Follow-Up and Promoting Liver Health

This is a PDF version of the following document:
Module 8: HCV Test and Cure
Lesson 5: Follow-Up and Promoting Liver Health

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Post-Treatment Monitoring and Management

Follow-Up in Persons who Achieve Sustained Virologic Response (SVR12)

- Counsel patients about the durability of this outcome. No need to continue to check HCV RNA unless they have risk factors for reinfection.
- Counsel patients about the risk of HCV reinfection, since treatment with HCV clearance does not confer immunity against future infection.
- Individuals who achieve SVR who do not have cirrhosis or other risk factors for HCV reinfection or chronic liver disease (e.g., excessive alcohol use, metabolic syndrome with or without fatty liver disease) do not require further HCV or liver-related clinical monitoring.
- Individuals who achieve SVR, but have risk factors for chronic liver disease (cirrhosis or metabolic dysfunction-associated steatotic liver disease), should have follow-up and liver-related clinical monitoring.
- Refer to support services for harm reduction as applicable (if not already done).

Screening for HCV Reinfection

Individuals who achieve an SVR with HCV treatment or who spontaneously clear HCV do not have long-term immunity to HCV and are at risk of HCV reinfection. These individuals will almost always maintain a positive HCV antibody for life and thus require screening for reinfection using HCV RNA. The following summarizes recommendations regarding screening for HCV reinfection in persons who have previously cleared HCV either through treatment or spontaneously through immune clearance.

Individuals Who Should Undergo Screening for HCV Reinfection

- Persons who continue to inject drugs
- Men who have sex with men
- Persons who engage in chem sex (e.g., sexual activity while under the influence of drugs)
- Individuals with intranasal substance use
- Persons who use glass pipes for substance use
- Individuals receiving HIV preexposure prophylaxis

Frequency of Screening for HCV Reinfection

- Periodic testing is recommended in individuals who continue to engage in the risk activities listed above; the exact interval for periodic testing is not defined in these recommendations.

- Annual testing is recommended in the following groups: (1) persons who inject drugs, (2) men with HIV who have unprotected sex with men or (3) persons who are HIV-negative and are receiving HIV preexposure prophylaxis (PrEP).

Recommended HCV Screening Test for HCV Reinfection

- The recommended test to screen for HCV reinfection is an HCV RNA assay.[Q] Screening for HCV Reinfection

Evaluation of Persons with Persistent ALT/AST Elevation

Most patients who undergo HCV treatment will have complete normalization of their alanine transaminase (ALT) and aspartate transaminase (AST) during and after treatment. Assessment of other causes of liver disease is recommended for those patients who have persistent ALT/AST elevation, including evaluation for:

- Alcoholic liver disease
- Non-alcoholic fatty liver disease, including steatohepatitis
- Autoimmune hepatitis
- Primary biliary cirrhosis
- Drug- or medication-induced liver injury
- Hepatocellular carcinoma when applicable

Recommendation for Persons Who Do Not Achieve SVR12 with Treatment

Treatment with recommended pangenotypic direct-acting antiviral (DAA) regimens is associated with SVR12 (cure) rates of greater than 95%. Nevertheless, management of persons who do not achieve an SVR (HCV RNA is detectable 12 weeks or more posttreatment) is occasionally needed. It is important to note that persons who do not achieve an SRV12 following DAA treatment are not eligible for the simplified treatment approach. The following summarizes recommendations for the initial management of these individuals:

- Refer to an HCV specialist for consideration of retreatment.
- Until referral to the specialist has been completed, monitor the patients every 6–12 months for clinical progression.
- Patients with cirrhosis can have CBC, hepatic function panel, and international normalized ratio (INR) checked every 6–12 months until referral has been completed.

Promoting Liver Health

Immunizations

Persons with chronic HCV should receive routine immunizations as part of their hepatitis care and immunizations against other viral hepatitis pathogens (hepatitis A virus [HAV] and hepatitis B virus [HBV]) is a special priority. In addition, persons with chronic HCV, especially individuals with cirrhosis, have an increased risk of developing invasive pneumococcal disease and therefore should therefore receive pneumococcal immunization.

Hepatitis A Immunization

Vaccination against HAV is a high priority in persons with chronic HCV who are not immune to HAV, as individuals with chronic HCV can develop fulminant hepatitis when they develop superinfection with HAV.[1] The hepatitis A immunization can be accomplished via a 2-dose series given at least 6 months apart (*Havrix* or *Vaqta*) or as a 3-dose hepatitis A and B combination vaccine (*Twinrix*).[2,3] For people with chronic HCV (untreated or treated), routinely checking a post-vaccination hepatitis A titer is not recommended, primarily because persons with chronic liver disease have a very high response to the hepatitis A vaccine.[3,4,5] Obtaining a post-vaccination titer is recommended for persons with chronic HCV who are immunocompromised, including persons with HIV.[3] If a hepatitis A post-vaccination titer is evaluated, seroconversion is defined as an IgG anti-HAV level of at least 10 mIU/mL.[3]

Table 1. Recommended Hepatitis A Immunization for Adults with Chronic HCV

Vaccine	Dosage	Dosing and Route
Hepatitis A Vaccines		
Havrix	1440 EL.U	2-Dose Schedule: 1 mL given IM at 0 and 6-12 months
Vaqta	50 U	2-Dose Schedule: 1 mL given IM at 0 and 6-18 months
Combined Hepatitis A and B Vaccine		
Twinrix	HAV: 720 EL.U *plus* HBsAg: 20 mcg	Standard 3-dose series: 1 mL given IM at 0, 1, and 6 mont Accelerated 4-dose series: 1 mL given IM on days 0, 7, and booster dose at month 12
Abbreviations: IM = intramuscular; HAV = hepatitis A virus; HBsAg = hepatitis B surface antigen		

Hepatitis B Immunization

All adults with chronic HCV infection should receive hepatitis B immunization, unless they have immunity to HBV (through prior vaccination or prior infection).[2,6] If hepatitis B immune status is unknown, recommendations are for baseline triple screening with hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), and hepatitis B core antibody (anti-HBc).[7] All current hepatitis B vaccines utilize recombinant hepatitis B surface antigen. The hepatitis B vaccine options include a 3-dose series using single HBsAg (*Engerix-B* or *Recombivax*) and a 2-dose hepatitis B vaccine series using single-HBsAg combined with a CpG 1018 adjuvant (*Heplisav-B*), and a 3-dose series hepatitis A and B combination vaccine (*Twinrix*); the triple HBsAg (*PreHevbrio*) vaccine was discontinued in November 2024 and is no longer available.[2,6,8]

Table 2. Recommended Hepatitis B Immunization for Adults with Chronic Hepatitis B

Vaccine	Dosage	Dosing and Route
Hepatitis B Vaccines		
Engerix-B	20 mcg	3-Dose Schedule: 1 mL given IM at 0, 1, and 6 months

Vaccine	Dosage	Dosing and Route
Recombivax HB	10 mcg	3-Dose Schedule: 1 mL given IM at 0, 1, and 6 months
Heplisav-B	20 mcg	2-Dose Schedule: 1 mL given IM at 0 and 1 month
Combined Hepatitis A and B Vaccine		
Twinrix	HAV: 720 EL.U *plus* HBsAg: 20 mcg	Standard: 3-dose series: 1 mL given IM at 0, 1, and 6 months Accelerated: 4-dose series: 1 mL given IM on days 0, 7, and 2 dose at month 12
Abbreviations: IM = intramuscular; HAV = hepatitis A virus; HBsAg = hepatitis B surface antigen		

Pneumococcal Immunization

All adults with chronic liver disease should receive pneumococcal immunization. In general, most experts would consider chronic HCV infection as meeting the criteria of chronic liver disease.[2] For persons who have never received pneumococcal vaccine (or do not know if they have received pneumococcal vaccine), two options exist: (1) administer one dose of the pneumococcal conjugate vaccine 20 (PCV20) or (2) administer one dose of pneumococcal conjugate vaccine 15 (PCV15), followed at least 1 year later by one dose of the 23-valent pneumococcal polysaccharide vaccine (PPSV23).[2]

Table 3. Recommended Pneumococcal Immunization in Adults 19-64 Years of Age with Chronic Liver Disease

Prior Pneumococcal Vaccination	Option A	Option B
None* (or pneumococcal vaccination history unknown)	1 dose PCV20	1 dose PCV15, followed ≥1 year with 1 dose of PPSV23
PPSV23 only	1 dose PCV20 (give ≥1 year after the last dose of PPSV23)	1 dose PCV15 (give ≥1 year after the last dose of PPSV23)
PCV13 only	1 dose PCV20 (give ≥1 year after PCV13)	1 dose PPSV23 (give ≥1 year after PCV13); review pneumococcal immunization recommendations again when patient turns 65 years old
PCV13 *and* PPSV23	No further pneumococcal immunization is recommended at this time; review pneumococcal immunization recommendations again when patient turns 65 yea old.	
*Also applies to people who received PCV7 at any age and no other pneumococcal vaccines.		

Source:

- Advisory Committee on Immunization Practices (ACIP). Recommended Adult Immunization Schedule by Medical Condition and Other Indications, United States, 2024. [ACIP]

Modifying Obesity

With rising rates of obesity, the prevalence of metabolic dysfunction-associated steatotic liver disease (MASLD) has risen substantially, as has the more severe form of MASLD, known as metabolic dysfunction-associated steatohepatitis (MASH).[9,10,11,12] The prevalence of MASLD and MASH in the United States is estimated at 30% and 5%, respectively.[13] Even in the absence of HCV infection, MASH can cause cirrhosis, hepatocellular carcinoma (HCC), and end-stage liver disease. In persons with HCV, steatosis can contribute to disease progression, particularly with genotype 3 HCV infection.[14] The mainstay of therapy for MASLD and MASH is weight loss through diet and exercise modifications. In addition, the United States Food and Drug

Administration (FDA) recently approved resmetirom (*Rezdiffra*), a thyroid hormone receptor-β selective agonist, for the treatment of metabolic dysfunction–associated steatohepatitis, based on a phase 3 trial that showed daily oral resmetirom was superior to placebo with respect to MASLD resolution and improvement in liver fibrosis.[15]

Recommendations for persons with chronic HCV and MASLD/MASH:

- Persons with MASLD who undergo HCV treatment and achieve an SVR should have their liver monitored with liver function tests every 6 to 12 months to ascertain ongoing liver inflammation.
- Any person with a body mass index (BMI) greater than 30 kg/m^2 should be offered a referral to a nutritionist for diet and weight loss counseling, with the goal of decreasing their BMI to less than 25 kg/m^2.
- Obese persons should limit their total caloric intake from fat to less than 30% (about 50 to 60 grams of fat per day), and they should receive counseling that any kind of weight loss can benefit them, even as little as 3 to 5% of their baseline weight.
- A combination of exercise and dietary therapy often produces good long-term results. Abstaining from alcohol is recommended.
- Pharmacologic liver-targeted therapy with resmetirom could be considered in persons with fibrosis stage 2 or 3 who do not respond to weight loss and dietary therapy. Oral resmetirom is dosed based on weight (80 mg once daily for persons weighing less than 100 kg and 100 mg once daily for persons weighing 100 kg or more). The dose of resmetirom may need adjusting based on potential drug interactions with other medications.[Q] MASLD Prevalence

Alcohol Use

Excessive alcohol consumption is one of the most common causes of liver disease in the United States. Evaluation for excessive alcohol use should ideally be done prior to starting HCV treatment as the combination of excessive alcohol consumption and chronic HCV can accelerate fibrosis progression and increase the risk of developing cirrhosis and liver complications, including hepatocellular carcinoma (HCC).[16,17,18,19] A “safe” level of alcohol consumption has never been established for persons with chronic HCV, and in general, these individuals should be counseled to avoid alcohol entirely. Multiple tools have been developed for practical and quick evaluation of excessive alcohol use. The U.S. Preventive Services Task Force (USPSTF) recommends using one of the following two brief alcohol screening tools for adults: the Alcohol Use Disorders Identification Test–Consumption (AUDIT-C) or the National Institute on Alcohol Abuse and Alcoholism (NIAAA) Single Alcohol Screening Question (SASQ).[20] It is important to note that excessive alcohol use is not a contraindication for HCV treatment, since DAA therapy has been shown to be effective regardless of alcohol use.[21] From a long-term perspective, individuals who clear HCV and continue to drink excessively will be at ongoing risk for liver complications related to alcohol consumption, particularly individuals who have cirrhosis.[22] Therefore, it is recommended to periodically reassess for excessive alcohol use as part of the long-term follow-up in persons after treatment of HCV.

Recommendations regarding alcohol for persons with chronic HCV:

- Ideally, persons with chronic HCV infection should abstain from alcohol. To work towards this goal with patients who are drinking, providers can conduct a brief intervention that takes no more than 5 to 15 minutes. The National Institute on Alcohol Abuse and Alcoholism provides guidance on how to perform a Brief Intervention on the steps to build motivation and explore a patient’s willingness to change.
- Individuals with past or present alcohol use should not be excluded from consideration of HCV treatment. Nevertheless, those with ongoing alcohol use should be encouraged to discontinue alcohol prior to, during, and after therapy for HCV, since continued alcohol use will place them at ongoing risk for long-term liver complications and liver-induced mortality.
- Individuals with ongoing alcohol use disorder should be considered for treatment of their alcohol use disorder with medications such as naltrexone.

[Activity] A. Determing AUDIT-C Score

Complementary and Alternative Medicines and Liver Toxicity

Complementary and alternative medicines are frequently used in the United States, including use by some to promote liver health.[23,24,25] Some complementary medications, however, may have harmful effects on the liver or cause major drug interactions with medications used to treat HCV.[24,25,26] Clinicians should obtain a complete history of the individual’s over-the-counter medications, supplements, and prescription medications at the initial visit, prior to HCV treatment, and during HCV treatment. For individuals taking complementary and alternative therapies, clinicians should discuss the risks and benefits of continuing these therapies. The National Institute of Health’s (NIH) Liver Tox is an excellent resource for information on the safety and efficacy of dietary and herbal supplements and can be used when counseling patients.

Recommendations regarding the use of complementary and alternative medicines

- Clinicians should obtain a complete list of the patient's complementary and alternative medicines and discuss the risks and benefits of continuing these medications.
- Resources such as Liver Tox from the NIH should be used to get information on the safety and efficacy of dietary and herbal supplements.

[Activity] A. How to Use Liver Tox

Management of Persons with Cirrhosis

The following discussion is intended to provide a brief highlight of key management issues in patients with compensated cirrhosis. This discussion will not address the management of individuals who have decompensated cirrhosis (Child-Turcotte-Pugh class B or C), as these individuals should be under the care of a liver specialist and are beyond the scope of this tutorial.

Hepatocellular Carcinoma Screening

Patients with cirrhosis should undergo regular surveillance for hepatocellular carcinoma (HCC). The population who should undergo surveillance for HCC includes all patients with cirrhosis, including individuals who have achieved an SVR12 with treatment. Although achieving an SVR12 reduces the overall risk of HCC, it does not eliminate this risk, which can persist years after HCV clearance in people with cirrhosis.[27]

Screening Testing Methods

- **Hepatic Ultrasound**: This test is the recommended radiographic method to use for HCC surveillance. Hepatic ultrasound has the advantage of being relatively easy to perform, noninvasive, and without additive risks of radiation or contrast exposure. This test has a sensitivity of approximately 60-80% for detecting HCC at any stage and about 45-60% for detecting early-stage HCC.[28,29,30]
- **Alpha-fetoprotein**: Alpha-fetoprotein (AFP) is the most widely used biomarker for HCC surveillance. If used alone as an HCC surveillance test, it has a sensitivity of only 47-64% and a specificity of 82-95% for detecting HCC among persons with HCV infection. The relatively low sensitivity results primarily from the lack of uniform secretion of AFP by all HCC tumors.[31] The lower specificity occurs because AFP can often be elevated above the upper limit of normal in persons with advanced fibrotic liver disease but without HCC.[32] For these reasons, use of AFP for HCC surveillance is recommended in combination with hepatic ultrasound.[30]

Guidance for HCC Surveillance

- **AASLD Recommendations**: The 2023 AASLD HCC Guidance recommends performing HCC surveillance for all adults with cirrhosis, using abdominal ultrasound and serum AFP at a frequency of approximately every 6 months.[33] For individuals who have suspected HCC based on a screening test result, the guidance recommends further evaluation with either a multiphasic CT or multiphasic magnetic resonance imaging.[33] This guidance recommends against screening persons with stage 3 fibrosis (without cirrhosis) following HCV clearance with DAA treatment.[33][Q] HCC Screening

Screening for Clinically Significant Portal Hypertension

Cirrhosis can manifest as two main clinical stages: compensated versus decompensated liver disease. Decompensated disease is marked clinically by the development of complications from portal hypertension which include ascites (and spontaneous bacterial peritonitis), variceal hemorrhage and overt hepatic encephalopathy, and are associated with significant morbidity and mortality.[34] Individuals with clinically significant portal hypertension, formally defined by hepatic vein pressure gradient of 10 mmHg or greater as measured by transjugular catheterization in a hepatic vein, are at greater risk of decompensation and need to be identified for consideration of preventive non-selective beta blockade. Due to the risks associated with HVPG assessment, a number of non-invasive measures have been used and considered acceptable to identify patients with clinically significant portal hypertension. These are:

- Ascites on abdominal imaging (cross-sectional CT, cross-sectional MRI, or ultrasound).
- Collaterals (periesophageal varices, recannulization of umbilical veins or splenorenal shunt) or hepatofugal venous flow on abdominal imaging.
- Liver stiffness measurement (LSM) by vibration-controlled transient elastography (or Fibroscan)

combined with platelet count:

- LSM ≥25 kPa regardless of platelet count
- LSM 20-24.9 kPa *plus* platelet count Figure 1).[34]

Management When Non-Selective Beta Blocker Cannot Be Used

For those who are intolerant of non-selective beta blockers or for whom there are contraindications, it is recommended that providers follow the traditional algorithm for screening directly for varices by endoscopy. In such patients, variceal screening can be safely deferred if the following low-risk criteria are met:[35,36]

- Platelet counts greater than 150,000 (10^9/L), *and*
- Median liver stiffness of less than 20 kPa on transient elastography

Summary Points

- Persons who receive HCV treatment with DAAs should be closely followed and monitored after treatment, except individuals who achieve an SVR and who do not have cirrhosis or other risk factors for HCV reinfection or chronic liver disease.
- All individuals who achieve an SVR12 should be counseled about outcome durability and the risk of HCV reinfection; persons at risk for HCV reinfection or who have risk factors for chronic liver disease should be screened for HCV reinfection using an HCV RNA assay. Persons who do not achieve an SVR12 following DAA treatment should be referred to an HCV specialist for consideration of retreatment; these patients are not eligible for simplified treatment.
- Immunizations play an important role in promoting liver health; persons with chronic HCV should receive routine immunizations as part of their care, with a high priority on immunizing against other viral hepatitis pathogens (hepatitis A and hepatitis B) and pneumococcal disease.
- In persons with chronic HCV, MASLD can contribute to progression of liver disease, especially in the more severe form, MASH. The mainstay of therapy for MASLD and MASH is weight loss through diet and exercise.
- Alcohol consumption may accelerate liver disease progression and thus, screening for excessive alcohol consumption should be performed in all persons with chronic HCV. Excessive alcohol use is not a contraindication for HCV treatment, but persons with excessive alcohol use should receive counseling to help reduce alcohol intake.
- Patients with cirrhosis should undergo HCC screening regardless of whether they achieve an SVR with HCV treatment. The recommended HCC screening consists of hepatic ultrasound and serum alpha-fetoprotein every 6 months. The primary mode for varices screening is by esophagogastroduodenoscopy and it can be deferred for selected patients with cirrhosis who are at low risk of developing varices.
- Patients with compensated cirrhosis should be assessed for clinically significant portal hypertension, which can be determined by a variety of non-invasive surrogate measures of portal pressure. Those with clinically significant portal hypertension should be considered for non-selective beta blockade to reduce the risk of progression to hepatic decompensation.

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Figures

Figure 1 (Image Series) - Non-Selective Beta-Blockers: Dosing and Contraindications (Image Series) - Figure 1 (Image Series) - Non-Selective Beta-Blockers: Dosing and Contraindications
Image 1A: Nonselective Beta-Blockers for Primary Prophylaxis Against Variceal Bleeding

Source: Kaplan DE, Ripoll C, Thiele M, et al. AASLD Practice Guidance on risk stratification and management of portal hypertension and varices in cirrhosis. Hepatology. 2024;79:1180-1211.

Recommended Beta-Blockers for Primary Prophylaxis Against Variceal Bleeding

	Propranolol	Nadolol	Carvedilol
Starting Dose	20-40 mg twice daily	20-40 mg at bedtime	6.25 mg once daily
Titration	Increase dose every 2-3 days until treatment goal	Increase dose every 2-3 days until treatment goal	Increase to 6.25 mg twice daily after 2-3 days
Max Dose	No ascites: 320 mg daily Ascites: 160 mg daily	No ascites: 160 mg daily Ascites: 80 mg daily	12.5 mg daily
Goal	Heart rate: 55-60 bpm SBP: ≥90 mm Hg	Heart rate: 55-60 bpm SBP: ≥90 mm Hg	No heart rate goal SBP: ≥90 mm Hg

Figure 1 (Image Series) - Non-Selective Beta-Blockers: Dosing and Contraindications
Image 1B: NSBB_Contraindications for the Use of Nonselective Beta-Blockers

Source: Kaplan DE, Ripoll C, Thiele M, et al. AASLD Practice Guidance on risk stratification and management of portal hypertension and varices in cirrhosis. Hepatology. 2024;79:1180-1211.

Contraindications to Nonselective Beta-Blockers
Absolute Contraindications
Asthma
2nd and 3rd degree atrioventricular block (in absence of implanted pacemaker)
Sick dinus syndrome
Extreme bradycardia (<50 beats per minute)
Relative Contraindications
Psoriasis
Peripheral arterial disease
Chronic obstructive pulmonary disease
Pulmonary arterial hypertension (controversial)
Insulin dependent diabetes mellitus (interferes with symptoms of hypoglycemia)
Raynaud syndrome

Table 1. Recommended Hepatitis A Immunization for Adults with Chronic HCV

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Hepatitis A Vaccines		
Havrix	1440 EL.U	2-Dose Schedule: 1 mL given IM at 0 and 6-12 months
Vaqta	50 U	2-Dose Schedule: 1 mL given IM at 0 and 6-18 months
Combined Hepatitis A and B Vaccine		
Twinrix	HAV: 720 EL.U *plus* HBsAg: 20 mcg	Standard 3-dose series: 1 mL given IM at 0, 1, and 6 mont Accelerated 4-dose series: 1 mL given IM on days 0, 7, and booster dose at month 12
Abbreviations: IM = intramuscular; HAV = hepatitis A virus; HBsAg = hepatitis B surface antigen		

Table 2. Recommended Hepatitis B Immunization for Adults with Chronic Hepatitis B

Vaccine	Dosage	Dosing and Route
Hepatitis B Vaccines		
Engerix-B	20 mcg	3-Dose Schedule: 1 mL given IM at 0, 1, and 6 months
Recombivax HB	10 mcg	3-Dose Schedule: 1 mL given IM at 0, 1, and 6 months
Heplisav-B	20 mcg	2-Dose Schedule: 1 mL given IM at 0 and 1 month
Combined Hepatitis A and B Vaccine		
Twinrix	HAV: 720 EL.U *plus* HBsAg: 20 mcg	Standard: 3-dose series: 1 mL given IM at 0, 1, and 6 months Accelerated: 4-dose series: 1 mL given IM on days 0, 7, and 2 dose at month 12
Abbreviations: IM = intramuscular; HAV = hepatitis A virus; HBsAg = hepatitis B surface antigen		

Table 3. Recommended Pneumococcal Immunization in Adults 19-64 Years of Age with Chronic Liver Disease

Prior Pneumococcal Vaccination	Option A	Option B
None* (or pneumococcal vaccination history unknown)	1 dose PCV20	1 dose PCV15, followed ≥1 year with 1 dose of PPSV23
PPSV23 only	1 dose PCV20 (give ≥1 year after the last dose of PPSV23)	1 dose PCV15 (give ≥1 year after the last dose of PPSV23)
PCV13 only	1 dose PCV20 (give ≥1 year after PCV13)	1 dose PPSV23 (give ≥1 year after PCV13); review pneumococcal immunization recommendations again when patient turns 65 years old
PCV13 *and* PPSV23	No further pneumococcal immunization is recommended at this time; review pneumococcal immunization recommendations again when patient turns 65 yea old.	
*Also applies to people who received PCV7 at any age and no other pneumococcal vaccines.		

Source:

- Advisory Committee on Immunization Practices (ACIP). Recommended Adult Immunization Schedule by Medical Condition and Other Indications, United States, 2024. [ACIP]