

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson's specific patient population; MD Anderson's services and structure; and MD Anderson's clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

Hepatitis B Virus (HBV) PRESENTATION

Medical history:

- Previous history of HBV
- On anti-HBV medications

Risk factors associated with HBV infection:

- Born in a country with a greater than or equal to 2% HBV prevalence (Appendix A)
- Parents born in high prevalence region (Appendix A)
- Household or sexual contact with HBV positive person
- HIV positive
- Injection drug use
- Men who have sex with men

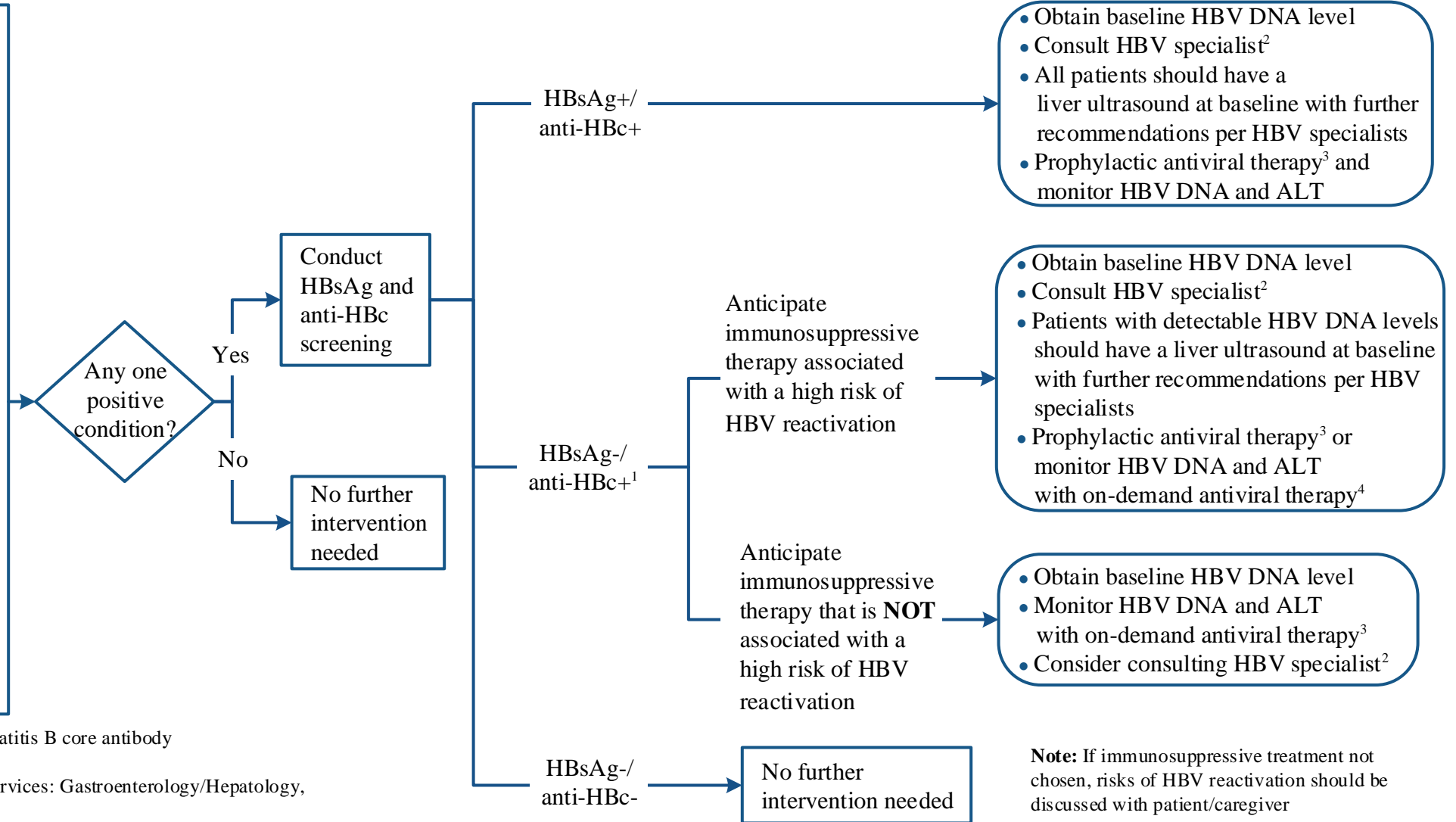
Patient to receive immunosuppressive therapies associated with high risk of HBV reactivation:

- B-cell-depleting agents
- Stem-cell transplantation

Patients awaiting other therapies should be screened at the discretion of their provider.

TEST RESULTS

RECOMMENDED IMMUNOSUPPRESSIVE TREATMENT



HBsAg = hepatitis B surface antigen / anti-HBc = hepatitis B core antibody

¹Independent of hepatitis B surface antibody status

²HBV Specialists are with the following consulting services: Gastroenterology/Hepatology, General Internal Medicine, or Infectious Diseases

³See Appendix B for Antiviral Therapy for anti-HBV

⁴On-demand antiviral therapy: anti-HBV medication started after elevation in ALT and/or HBV DNA

Note: Acute hepatitis manifested by an acute elevation in liver enzymes with jaundice, ascites, or encephalopathy in a patient without a history of hepatitis is reportable to the public health authorities, as is standard medical practice and aligned with Infection Control Services.

Note: If immunosuppressive treatment not chosen, risks of HBV reactivation should be discussed with patient/caregiver

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

APPENDIX A: Geographic Regions with a Prevalence of Hepatitis B Surface Antigen Greater Than or Equal to 2%

Region ¹	Countries
Africa	All
Asia	All
Australia and South Pacific	All except Australia and New Zealand
Middle East	All except Cyprus and Israel
Eastern Europe	All except Hungary
Western Europe	Malta, Spain, and indigenous populations in Greenland
North America	Alaska natives and indigenous populations in northern Canada
Mexico and Central America	Guatemala and Honduras
South America	Ecuador, Guyana, Suriname, Venezuela, and Amazonian areas of Bolivia, Brazil, Colombia, and Peru
Caribbean	Antigua and Barbuda, Dominica, Grenada, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, and Turks and Caicos Islands

¹The regions with the highest prevalence (greater than 5%) are sub-Saharan Africa and Central and Southeast Asia

APPENDIX B: Antiviral Therapy

Anti-HBV medications (to be used as monotherapy)²:

- Adefovir
- Entecavir (recommended)
- Lamivudine
- Pegylated interferon alfa-2a
- Tenofovir alafenamide (recommended)
- Tenofovir disoproxil fumarate (recommended)
- Telbivudine

Of these, entecavir or tenofovir are preferred due to low viral resistance and strong efficacy data on patients anticipated to receive immunosuppressive therapies associated with a high risk of reactivation (see Page 1). Tenofovir has a low risk of nephrotoxicity. It is recommended that oncology providers seek assistance from HBV specialists about initiation and monitoring antiviral medications for optimal shared decision making of medical providers/teams with patients.

American Association for the Study of Liver Disease (AASLD) guidelines for treatment of chronic hepatitis B

²The medications are currently available (as of 10/2/2017)

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson's specific patient population; MD Anderson's services and structure; and MD Anderson's clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

Hepatitis C Virus (HCV) PRESENTATION

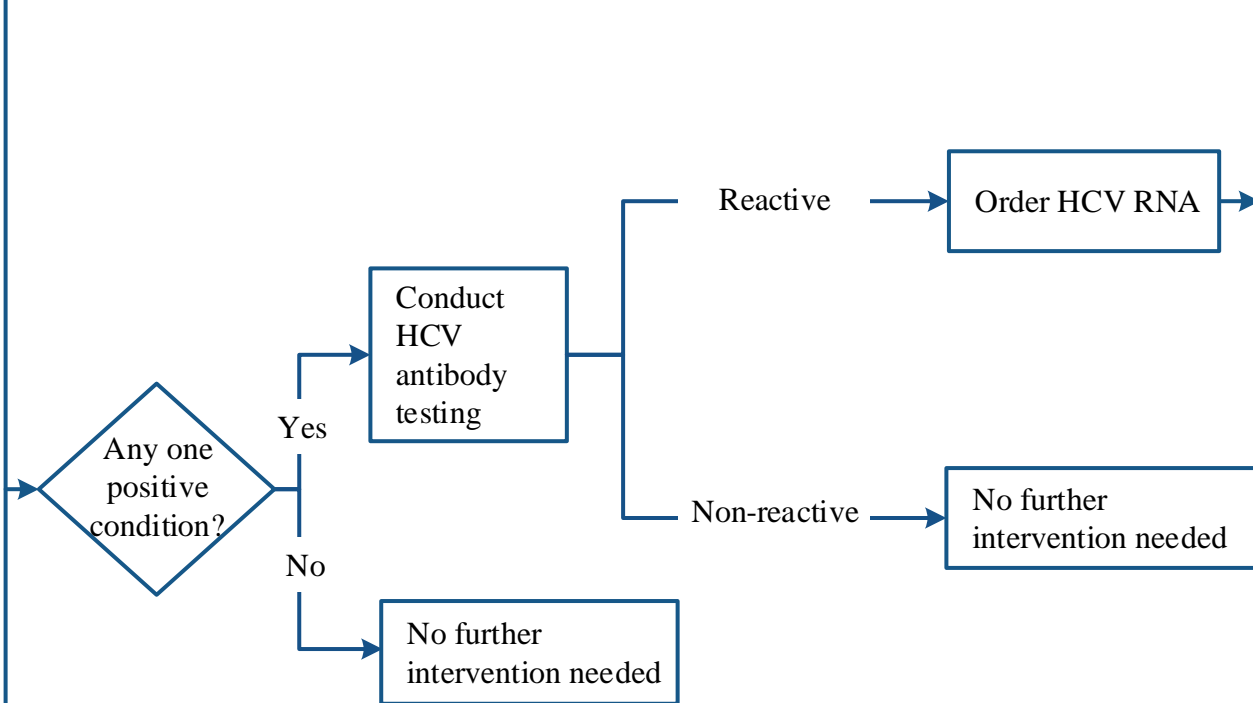
Persons for whom HCV screening is recommended:

- All new patients¹
- All hematopoietic stem cell transplant candidates
- For other cancer patients, consider screening patients who belong to groups at heightened risk of HCV infection (see below)

Risk factors associated with HCV infection:

- Persons born during 1945-1965
- Persons who have injected illicit drugs in the recent or remote past, including those who injected only once and do not consider themselves to be drug users
- Persons with conditions associated with high prevalence of HCV infection including:
 - Persons with HIV infection
 - Persons with hemophilia who received clotting factor concentrates prior to 1987
 - Persons who have ever been on hemodialysis
 - Persons with unexplained abnormal aminotransferase levels
- Prior recipients of transfusions or organ transplants prior to July 1992 including:
 - Persons who were notified that they had received blood from a donor who later tested positive for HCV infection
 - Persons who received a transfusion of blood or blood products
 - Persons who received an organ transplant
- Children born in HCV-infected mothers
- Health care, emergency medical and public safety workers after a needle stick injury or mucosal exposure to HCV-positive blood
- Current sexual partners of HCV-infected persons²

TEST RESULTS



RECOMMENDED IMMUNOSUPPRESSIVE TREATMENT

- Refer to HCV Clinic³ for consideration of anti-HCV therapy,⁴ if indicated
- Patients with detectable HCV RNA should have a liver ultrasound at baseline with further recommendations per HCV specialists

Note: Acute hepatitis manifested by an acute elevation in liver enzymes with jaundice, ascites, or encephalopathy in a patient without a history of hepatitis is reportable to the public health authorities, as is standard medical practice and aligned with Infection Control Services.

¹ In alignment with CDC and other professional societies best practice guidelines for population health. This is standard practice in our hematologic patient populations that has now expanded to other services to benefit more patients. PCP-General teams may opt out of screening.

² Although the prevalence of infection is low, a negative test in the partner provides reassurance, making testing of sexual partners of benefit in clinical practice

³ Infectious Diseases Department

⁴ See Appendix C for Antiviral Therapy for anti-HCV

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson's specific patient population; MD Anderson's services and structure; and MD Anderson's clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

APPENDIX C: Antiviral Therapy

Anti-HCV medications (do not use as monotherapy)¹:

- Daclatasvir
- Elbasvir
- Grazoprevir
- Glecaprevir
- Ledipasvir
- Ombitasvir
- Paritaprevir/Ritonavir
- Pibrentasvir
- Ribavirin
- Simeprevir
- Sofosbuvir
- Velpatasvir
- Voxilaprevir

HCV therapy should be undertaken by providers experienced in management of HCV in cancer patients in close collaboration with oncologists.

Treating physicians should be mindful of potential drug interactions and/or side effects between cancer therapies and direct acting antivirals (DAAs), although these have not been extensively studied in HCV-infected patients with cancer. The potential drug-drug interactions between DAAs and cancer therapies have been summarized elsewhere

¹The medications are currently available (as of 10/2/2017)

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson's specific patient population; MD Anderson's services and structure; and MD Anderson's clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

SUGGESTED READINGS

- AASLD/IDSA/IAS–USA. HCV Guidance: Recommendations for testing, managing, and treating hepatitis C. <http://www.hcvguidelines.org> (April 12, 2017) Accessed: August, 2017.
- Huang, H., Li, X., Zhu, J., Ye, S., Zhang, H., Wang, W., ... Cao, Y. (2014). Entecavir vs lamivudine for prevention of hepatitis B virus reactivation among patients with untreated diffuse large B-cell lymphoma receiving R-CHOP chemotherapy: a randomized clinical trial. *Jama*, 312(23), 2521-2530.
- Hwang, J. P., Somerfield, M. R., Alston-Johnson, D. E., Cryer, D. R., Feld, J. J., Kramer, B. S., ... Artz, A. S. (2015). Hepatitis B virus screening for patients with cancer before therapy: American Society of Clinical Oncology Provisional Clinical Opinion Update. *Journal of Clinical Oncology*, 33(19), 2212-2220.
- LeFevre, M. L. (2014). Screening for hepatitis B virus infection in nonpregnant adolescents and adults: U.S. Preventive Services Task Force Recommendation Statement. *Annals of internal medicine*, 161(1), 58-66.
- Liver Cancer Screening algorithm. <http://www.mdanderson.org/education-and-research/resources-for-professionals/clinical-tools-and-resources/practice-algorithms/screening-liver-web-algorithm.pdf>
- Moyer, V. A. (2013). Screening for hepatitis C virus infection in adults: U.S. Preventive Services Task Force recommendation statement. *Annals of Internal Medicine*, 159(5), 349-357.
- Reddy, K. R., Beavers, K. L., Hammond, S. P., Lim, J. K., Falck-Ytter, Y. T. (2015). American Gastroenterological Association Institute guideline on the prevention and treatment of hepatitis B virus reactivation during immunosuppressive drug therapy. *Gastroenterology*, 148(1), 215-219.
- Terrault, N. A., Bzowej, N. H., Chang, K. M., Hwang, J. P., Jonas, M. M., & Murad, M. H. (2016). AASLD guidelines for treatment of chronic hepatitis B. *Hepatology*, 63(1), 261-283.
- Torres, H. A., Chong, P. P., De Lima, M., Friedman, M. S., Giral, S., Hammond, S. P., ... Gambarin-Gelwan, M. (2015). Hepatitis C virus infection among hematopoietic cell transplant donors and recipients: American Society for Blood and Marrow Transplantation Task Force Recommendations. *Biology of Blood Marrow Transplantation*, 21(11), 1870-1882.
- Weinbaum, C. M., Williams, I., Mast, E. E., Wang, S. A., Finelli, L., Wasley, A., ... Centers for Disease Control and Prevention (CDC). (2008). Recommendations for identification and public health management of persons with chronic hepatitis B virus infection. *MMWR Recomm Rep*, 57, 1-20.

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson's specific patient population; MD Anderson's services and structure; and MD Anderson's clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of Hepatitis B Virus and Hepatitis C experts at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

Boris Blechacz, MD, PhD (Gastroenterology Hepatology & Nutrition)[‡]

Shonice Holdman, MBA[♦]

Jessica P. Hwang, MD, MPH (General Internal Medicine)[‡]

Firoze Jameel, MSN, RN, OCN[♦]

Ethan Miller, MD (Gastroenterology Hepatology & Nutrition)[‡]

Harrys A. Torres, MD (Infectious Diseases)[‡]

[‡] Core Development Team

[♦] Clinical Effectiveness Development Team