively low. According to the Center for Disease Control, “the number of persons acquiring HCV via household contact with a person infected with HCV is extremely low. These cases would most likely involve sharing a razor or toothbrush, since this process could involve transmission via a blood-tainted device.”3

Sexual Intercourse

The risk of sexual transmission of Hepatitis C is relatively low, but it is still a concern. Approximately fifteen percent of Hepatitis C cases are caused by sexual transmission, but it is difficult to truly determine the cause of many of these cases as a number of the individuals also engaged in IV drug use. The risk of sexual transmission of Hepatitis C is much lower than the risk of transmission through injection drug use.26

Vertical Transmission (Perinatal)

Hepatitis C is transmitted from mother to child in less than ten percent of childbirth instances. Perinatal transmission is most common in instances when the mother has detectable levels of Hepatitis C virus RNA in their
plasma during pregnancy. Transmission occurs most frequently during birth when the child has the most contact with the mother’s blood and vaginal secretions. The perinatal risk of Hepatitis C transmission is increased if the mother is co-infected with HIV.27

**Diagnosis Of Hepatitis C**

When a patient suspects that he or she may have come into contact with Hepatitis C, or if the patient displays symptoms of the virus, it is important to conduct diagnostic testing to determine if the patient is Hepatitis C positive. The patient is first diagnosed using serologic testing, and will often undergo a liver biopsy after the positive diagnosis to determine the extent of liver damage.

**Serology**

Hepatitis C is initially diagnosed using one of two classes of assays: serologic assays and molecular assays. Serologic assays are used to detect the Hepatitis C antibody in the blood, while molecular assays detect viral nucleic acid.28 While both of these tests can determine if a person is infected with Hepatitis C, they cannot determine the level of severity of the infection.

It is important to use the same type of test before and during treatment to ensure monitoring results are accurate. The following chart provides a description of each type of assay test, including serologic and molecular assays.29
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serologic Assays</td>
<td>Tests that detect anti-HCV are used both to screen for and to diagnose HCV infection. Anti-HCV can be detected in the serum or plasma using a number of immunoassays. Two enzyme immunoassays (EIAs) are approved by the U.S. Food and Drug Administration (FDA) for clinical use, Abbott HCV EIA 2.0 (Abbott Laboratories, Abbott Park, IL) and ORTHO HCV Version 3.0 ELISA (Ortho-Clinical Diagnostics, Raritan, NJ), as well as one enhanced chemiluminescence immunoassay (CIA) VITROS, Anti-HCV assay, (Ortho- Clinical Diagnostics, Raritan, NJ). The specificity of current EIAs for anti-HCV is greater than 99%. False positive results are more likely to occur when testing is performed among populations where the prevalence of hepatitis C is low. False negative results may occur in the setting of severe immunosuppression such as infection with HIV, solid organ transplant recipients, hypo- or agammaglobulinemia or in patients on hemodialysis. The recombinant immunoblot assay, Chiron RIBA HCV3.0 SIA (Chiron Corporation, Emeryville, CA) is also FDA approved. This assay was originally developed as a more specific, supplemental assay to confirm the results of EIA testing. However, specificity is extremely high for third generation EIA results that exceed particular signal/ cutoff ratios. Given the widespread availability of nucleic acid testing, the role for RIBA testing in HCV diagnosis and management has all but disappeared.</td>
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</table>
**Molecular Assays**

Historically, qualitative assays have been more sensitive than quantitative assays. With the recent availability of real time polymerase chain reaction (PCR)-based assays and transcription-mediated amplification (TMA) assays, with sensitivities of 10-50 IU/mL, there is no longer need for qualitative assays.

A highly sensitive assay with this lower limit of detection is considered appropriate for monitoring during therapy.

All currently available assays have excellent specificity, in the range of 98% to 99%. In 1997, the World Health Organization established the first International standard for HCVRNA nucleic acid technology, and the IU rather than viral copies is now the preferred unit to report test results.

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**Reading Test Results**

Proper identification of the Hepatitis C virus relies on the ability of the treating provider to accurately read the results of the tests.

The CDC provides the following table to help health professionals understand hepatitis C virus (HCV) test outcomes, including those for HCV antibody nonreactive, HCV antibody reactive, HCV RNA detected, HCV RNA not detected:

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<table>
<thead>
<tr>
<th>TEST OUTCOME</th>
<th>INTERPRETATION</th>
<th>FURTHER ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCV antibody nonreactive</td>
<td>No HCV antibody detected</td>
<td>Sample can be reported as nonreactive for HCV antibody. No further action required. If recent exposure in person tested is suspected, test for HCV RNA.</td>
</tr>
<tr>
<td>HCV antibody reactive</td>
<td>Presumptive HCV infection</td>
<td>A repeatedly reactive result is consistent with current HCV infection, or past HCV infection that has resolved, or biologic false positivity for HCV antibody. Test for HCV RNA to identify current infection.</td>
</tr>
<tr>
<td>HCV antibody reactive, HCV RNA detected</td>
<td>Current HCV infection</td>
<td>Provide person tested with appropriate counseling and link person tested to care and treatment.</td>
</tr>
<tr>
<td>HCV antibody reactive, HCV RNA not detected</td>
<td>No current HCV infection</td>
<td>No further action required in most cases. If distinction between true positivity and biologic false positivity for HCV antibody is desired, and if sample is repeatedly reactive in the initial test, test with another HCV antibody assay. In certain situations, follow up with HCV RNA testing and appropriate counseling.</td>
</tr>
</tbody>
</table>

**Biopsy**

A liver biopsy is used to evaluate the condition of the liver in patients who are infected with Hepatitis C. Liver biopsies are rarely used in instances of acute Hepatitis C infection, but they are quite common in chronic infections. Regular biopsies are useful diagnostic tools in the management of the disease. In many instances, a biopsy is used prior to initiating treatment,
and again at various points to assess the progress of the virus and determine any future treatment needs.\textsuperscript{31} It is an important diagnostic baseline for patients with chronic infection, as well as a useful monitoring diagnostic tool. A liver biopsy is especially useful in assessing the level of fibrosis in the liver, which is indicative of the level of damage caused by the virus.\textsuperscript{32} The following guidelines for liver biopsy in patients with Hepatitis C provide a thorough overview of why and when a biopsy is necessary:\textsuperscript{33}

<table>
<thead>
<tr>
<th>Why Biopsy?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopsy can provide information in relation to:</td>
</tr>
<tr>
<td>• Staging and grading of severity of liver disease for prognosis.</td>
</tr>
<tr>
<td>• Assessment of the impact of co-factors on fibrosis (such as alcohol, Non-Alcoholic Steatohepatitis (NASH), HIV, HBV).</td>
</tr>
<tr>
<td>• Excluding other causes of liver disease or other co-existing liver disease.</td>
</tr>
<tr>
<td>• Making the decision to treat patients with genotype 1 and a high viral load or those with existing co-morbidities.</td>
</tr>
<tr>
<td>• Assessing the duration of therapy required for those with genotype 3.</td>
</tr>
<tr>
<td>• Duration of disease.</td>
</tr>
</tbody>
</table>

It is recommended that biopsy be considered where:

• Cirrhosis is suspected and there may be:
  o Clinical signs of chronic liver disease.
  o Cofactors such as alcohol, NASH.
  o A long duration of disease, for example in older patients.
• Other concomitant liver disease needs to be excluded.
• There are existing co-infections, specifically HIV and/or HBV.
• There are other existing co-morbidities.
• Patient history or examination indicative of likely advanced fibrosis.
• The patient has genotype 1 and a high viral load.
• Advanced Fibrosis is suspected and the patient has genotype 2 or 3 (use to determine treatment duration).
Treatment Of Acute And Chronic Hepatitis C

Hepatitis C treatment is intended to prevent the progression of the virus and treat any symptoms of the infection. Patients who experience chronic Hepatitis C will require treatment to prevent the disease from progressing. In addition, patients who have an acute infection will need treatment to prevent the infection from progressing from the acute stage to the chronic stage. Specific treatment measures will vary depending on the needs of the patient, the level and severity of the infection and the presence of any co-infections. However, there are standard treatment measures that are typically used with most Hepatitis C patients. These measures are intended to slow the progression of the virus while addressing and secondary issues caused by the infections. In some patients, additional measures may be taken to address specific treatment needs.

The following chart provides the key points of Hepatitis C treatment:

<table>
<thead>
<tr>
<th>Basic Guidelines for Hepatitis C Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Treatment for hepatitis C virus (HCV) nearly always involves a combination of an interferon, given by injection, and ribavirin, given in pill form.</td>
</tr>
<tr>
<td>• Treatment often has a lot of side effects, particularly fatigue, muscle aches, and mild anxiety. Many people are able to continue to work at their jobs while on therapy, but some are not.</td>
</tr>
<tr>
<td>• The main goal of treatment is to have the virus removed from a patient's blood long-term. This is called &quot;sustained virological response&quot; (SVR), defined as no virus present in a blood sample 6 months after completion of therapy. In many cases, SVR is associated with a much lower risk for adverse health consequences from HCV.</td>
</tr>
<tr>
<td>• Treatment is not the best option for every patient. The benefits of treatment are the most clear in patients with greater degrees of liver disease and more treatable genotypes (2 and 3).</td>
</tr>
</tbody>
</table>
Medication

The primary treatment for Hepatitis C is antiviral medications, which are intended to prevent the progress of liver disease and maintain some level of liver function. There are a number of different options for treatment, depending on how advanced the disease is and the specific needs of the patient.

The following table provides information on the specific types of medication used and the reasons for using each one.\(^\text{35}\)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Description</th>
</tr>
</thead>
</table>
| Pegylated interferon (peginterferon) and ribavirin | The most common treatment for hepatitis C is a combination of two medicines, pegylated interferon (also called peginterferon) and ribavirin. The ribavirin treatment is taken as a pill, and the pegylated interferon is taken as a weekly shot.  

The recommended duration of treatment with this combination is usually 24 weeks for genotypes 2 and 3. In the past, patients with genotype 1 were all treated for 48 weeks. However, treatment for patients with genotype 1 now includes an additional medication that improves cure rates, and the length of treatment depends upon whether a person has been treated in the past and upon changes in the level of the virus in the blood during treatment.  

Side effects occur in almost 80 percent of patients who are given pegylated interferon and ribavirin. The most common side effects include flu-like symptoms, low levels of red and white blood cells, depression, and fatigue. Treatments to minimize these symptoms are available. |
### Protease inhibitors

Patients with genotype 1 are also treated with a protease inhibitor in addition to pegylated interferon and ribavirin. Protease inhibitors became available in May 2011, so patients treated before this time did not receive them.

Protease inhibitors do not work if taken by themselves because the virus quickly becomes resistant. By taking the protease inhibitors with peginterferon and ribavirin, resistance is much less likely. Protease inhibitors are pills and include boceprevir (brand name: VictrelisTM) and telaprevir (brand name: IncivekTM). These medications are used only for patients with genotype 1 and significantly increase cure rates in patients with genotype 1. Common side effects of protease inhibitors include low blood counts (anemia) and rashes.

The primary goal of antiviral treatment is the reduction, and eventual elimination, of the virus in the blood. Therefore, regular monitoring is necessary to assess the success of the treatment. If the treatment does not reduce the viral load, a different treatment may be needed. The length of the treatment will depend on how the patient responds and how well the treatment works. Typically, patients will undergo treatment for approximately one year, unless they have genotype 2 or 3 Hepatitis, in which case they will be treated for approximately six months.

Some patients will not respond to medications. Depending on the genotype of the virus and the severity of the infection, the patient may not experience any decrease in viral load from treatment. In these instances, other options must be explored. To determine the success of treatment, the patient will require regular monitoring. The following fact sheet provides information on the monitoring of antiviral Hepatitis C treatment:
The level of hepatitis C virus should be checked often during the course of treatment. It usually is checked with 2 types of measurements:

- **HCV RNA quantitative test:** "the viral load"; this test measures the exact amount of virus in the bloodstream and is reported in international units per milliliter (such as 2,462,514 IU/mL).

- **HCV RNA qualitative test:** this test determines only the presence or absence of any detectable virus in the bloodstream. It is reported as "detected or not detected" but there is no number of viral units reported. This test is able to detect very, very low levels of virus. Sometimes, if there is a very small number of HCV viral units in the bloodstream, the quantitative test will not be able to measure any virus and will yield a negative result, but the qualitative test will find the lower levels of virus, meaning that virus is still present but at very low levels. The goal of treatment is for the qualitative test result to become "not detected" and to stay "not detected" permanently, even after treatment is stopped.

Important time points during the treatment course for checking the virus with these tests are at 4 weeks, 12 weeks, end of treatment, and 6 months after the end of treatment.

- **Rapid Virologic Response:** the virus is undetectable at 4 weeks into the course of treatment

- **Early Virologic Response:** the virus is undetectable at 12 weeks into the course of treatment

- **End of Treatment Response:** the virus is undetectable at the determined end of treatment (usually either 24 weeks or 48 weeks)

- **Sustained Virologic Response:** the virus is undetectable at 6 months after treatment is stopped
**Vaccination**

Patients who are infected with Hepatitis C will often require vaccinations to prevent co-infection with other illnesses. Since chronic Hepatitis C negatively impacts the patient’s immune system and liver function, it is important to protect the patient from acquiring other illnesses that will further damage the body, especially the liver.\(^7\)

The following guidelines provide information regarding the recommended vaccinations for an individual with Hepatitis C:\(^{37}\)

- Anyone who is infected with hepatitis C should be vaccinated against hepatitis A and B, unless he or she is already immune. A blood test can tell if the patient is immune. A vaccine that helps to prevent pneumonia is recommended.
- Influenza (flu) vaccination is recommended every year, usually in the fall.
- Routine vaccines are also recommended, including diphtheria and tetanus booster every 10 years.

**Prognosis For The Patient With Hepatitis C**

The evolution of Hepatitis C and the prognosis for the patient will vary for each individual. Some patients will only experience acute infection that resolves itself after a brief period, while other patients will progress to chronic infection after a number of years. In some patients, the virus will only cause mild symptoms. However, other patients will experience severe symptoms and will suffer long-term damage.\(^{38}\) Therefore, the progression of the virus and the prognosis will differ for each patient.

The following fact sheet provides a thorough overview of the different stages of infection and the prognosis for each:\(^{29}\)
ACUTE HCV INFECTION
The incubation period for newly acquired (acute) HCV infection ranges from two weeks to six months, with an average incubation period of six to seven weeks. However, viral replication can be detected as early as one week after exposure. Of patients with acute HCV infection, 60 to 70 percent have no discernible symptoms; 20 to 30 percent have jaundice; and 10 to 20 percent have nonspecific symptoms such as loss of appetite, fatigue and abdominal pain.

Most patients (about 80 percent) who seek medical care for symptoms related to acute hepatitis C have bilirubin levels of at least 3.0 mg per dL (51 μmol per L); average: 4.1 mg per dL (70 μmol per L) and alanine aminotransferase (ALT) levels greater than 600 U per L (10,000 nkat per L); average: 1,410 U per L (23,500 nkat per L). Only 15 percent of patients require hospitalization, and fulminant disease is rare.

The course of acute hepatitis C is variable, although its most characteristic feature is fluctuating, polyphasic ALT patterns. Some patients have variations of several hundreds of U per L from week to week, and such variations are sometimes recurrent, with the magnitude of the ALT elevations diminishing over time.

Normalization of ALT levels, which may occur, suggests full recovery but is frequently followed by ALT elevations, indicating chronic liver disease. This facet of hepatitis C necessitates prolonged follow-up to assure appropriate diagnosis and management.

CHRONIC HCV INFECTION
Most patients (85 percent or more) with acute HCV infection develop persistent infection; chronic hepatitis develops in an average of 70 percent of infected patients. No clinical features of the acute disease or risk factors for infection, including a history of percutaneous exposures, have been found to be predictive of chronicity.

In the United States, about 40 to 60 percent of cases of chronic liver disease are associated with HCV infection. The progression of chronic liver disease is usually insidious: it is slow and without symptoms or physical signs in most patients during the first two decades after infection. Frequently, chronic hepatitis is not recognized until symptoms appear with the development of advanced liver disease.
The risk for severe hepatic sequelae is difficult to assess because the number of prospective studies is small, the definitions of clinical disease differ among studies and histopathologic data are not always available. Follow-up studies have shown that chronic active hepatitis developed in 26 percent to more than 50 percent of HCV–infected patients, and cirrhosis in 8 to 42 percent, an average of three years after the onset of acute disease. Longer follow-up studies indicate that cirrhosis develops in 10 to 20 percent of persons during the first 20 years of HCV infection.

HCV also appears to be a contributing cause of primary hepatocellular carcinoma. Once cirrhosis is established, the rate of development of primary hepatocellular carcinoma may be as high as 1 to 4 percent per year.

Twenty-year follow-up studies of patients with HCV infection have shown that mortality caused by liver disease was infrequent (range: 1.6 percent to 6 percent).

**Summary**

Hepatitis C is a viral disease of the liver that is responsible for the death of over 350,000 people worldwide per year. However, there are six genotypes of the Hepatitis C virus and not all require treatment — some resolve on their own without medical intervention. Additionally, in many countries with modern healthcare services, treatment options are available to manage chronic forms of the virus. No vaccine is available, but exposure to the virus can be limited through universal precautions.

Patients who are infected with Hepatitis C will experience an acute or chronic infection and will need to be treated accordingly. In instances of acute infection, patients may receive medication to prevent the progression of the illness. In instances of chronic infection, patients will require medical treatment to prevent additional liver damage and slow the progression of the illness. In both instances, patients will require regular monitoring to assess
the level of infection and identify any complications. With proper medical treatment, many patients will live a long time without any major complications. While Hepatitis C can be a lifelong illness, it will not cause extensive damage if properly managed.

Please take time to help the NURSECE4LESS.COM course planners evaluate nursing knowledge needs met following completion of this course by completing the self-assessment Knowledge Questions after reading the article. Correct Answers, page 31.
1. According to the Center for Disease Control, there are approximately __________ new Hepatitis C infections annually.
   a. 5,000 – 10,000  
   b. 10,000 – 15,000  
   c. 15,000 – 20,000  
   d. 21,000 – 25,000

2. Which of the following organs does Hepatitis C affect?
   a. Heart  
   b. Liver  
   c. Brain  
   d. Kidneys

3. Hepatitis C is transmitted through which following substance?
   a. Blood  
   b. Feces  
   c. Saliva  
   d. Semen

4. The most common form of transmission of Hepatitis C is:
   a. Vertical transmission  
   b. Sexual Contact  
   c. Unwashed hands  
   d. Injection drug use

5. What are the symptoms of hepatitis?
   a. Fatigue  
   b. Low fever  
   c. Nausea  
   d. All of the above
CORRECT ANSWERS:

1. c
2. b
3. a
4. d
5. d

REFERENCE SECTION

The reference section of in-text citations include published works intended as helpful material for further reading. Unpublished works and personal communications are not included in this section, although may appear within the study text.

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12. CDC DVH - Hepatitis E Information For the Health Professional.
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http://www.hepatitis.va.gov/provider/reviews/hcv-treatments.asp

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37. Hepatitis C [Internet]. Available from:

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