Hepatitis B: Pathophysiology, Protection, and Patients

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Purpose

The purpose of this course is to provide participants with a functional knowledge of hepatitis B infection (HBV), how it differs from other types of hepatitis viruses, and how to assist in the care of patients diagnosed with chronic HBV.

Learning Objectives

After successful completion of this course, you will be able to:

1. Differentiate between hepatitis B infection and other types of hepatitis, including symptoms, patient presentation, testing, and prevention.
2. Describe the pathophysiology of the hepatitis B virus, including transmission and virus replication.
3. Summarize the impact of liver disease caused by chronic hepatitis B infection on global public health.
4. Identify the groups and individuals at highest risk for infection with the hepatitis B virus.
5. List the seven types of hepatitis B medications currently available and the three most commonly used treatments.
6. Apply the current CDC recommendations regarding hepatitis B vaccination in a case study example.
7. Create a patient and family education plan for a person living with chronic hepatitis B using current guidelines and resources.
Section I: Introduction

In this section, we will review the pathophysiology of the hepatitis B virus, including transmission and virus replication.

This section will also allow the learner to differentiate between hepatitis B infection and other types of hepatitis, including symptoms and patient presentation, testing, and prevention.

What is Hepatitis B?

What is hepatitis B and why is it so important in the healthcare environment today? As providers, we are often bombarded with information about hepatitis B, yet most of us do not really understand the basic differences between the various strains that cause hepatitis, and why the disease is such a grave public health concern. Liver disease is on the rise world-wide and the cost of care is staggering. Hepatitis in its various forms is preventable and treatable but not necessarily curable, as we’ll see throughout this course.

There is an “alphabet” of viruses that cause hepatitis: A, B, C, D, and E. There is also a G, however, the clinical significance of this strain is yet to be determined. All of these are endemic to the US with the exception of hepatitis E. This course will teach you the differences between hepatitis B (HBV) and the others, while providing you with a foundational knowledge of the pathophysiology of the virus, the impact on public health, how to prevent and treat the disease, and most importantly, how to care for a patient with chronic HBV.

Double-stranded red DNA genome is enclosed by the blue protein capsid shell contained within the gold membrane studded with glycoprotein spikes that bind to hepatocytes.

Definition of Hepatitis

Hepatitis means “liver inflammation.” This is a broad term for a spectrum of liver dysfunction caused by viral agents, bacteria, metabolic syndromes, vascular disorders, drugs, or toxic substances.

There are many viruses that can cause liver inflammation and elevated liver enzymes on routine blood work (elevated AST and ALT), such as Epstein-Barr and cytomegalovirus. However, the A, B, C, D, and E viruses are the most common and are under close public health surveillance (Thomas, 2011). We will examine these five viruses and see how they differ.

Complexity of the Disease

The pathophysiology of how HBV replicates at the cellular level is complex. Some researchers spend their entire career studying how the virus lives, replicates and persists in the hepatocytes of the liver. For our purposes, describing the basics of transmission and replication will aid you in understanding how the illness progresses and why treatment modalities are often unsuccessful at controlling the disease.
Pathophysiology of HBV

Pathophysiology of Hepatitis B

The hepatitis B virus is constructed of an outer capsule containing HBsAg (hepatitis B surface antigen), an inner core containing HBcAg (HBV core antigen), and the HBeAg (hepatitis B e-antigen).

As the blood becomes exposed to HBV, the body mounts a cell-mediated immune response by sending cytotoxic T cells and natural killer cells to the virus and release inflammatory cytokines. The greater the immune response, the greater the chance of fighting the virus.

As the hepatocytes are attacked and infiltrated by the HBV, they appear to have a “ground glass” look under histological exam due to the HBsAg infiltrating the cell’s cytoplasm – this is a differentiator for HBV versus other forms of hepatitis.

Because hepatocytes are continually proliferating, the virus is constantly being shed into the blood which contributes to chronic infection.
HBV Replication

The process by which the HBV virus replicates occurs in six (simplified) steps:

1. **Attachment**: The virus enters the cell using endocytosis by binding to a receptor on the surface of the cell.
2. **Penetration**: The viral membrane merges with the host cell membrane then sends its DNA and several proteins into the host cell’s cytoplasm.
3. **Uncoating**: Unlike other viruses, HBV uses RNA to replicate. HBV has partially double stranded DNA that must be made into fully double stranded DNA first. Core proteins separate from the partially double stranded viral DNA and make covalently closed circular DNA (cccDNA). The cccDNA becomes the transcription template for four mRNAs.
4. **Replication**: The largest of the four mRNA is used to make new copies of the genetic material.
5. **Assembly**: The four mRNA are reprocessed, forming progeny virions that are returned to the nucleus where they are recycled and make additional virions.
6. **Release**: DNA is synthesized via reverse transcriptase and new virus is sent into the cytoplasm, then towards the cell membrane where it is released.

Test Yourself

Sequence the steps in HBV replication:
- Uncoating
- Assembly
- Release
- Attachment
- Replication
- Penetration

The correct sequence is as follows:
Overview of Types A, C, D, and E

While the pathophysiology and replication process of HBV may seem tedious, you now have a better foundation on which to build your knowledge of the disease. All forms of hepatitis virus are similar; however there are distinctive features to each type. Let’s start with an overview of each subtype, A, C, D, and E.

**Hepatitis A**
- Prodromal symptoms: Flu-like, abrupt onset, nausea, vomiting, anorexia, high fever, RUQ pain
- Fecal-oral transmission (household and sexual contact), sewage, contaminated water or shellfish
- Virus easily destroyed by heating to 185°F
- Incubation = 15-50 days but usually one month average
- Does not progress to chronic state
- No carrier state
- Self-limiting, treatment is supportive care (usually for dehydration)
- Vaccine-preventable (HAVRIX, VAQTA or Ig) at birth and 6-12 mos; no recommendation for post-exposure prophylaxis
- Confirm diagnosis by serology: presence of IgM antibodies to HAV

**Hepatitis C**
- Only 25% of patients with HCV are symptomatic before they progress to chronic liver disease, liver failure, or hepatocellular carcinoma
- Percutaneous transmission, primarily IV drug users (used to be post-transfusion due to lack of screening) and sexual contact
- Incubation = 6-7 weeks
- Alcohol consumption increases risk of progression to chronic state
- Treatment consists of anti-viral therapies in the acute phase of infection to prevent chronic disease – pegylated interferon, ribivirin and supportive care
- No vaccine available
- Confirm diagnosis by serology; presence of antibody to HCV

**Hepatitis D**
- Only present if co-infected with hepatitis B because it requires hepatitis b antigen to replicate
- Percutaneous transmission, primarily IV drug users and sexual contact
- New cases are uncommon
- Treatment is concomitant with hepatitis B
- Incubation is 1-6 months
- Confirm diagnosis by serology: presence of antibody to HDV or HDV RNA present with HBV infection
**Hepatitis E**
- Only common to Africa, Southeast Asia, and parts of Mexico
- Transmitted by fecally contaminated water, similar to HAV
- Large outbreaks have been reported in refugee camps
- Incubation period is 2 weeks-2 months
- Self-limiting disease, does not progress to a chronic state
- No carrier state
- Confirm diagnosis = presence of IgM antibodies to HEV

**Test Yourself**

Match the description to the correct hepatitis virus (A, C, D, or E):
- A. Large Outbreak in refugee camps not in the US
- B. Only present if the patient also has HBV infection
- C. 75% are asymptomatic until the disease has progressed to a chronic state
- D. Virus can be eliminated by heating contaminated foods to 185 °F

The correct order is as follows:
1. Hepatitis A = Virus can be eliminated by heating contaminated foods to 185 °F
2. Hepatitis C = 75% are asymptomatic until the disease has progressed to a chronic state
3. Hepatitis D = Only present if the patient also has HBV infection
4. Hepatitis E = Large outbreaks in refugee camps not in the US
**Patient History and Lab Testing**

Now that we’ve reviewed the basics of various types of hepatitis, let’s compare them to hepatitis B and see where the similarities and differences are.

Symptoms and patient presentation in all types of hepatitis are similar; however, there are some subtle differences as we’ve already seen. For example, hepatitis A has an abrupt onset and is self-limiting, whereas hepatitis C is insidious, progressive, and requires treatment. Because all forms of hepatitis present with similar symptoms and patterns, it is extremely important to perform a careful patient history with serologic testing (commonly referred to as the Hepatitis Panel) to accurately diagnose which type of hepatitis.

Take a look at the features of hepatitis B as compared to types A, C, D, and E.

It is important to note that the **hepatitis panel** only screens for types A, B and C. Hepatitis D is only present if the patient has hepatitis B and there is no test available in the US for type E since this virus is not endemic to the United States.

**Hepatitis B: Transmission**

- Contact with infected blood or body fluids through contaminated needles, such as IV drug users or needle stick injuries by healthcare workers
- Sexual transmission – oral and/or genital contact
- Patients undergoing hemodialysis, receiving numerous blood transfusions, or on immunosuppressive therapies at higher risk, as are first generation immigrants from southeast Asia, China, and the Middle East
- Mother-infant transmission in third trimester of pregnancy
- Higher risk for exposure when traveling to countries where infection rates are higher
- Virus can live for seven days outside the body on a contaminated surface
Hepatitis B: Testing

- HBsAg (hepatitis B surface antigen) confirms the presence of the virus in the blood (acute or chronic infection)
- IgM anti-HBs (Immunoglobulin M antibody to HBsAg) present in the acute phase of infection
- IgG anti-HBs (Immunoglobulin G antibody to HBsAg) present during resolving phase or shows presence of immunity (either by vaccination or resolved infection)
- HBeAg (hepatitis B e-antigen), anti-HBe (antibody to hepatitis B e-antigen) and anti-HBc (antibody to hepatitis B core antigen) persist in the carrier state

Hepatitis B: Prevention

- HBV vaccine: Given in a series then titers are drawn to test for presence of IgG anti-HBs providing immunity from the virus after seroconversion
- Proper hygiene practices: Including, but not limited to safe sexual practice, do not share needles if using IV drugs, standard precautions, and needleless systems for healthcare providers
HBV: Acute vs. Chronic – What’s the Difference?

**Acute HBV**
- Subclinical infection in 70% of adults and 90% of children
- Prodromal phase: Typical hepatitis symptoms, anorexia, nausea, flu-like symptoms, ALT and AST elevate
- Icteric phase: Jaundice and dark urine set in
- Convalescent phase: Symptom resolution, appetite returns, sense of wellness increases
- Treatment is supportive, usually lasting 1-3 months
- May require hospitalization for dehydration or other symptoms/supportive care
- Fulminant liver failure and hepatocellular necrosis in 1% of all cases with high mortality; liver transplant may be the only option

**Chronic HBV**
- Chronic HBV begins where the convalescent phase ends after acute infection
- If HBsAg persists longer than 10 weeks after initial exposure in serologic testing, it may signal the onset of chronic HBV – definitive if >6 months
- HBeAg is an indicator of viral replication and infectivity – if HBeAg remains, this predicts the continued development of chronic disease
- Positive liver biopsy
- Up to 30% of individuals with unresolved, chronic HBV will progress to cirrhosis and hepatocellular carcinoma (HCC)
## The Details – Side by Side

<table>
<thead>
<tr>
<th></th>
<th>Hepatitis A</th>
<th>Hepatitis B</th>
<th>Hepatitis C</th>
<th>Hepatitis D</th>
<th>Hepatitis E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size/Type of Virus</strong></td>
<td>27 nm RNA virus</td>
<td>47 nm DNA virus</td>
<td>30-60 nm RNA virus</td>
<td>36 nm RNA virus (defective with HbsAg coat)</td>
<td>32 nm RNA virus</td>
</tr>
<tr>
<td><strong>Incubation Period</strong></td>
<td>30 days</td>
<td>60-180 days</td>
<td>35-75 days</td>
<td>30-180 days (dependent on HBV)</td>
<td>15-60 days</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Oral-fecal, parenteral, sexual</td>
<td>Parenteral, sexual</td>
<td>Parenteral</td>
<td>Oral-fecal, parenteral, sexual</td>
<td>Oral-fecal</td>
</tr>
<tr>
<td><strong>Onset</strong></td>
<td>Abrupt/acute</td>
<td>Insidious</td>
<td>Insidious</td>
<td>Insidious</td>
<td>Acute</td>
</tr>
<tr>
<td><strong>Chronic Progression</strong></td>
<td>No; self-limiting</td>
<td>Yes; 15-30% chance of cirrhosis and hepatocellular carcinoma</td>
<td>Yes; most common cause of liver disease in the world</td>
<td>Yes, but only appears as coinfection with HBV</td>
<td>No; self-limiting</td>
</tr>
<tr>
<td><strong>Carrier State</strong></td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td><strong>Prophylaxis</strong></td>
<td>Hygiene, HAV vaccine, immune globulin, safe food and water handling</td>
<td>Hygiene, HBV vaccine</td>
<td>Hygiene, screening donated blood products</td>
<td>Hygiene, HBV vaccine</td>
<td>Hygiene, safe water handling</td>
</tr>
</tbody>
</table>

(Huether, 2010)
Test Yourself

A patient arrives at your clinic in the morning with a variety of complaints. She has flu-like symptoms for approximately two weeks and is not getting better with over the counter medications. She has lost her appetite and is having joint pain, RUQ abdominal pain and exhaustion. You suspect hepatitis. How would you expect to differentiate which type of hepatitis this patient may have?

A. Ask her if she’s been exposed to hepatitis in the past.
B. Take a careful patient history and ask her if she’s ever been exposed to hepatitis in the past.
C. Take a careful patient history, including recent travel, social and sexual history, and blood for hepatitis panel
D. Take a careful patient history and draw routine blood looking for elevated ALT and AST

The correct answer is C. Because all forms of hepatitis can present with similar symptoms, a careful history and physical are important to give you an idea of what the patient is at risk for (example, abrupt onset with high fever would be indicative of HAV, whereas sexual history and reported IV drug use would incline the provider towards B or C). However, the only definitive diagnostic tool is serology, so you would expect an order to draw blood for the hepatitis panel.

Section II: Public Health

In this section, we will summarize the impact of liver disease caused by chronic hepatitis B infection on global public health, and identify groups and individuals at highest risk for infection with the hepatitis B virus.
Who is at Risk in Healthcare?

In terms of unique characteristics of disease, hepatitis B is significant because the Centers for Disease Control (CDC) has placed people working in the delivery of healthcare in a higher risk category for exposure to the disease. This is unlike the other viruses that cause hepatitis and liver disease.

Think for a moment about two nurses:

Nurse A: Works in an outpatient dialysis center in a large, urban environment. The patient demographic is of lower socioeconomic status and 40% of her patients are recent immigrants from Southeast Asia and China.

Nurse B: Works in a long-term care facility in an upscale neighborhood. Her patients are mostly upper and middle class and primarily have dementia and diabetes.

Who do you think is more at risk for HBV exposure – Nurse A or Nurse B?

Outbreaks from 2008-2012

The effects of HBV are far reaching. How you conduct yourself in your clinical practice protects not only you as a provider of healthcare, but your patients as well. To start, let’s look at the HBV reported data from CDC from 2008-2012:

- A total of 19 healthcare-associated HBV outbreaks
- 15 of the 19 outbreaks were in long-term care (LTC) facilities
- 153 outbreak-associated total cases
- Over 10,000 persons notified to be screened for HBV as a result
**Lapse in Infection Control Procedure**

87% of the 15 LTC outbreaks were associated with lapses in infection control procedures during assisted monitoring of blood glucose.

Although many findings were reported the following are some of the more prevalent examples of lapses in infection control procedures cited by the CDC after the investigations were complete:
- Use of fingerstick devices for >1 patient
- Use of blood glucose meter for >1 resident without proper cleaning and disinfecting procedures between residents
- Cross-contamination between clean supplies and contaminated blood glucose monitoring equipment

**Populations at Highest Risk**

The CDC has targeted four sectors at high risk for exposure:
1. Long-term care facilities
2. Correctional facilities
3. Hemodialysis centers
4. Healthcare facilities (various acute care and outpatient clinical settings)

There are also populations at higher risk for HBV exposure or higher risk for complications as a result of having HBV infection:
- Asian and Pacific Islanders
- Injection drug users
- Persons with HIV and AIDS
- Men who have sex with men
Casual Contact and Personal Risk

What’s a person’s risk when they are not in a “high risk” category?

The CDC states that hepatitis B is **NOT** spread by casual contact. This means sharing eating utensils, breastfeeding, hugging, holding hands, or coughing/sneezing does not spread the virus.

However, **DO NOT** use the toothbrush or shaving razor of an infected person, as the virus can live for up to a week on surfaces and these tools are prone to causing breaks in the skin and the oral mucosa which may pass the virus.

Case Study: North Carolina ALF

*Impact on Public Health: Death*

The Case in North Carolina, August-October 2010

A local hospital in Wayne County North Carolina reported that there were four suspected cases of hepatitis B from the same assisted living facility. The state DPH and the Wayne County DPH conducted an epidemiological investigation of the four persons and facility in question. The CDC published the findings in their weekly MMWR, February 18, 2011:

“The investigation identified unsafe practices, including sharing of reusable fingerstick lancing devices approved for single patient use only and shared use of blood glucose meters without cleaning and disinfection between patients. Of 87 persons who had resided in the facility during the study period, 47 were excluded from analysis because of HBV immunity (20 persons), chronic infection (one person), or unknown HBV status (26 persons). Of the remaining 40, eight met the case definition. Of these, all were hospitalized, and six died from hepatitis complications. All eight were among the 15 residents whom facility staff had assisted with blood glucose monitoring...”
Financial Impact

Impact on Public Health: Financial Cost

The financial burden of caring for patients with HBV grows exponentially. The number of newly reported cases has decreased each year, however, the mortality and morbidity for current cases increases. In fact, hepatocellular carcinoma (HCC) has doubled in the last 15 years with mortality due to HCC up by 41% (Lavanchy, 2004). This can be attributed to the insidious nature of the disease and the fact that formalized worldwide vaccination only began in 1992 (WHO, 2013), precluding many older individuals that were not vaccinated as infants/children and were subsequently exposed and infected.

Vaccination vs. Treatment Cost

Impact on Public Health: Financial Cost

Hepatitis B affects 1.25 million Americans. The estimated expenditure in the United States of both medical costs and losses in work per year due to HBV is approximately $700 million (CDC, 2004).

The CDC posts “CDC pricing” for vaccine programs that are grant-funded (these may be public health departments, urban initiatives, and federally qualified health centers). For example:

✓ The cost of an adult hepatitis B vaccine is about $25.00 ($75.00 for a three vaccine series)
✓ The cost of a child dose of hepatitis B vaccine is $11.00-$25.00 (depending on the age of the child and if it is a combination vaccine; this is $33.00-$75.00 for the series)
✓ Consider the cost difference between vaccination and treatment for disease
Global and National Statistics

✓ 350 million people worldwide living with chronic HBV
✓ 1.2 million in the United States alone
✓ 1 in 12 Asian-Americans are infected with HBV, many were infected at birth or as children
✓ Conservatively 15%, but upwards of 25-30% of those infected with HBV will develop cirrhosis and hepatocellular carcinoma
✓ HBV is often called the “silent disease” because upwards of 2/3 of those infected are unaware that they have HBV
✓ New cases of HBV in children have decreased 95% since 1990 with the advent of vaccination programs for infants and children

CDC, 2013

Test Yourself

Who is at high risk? Assuming the following populations have not been vaccinated against HBV, identify which of the following case scenarios have correctly identified the risk potential for HBV infection.

A. Registered nurse working in acute care
B. Hemodialysis patient
C. Mother of three at her local gym twice per week
D. 55 year old man, first generation immigrant from China

All of the above are at risk, except the mother of three. Casual contact in a gym would not place her at risk unless she was engaged in high risk behaviors. RN's, HD patients, and first generation persons of Asian decent are all in the high risk category according to the CDC.
Test Yourself

Nurses can prevent the spread of HBV infection by utilizing standard precautions and proper infection control procedures when assisting patients with blood glucose monitoring.

A. True
B. False

The correct answer is true. Many outbreaks of HBV have been traced to improper infection control techniques and sanitation when staff was assisting patients with “fingerstick” blood glucose monitoring. You can protect your patients and yourself by implementing your organization’s infection control policy and procedures in your daily interventions.

Section III: Treatment Options and Disease Prevention

In this section, we will review the seven types of hepatitis B medications currently available and the three most commonly used treatments.

We will also apply the current CDC recommendations regarding hepatitis B vaccination in a case study example.
Hepatocellular Turnover and Proliferation of the Disease

We’ve covered a lot of information so far, but let’s return to pathophysiology for a moment. Remember that because of hepatocellular turnover, HBV is constantly being shed so that new virus can infect new hepatocytes. The human liver is an amazing organ because it has the ability to regenerate and make new cells; however, it’s the fast cellular turnover that may also hinder the effective treatment of the disease.

How then, do we treat a disease that is constantly proliferating? The issue is that the cellular regeneration happens at different rates. It is not possible to “arrest” cellular turnover so that treatments can be most effective to eradicate the virus all at once. Thus is the difficulty with selecting an appropriate treatment.

AASLD Guidelines for Treatment

The American Association for the Study of Liver Diseases (AASLD) has published guidelines regarding care for patients with chronic hepatitis B. These guidelines are aimed at evaluation of patients, prevention of HBV infection, management of patients with chronic HBV, and treatment of patients with chronic HBV (AASLD, 2009).

Note! “The aims of treatment of chronic hepatitis B are to achieve sustained suppression of HBV replication and remission of liver disease. The ultimate goal is to prevent cirrhosis, hepatic failure, and HCC” (AASLD, 2009). and HCC” (AASLD, 2009).
FDA Approved Medications

There are currently seven medications used to treat chronic hepatitis B and prevent liver cirrhosis, cancer, and failure. Of the seven used, there are three that are most commonly used: Interferon-α, Pegylated Interferon-α, and Lamivudine. Each patient is different and may be treated with any one of these medications or a combination of treatments. As an example, one patient may receive an immune-modulator as well as an antiviral.

Hepatitis is never fully “eradicated”, although many patients will have undetectable levels in the blood after treatment. These are the success stories. Therapy is geared towards suppression of the virus, either by use of immune-modulators or antivirals so patients do not progress to liver disease (or that liver disease can be somewhat reversed or arrested). Each case is different and each patient response is unique.

The seven FDA-approved medications currently in use are:
1. Interferon-α (INF-α): Immune-modulator
2. Pegylated Interferon-α (pegINF-α): Immune-modulator
3. Lamivudine: Inhibits HBV DNA synthesis
4. Entecavir: Inhibits DNA synthesis in three different steps of activity
5. Adefovir: Inhibits reverse transcriptase and DNA polymerase activity
6. Tenofovir: Similar to adefovir, first approved for HIV treatment
7. Telbivudine: L-nucleoside analogue; potent antiviral activity
Primary and Secondary Treatments

Some medications are “primary” treatments, meaning first line therapies and others are “secondary” treatments. Secondary treatments are used if primary treatment is contraindicated or if primary treatment has failed, particularly in the case of resistance.

**Primary Treatments:**
1. Interferon-α (INF-α): Standard treatment up to 12-24 weeks, many side effects (flu-like, fatigue, neutropenia), injected medication, cannot be used in patients with decompensated liver disease, ok to use if planning on becoming pregnant, less chance of resistance, may cause neutropenia.
3. Lamivudine: Standard treatment 48-52 weeks. Cost effective for oral medication, high incidence of resistance, may be used during pregnancy, used for patients coinfected with HIV, can be used in patients with decompensated liver disease.
4. Entecavir: Standard treatment 48 weeks. High efficacy primary treatment, low rate of resistance, can be used in patients with decompensated liver failure.

**Secondary Treatments (or may be primary treatments if above primary treatments not indicated):**
1. Adefovir: Standard treatment 48 weeks. Good for patients with lamivudine-resistant HBV, but lower efficacy rate at eradicating the virus (only 25% response in some studies/patients).
2. Tenofovir: Standard treatment is 48 weeks. Higher potency than adefovir and is effective at suppressing lamivudine-resistant HBV and wild-types.
3. Telbivudine: Standard treatment is 52 weeks. Better efficacy than lamivudine and adefovir, but has same resistance and is expensive. Limited role as a primary therapy.
**Test Yourself**

Pegylated interferon-α is a commonly used treatment for chronic hepatitis B patients with decompensated liver disease.

A. True  
B. False

The correct answer is false. Immune-modulators (INF-α and pegINF-α) are not for use in patients with decompensated liver disease. Lamivudine or entecavir would be options instead.

**Prevention through Vaccination**

Although treatment options have progressed in the past ten years, the best treatment is of course, *prevention*.

Currently, all newborn children in the United States are recommended to receive the hepatitis B vaccine at birth, the second dose at between one and two months and the third dose at between 6 and 15 months of age (CDC, 2013). For adults that have not been vaccinated as children, CDC makes the following recommendations for populations in higher risk categories that may be exposed to HBV.
**Test Yourself**

You are a nurse working in public health. A young man arrives at one of your monthly clinics for sexually transmitted infection (STI) screening. He has been to your clinic four times during the past year for several different STI’s. He has been counseled before on safe sex practices and the transmission of infectious disease; however, this is the second time he is being treated for Chlamydia in four months. You are concerned that he may not be thinking about hepatitis infection and there is no documentation in his chart regarding hepatitis status. During his counseling session after he is examined, it is appropriate to discuss the following:

- **A.** “I think you should have a hepatitis B vaccination series since you’re sexually active and at risk for infection.”
- **B.** “You’re obviously high risk for hepatitis B. Would you like me to make an appointment for you to receive the vaccine series?”
- **C.** “Do you know if you’ve had the hepatitis vaccine already? If not, we can schedule you for the vaccination series here and I can provide you with written information on the benefits of the vaccine.”

The correct answer is A. Approaching the patient therapeutically and correctly adding pertinent information to his patient history may uncover that he’s already had the vaccine series. If he has not, you have provided him with an opportunity to discuss hepatitis B with you and how you can help prevent him from becoming infected.
CDC/ACIP Recommendations 2013

CDC/ACIP Hepatitis B Vaccination Recommendations by Group

The following recommendations have been recently reviewed by the CDC. The CDC continues to concur with the World Health Organization (WHO) that the hepatitis B vaccine is 95% effective in preventing HBV infection progressive liver complications, and is the first vaccine against a major human cancer, that is hepatocellular carcinoma or HCC (WHO, 2012). The WHO has also demonstrated their support of worldwide HBV vaccination with a showing of 179 countries at the end of 2011 participating in infant vaccination programs (WHO, 2012).

- Persons at risk for infection by sexual exposure
- Sex partners of hepatitis B surface antigen (HBsAg) positive persons
- Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than one sex partner during the previous six months)
- Persons seeking evaluation or treatment for a sexually transmitted disease
- Men who have sex with men
- Persons at risk for infection by percutaneous or mucosal exposure to blood
- Current or recent injection drug users
- Household contacts of HBsAg-positive persons
- Residents and staff of facilities for developmentally disabled persons
- Healthcare and public safety workers with reasonably anticipated risk for exposure to blood or blood contaminated body fluids
- Persons with end-stage renal disease, including pre-dialysis, hemodialysis, peritoneal dialysis, and home dialysis patients
- International travelers to regions with high or intermediate levels (HBsAg prevalence of >2%) of endemic HBV infection
- Persons with chronic liver disease
- Persons with HIV infection
- All other persons seeking protection from HBV infection
Section IV: Living with HBV – Creating a Plan for Your Patient

In this section, we will create a patient and family education plan for a person living with chronic hepatitis B using current guidelines and resources.

Putting it all Together in a Patient’s Plan of Care

You have covered a lot of ground regarding hepatitis B infection! Let’s put it all together in an education plan for your patient living with chronic HBV. Here, we will discuss more details regarding CDC’s recommendations for living with HBV, healthcare workers with HBV and how to develop your plan of care based on the evidence.

HBsAg-Positive Persons

Persons who are HBsAg-positive should:
✓ Have sexual partners vaccinated, and use barrier protection if not
✓ Not share toothbrushes or shaving razors
✓ Cover open cuts and wounds
✓ Clean blood spills with bleach
✓ Not donate blood, body fluids, or organs

Children and adults who are HBsAg-positive:
✓ Should not be excluded from daycare or school activities or sports
✓ Can share food, utensils, and kiss others without infecting each other
**Dietary and Pregnancy**

There are no recommended dietary restrictions or recommendations for persons with HBV. However, the consensus agrees that excess use of alcoholic beverages may be a risk factor for the development of cirrhosis (AASLD, 2009).

HBsAg-positive women who are pregnant should be counseled to inform healthcare providers and her pediatrician of her status. This will help ensure that the hepatitis B immune globulin (HBIG) and hepatitis B vaccine will be administered to the child in the neonatal period, preferably before discharge to home (AASLD, 2009).

**Why Do Some Patients Progress to Cirrhosis and HCC and Others Do Not?**

**Risk for Cirrhosis:**
- Older age (longer duration of infection)
- HBV genotype C
- High levels of HBV DNA
- Habitual alcohol consumption and concurrent infection with hepatitis C virus (HCV), hepatitis D virus (HDV), or human immunodeficiency virus (HIV)
- Heavy alcohol consumption
- Carcinogens (example: aflatoxin)
- Smoking cigarettes

**Risk for HCC:**
- Male gender
- Family history of HCC
- Older age
- History of reversions from anti-HBe to HBeAg
- Presence of cirrhosis
- HBV genotype C, core promoter mutation, and coinfection with HCV
CDC’s Position on Healthcare Workers with HBV

What about healthcare workers living with HBV? How does that translate to patient care and risk of transmission?

It is interesting to note that for people in healthcare industries that have HBV, the CDC states there is only one published report of “provider to patient” transmission of HBV during exposure-prone procedures in the US since 1994 (Bell, Shapiro, Chielsleski, 1995).

The CDC (2012) updated its recommendations regarding healthcare workers and students in health-related industries that have chronic HBV:

“The latest recommendation states that providers who perform exposure-prone procedures should have an expert panel providing oversight of the provider’s practice to ensure patient safety.”

CDC (2012) also makes note that persons with chronic HBV should not be excluded from practice settings specifically because of his/her HBV status:

“Chronic HBV infection in itself should not preclude the practice or study of medicine, surgery, dentistry, or allied health professions. Standard precautions should be adhered to rigorously in all healthcare settings for the protection of both patient and provider.”

It is also discouraged for healthcare organizations to restrict the practice of providers and students with HBV. Arbitrary policies such as mandatory antiviral therapy, forced practice change and pre-notification to patients of the providers’ HBV should not be routinely practiced in the healthcare setting (CDC, 2012).
Using the Nursing Process

It is time to put your newly acquired knowledge about chronic hepatitis B infection to work for Lorraine. She is a new patient that has just been told she has chronic HBV that requires treatment.

You will create a basic patient care plan for Lorraine by pulling items together for her that will be meaningful and evidence-based. Read her story and decide what would be most useful for her. Use the nursing process to guide your actions as you proceed through the activity.

Lorraine: Living with Chronic HBV

This is Lorraine. For the past seven years, she has been sober and clean of a heroin addiction she had through her 20’s. She is now 34 years old and was told she has chronic hepatitis B. Her viral load is high, as are her ALT and AST levels, but her liver is currently compensated.

Her physical exam reveals a thin, moderately pale Caucasian female with non-icteric sclera. She has no ascites, but complains of infrequent joint and mild abdominal pain with palpation in the RUQ.

Lorraine’s mentation is intact; however, she is extremely distraught over her diagnosis and unsure of the course of this disease. She explains that she is afraid of passing the virus on to her son who is four years old and to her husband - even others in her family.

She is slated to start pegINF-α treatment in a week and she’s heard the side effects are “terrible.” She is worried that she will not be able to take care of her family while she is undergoing treatment.

How would you approach a teaching plan for this patient?
Test Yourself

After assessing Lorraine and evaluating her needs, you should now select the appropriate nursing diagnoses.

Select the diagnoses you think are best for Lorraine based on what she’s told you thus far.

A. Anxiety
B. Impaired gas exchange
C. Risk for infection
D. Activity intolerance
E. Knowledge deficit
F. Ineffective airway clearance
G. Pain

Selections A, C, E, and G are correct.
Nursing Interventions

Lorraine will need support. Use the following nursing diagnoses below to access ideas for implementing nursing interventions for each nursing diagnosis.

Managing Pain:
- Appropriate use of analgesics
- Take a yoga class
- Learn how to meditate
- Attend a support group
- Massage
- Rest
- Ice/heat therapy

Managing Anxiety:
- Provide emotional support
- Encourage open communication
- Use music therapy
- Use active listening skills
- Go to the gym
- Take a yoga class
- Learn how to meditate
- Attend a support group

Mitigating Risk for Infection Once She Starts Treatment:
- Rest
- Get the flu shot
- Teach hand washing to the family
- Visit doctor regularly
- Don’t miss appointments for blood work

Learning About Her Disease:
- Maintain adequate nutrition
- Teach her how to prevent spreading the disease (i.e., safe sex, cover cuts, vaccinate the family)
- Watch her take her injections and monitor her technique
- Teach her ways to manage side effects of treatment
### Interventions List

These may help you decide what to add to Lorraine’s plan. Or, add other interventions as appropriate.

<table>
<thead>
<tr>
<th>Interventions for Lorraine</th>
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<tbody>
<tr>
<td>Teach relaxation techniques (i.e., guided imagery)</td>
<td>Use music therapy</td>
<td>Rest</td>
</tr>
<tr>
<td>Use active listening skills</td>
<td>Encourage attendance at a community support group</td>
<td>Stay physically active and fit</td>
</tr>
<tr>
<td>Get adequate nutrition and hydration</td>
<td>Provide emotional support</td>
<td>Proper use of approved analgesia</td>
</tr>
<tr>
<td>Encourage open communication</td>
<td>Hand washing</td>
<td>Massage</td>
</tr>
<tr>
<td>Ice/heat therapy</td>
<td>Make sure seasonal influenza vaccine is up to date for all family members</td>
<td>Teach family to cover coughs and sneezes</td>
</tr>
<tr>
<td>Rest when you’re tired</td>
<td>Vaccination status of son and husband</td>
<td>Teach patient and husband how to have safe sex to prevent infection</td>
</tr>
<tr>
<td>Cover cuts and breaks in the skin</td>
<td>Teach how to clean contaminated areas in the home</td>
<td>Visit the doctor regularly</td>
</tr>
<tr>
<td>Don’t miss appointments for blood work</td>
<td>Teach patient how to inject herself with pegINF-a</td>
<td>Teach patient how to manage nausea, fever, and other side effects of treatment</td>
</tr>
</tbody>
</table>
Time to Review

Lorraine will surely benefit from the plan you’ve developed as will other patients you encounter in your practice. To summarize what you’ve learned, you should now be able to:

- Differentiate between hepatitis B infection and other types of hepatitis, including symptoms and patient presentation, testing, and prevention.
- Describe the pathophysiology of the hepatitis B virus, including transmission and virus replication.
- Summarize the impact of liver disease caused by chronic hepatitis B infection on global public health.
- Identify the groups and individuals at highest risk for infection with the hepatitis B virus.
- List the seven types of hepatitis B medications currently available and the three most commonly used treatments.
- Apply the current CDC recommendations regarding hepatitis B vaccination in a case study example.
- Create a patient and family education plan for a person living with chronic hepatitis B using current guidelines and resources.
References


CDC (2012). Updated cc recommendations for the management of hepatitis b virus-infected health-care providers and students. *Recommendations and Reports*, 61(RR03),1-12


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